Shore Installation Process Handbook

Version 3.0

October 19, 2009

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From: Assistant Commander for Logistics and Fleet Support, Space and Naval Warfare Systems Command (Code 4.0)

Subj: LETTER OF PROMULGATION

1. This letter hereby authorizes the release and distribution of the Shore Installation Process Handbook, Version 3.0. This document version supersedes the Shore Installation Process Handbook; Version 2.2 dated 21 September 2007. It is effective upon receipt and shall be handled administratively in accordance with Space and Naval Warfare Systems Command instruction (SPAWARINST) 4720.1.

2. Per Naval Network Warfare Command instruction (NETWARCOMINST) 12272.1 and SPAWARINST 4720.1, the Shore Installation Process Handbook provides procedures and guidance to be used by all SPAWAR activities during the installation of electronic systems at shore facilities.

3. The Shore Installation Process Handbook is a unclassified publication. A distribution determination was completed in accordance with Department of Defense Directive (DoDD) 5230.24. Disclosure of this publication or portions thereof is limited to Department of Defense (DoD) and U.S. DoD contractors for administrative or operational use. Date of Determination is 17 June 2008. Other requests must be referred to SPAWARSYSCOM, Code 4.0.

MARTIN BROWN

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EXECUTIVE SUMMARY

In 1999, Commander, Space and Naval Warfare Systems Command recognized that varying forms of installation processes with inconsistent results were being utilized during the installation of SPAWAR systems at Naval shore facilities. To standardize procedures utilized by SPAWAR field activities, the SPAWAR Shore Installation Process Handbook (SIPH) was developed to document an optimized process based upon decades of installation experience and lessons learned. The goal of the SIPH was to document a repeatable process that provides guaranteed successful results that minimize cost, improve performance, and improve customer satisfaction. The results of SPAWAR shore installations performed since the implementation of the original SIPH in 1999 have demonstrated that this goal has been on the whole achieved.

In June 2003, version 2.0 of the SIPH was published to incorporate lessons learned during the prior three years as the process matured. In April 2007, version 2.1 was released to update Sections 1, 2, 3, and 9 and associated appendixes. In September 2007, version 2.2 was released to update Sections 4, 5, and 6 and all associated appendixes. Version 3.0 updates Sections 7 and 8 and adds a new Section 10 on tailoring the process. Version 3.0 also contains other changes and improvements resulting from policy changes and Lean Six Sigma initiatives. Version 3.0 reflects the most up-to-date lessons learned, process improvements, and organizational changes.

The SIPH is an unclassified publication that provides a comprehensive reference that details the elements of the Shore Installation Process to be used by SPAWAR Headquarters and all field activities when installing electronic systems at a Naval shore facility. This handbook not only details the process to be followed, but also includes examples of documentation to be utilized so that the content and format of the installation documentation delivered to customers by SPAWAR activities will be consistent and complete.

The Shore Installation Process requires customer involvement and concurrence early in the installation cycle and is oriented toward continuous customer involvement and satisfaction. To aid in the successful completion of each step in the process, checklists are provided. Organizational relationships, roles and responsibilities, and methodology to ensure that actions and information are provided to and through the appropriate level for management oversight are also included.

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PREFACE

The Shore Installation Process Handbook is designed as a comprehensive reference providing guidance and direction concerning processes to be followed for installation of C4ISR systems and other electronic systems at shore facilities. SPAWARINST 4720.1 establishes this handbook as the primary reference to be used by all SPAWAR personnel and subordinate commands for all installations at shore facilities.

Throughout this publication, references to other publications imply the effective edition.

Report any missing pages to the SPAWAR 4.2 Installation Competency office.

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RECOMMENDED CHANGES

Recommended changes to this publication may be submitted at any time and should include the following information:

1. Version number of the Shore Installation Process Handbook.
2. Location of recommended change: page, paragraph, line, and figure number.
3. Type of change: add/delete/modify, text/figure.
4. Exact change recommendation. Give verbatim text changes. If a figure is to be added, supply a rough sketch or identify the source of the new figure. If a figure is to be changed, include a marked up copy of the existing figure.
5. Rationale/justification for the proposed change.

All recommendations should be submitted to:

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RECORD OF CHANGES

Change No. and Date of Change	Date of Entry	Page Count verified by (Signature)
Version 3.0 **May 2009**		**Version 3.0 includes a general update to the entire document. Major changes were made to Sections 5, 7, and 8 as well as Appendices J, N, R, W, Y, and AD. A new Section 10 was added that describes tailoring of the process for special situations.**

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1.0 INTRODUCTION

1.1 Background

The basis for modern Production Management theory states that to be successful, an organization must recognize that process control of an established process provides repeatable and desirable results. This handbook documents the optimized and repeatable Shore Installation Process (SIP) that is based upon decades of installation experience and lessons learned. This repeatable process provides guaranteed successful results that minimize cost, improve performance, and improve customer satisfaction. This process is used by Space and Naval Warfare Systems Command (SPAWAR), Program Executive Offices (PEOs), subordinate Commands, and contractors regardless of funding source when installing Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) systems and other electronic systems at shore facilities. This handbook was initially published in September 1999. Version 2.0 was published in June 2003. Version 3.0 is intended to provide a general update and to incorporate additional lessons learned, process improvements, and organizational changes.

1.2 Handbook Structure

The basic Shore Installation Process is shown in Figure 1-1. The basic process consists of requirements definition, planning, design, pre-production preparations, installation, and operational turnover. Installation projects will normally use these basic 6 steps with varying degrees of complexity. Each of these 6 steps is explained in detail in Sections 3 through 8.

- Work Plan Development and Tasking (Section 3).
- Installation Planning (Section 4).
- Installation Design (Section 5).
- Pre-Installation Tasks (Section 6).
- Installation Performance (Section 7).
- System Turnover to the Customer (Section 8).

Section 2 describes activities that are usually performed by a Program Office in preparing a program requirement for the installation process. If the sponsoring activity is not a Program Office then those preparations will either be the responsibility of the sponsoring activity or of the installation activity. If the activities identified in Section 2 are not completed by the sponsoring activity, the installation will become more costly, and the probability that difficulties will arise during the installation phase and the probability of customer dissatisfaction will both increase. If installation activities require clarification of installation standards, contact SPAWAR 4.2.

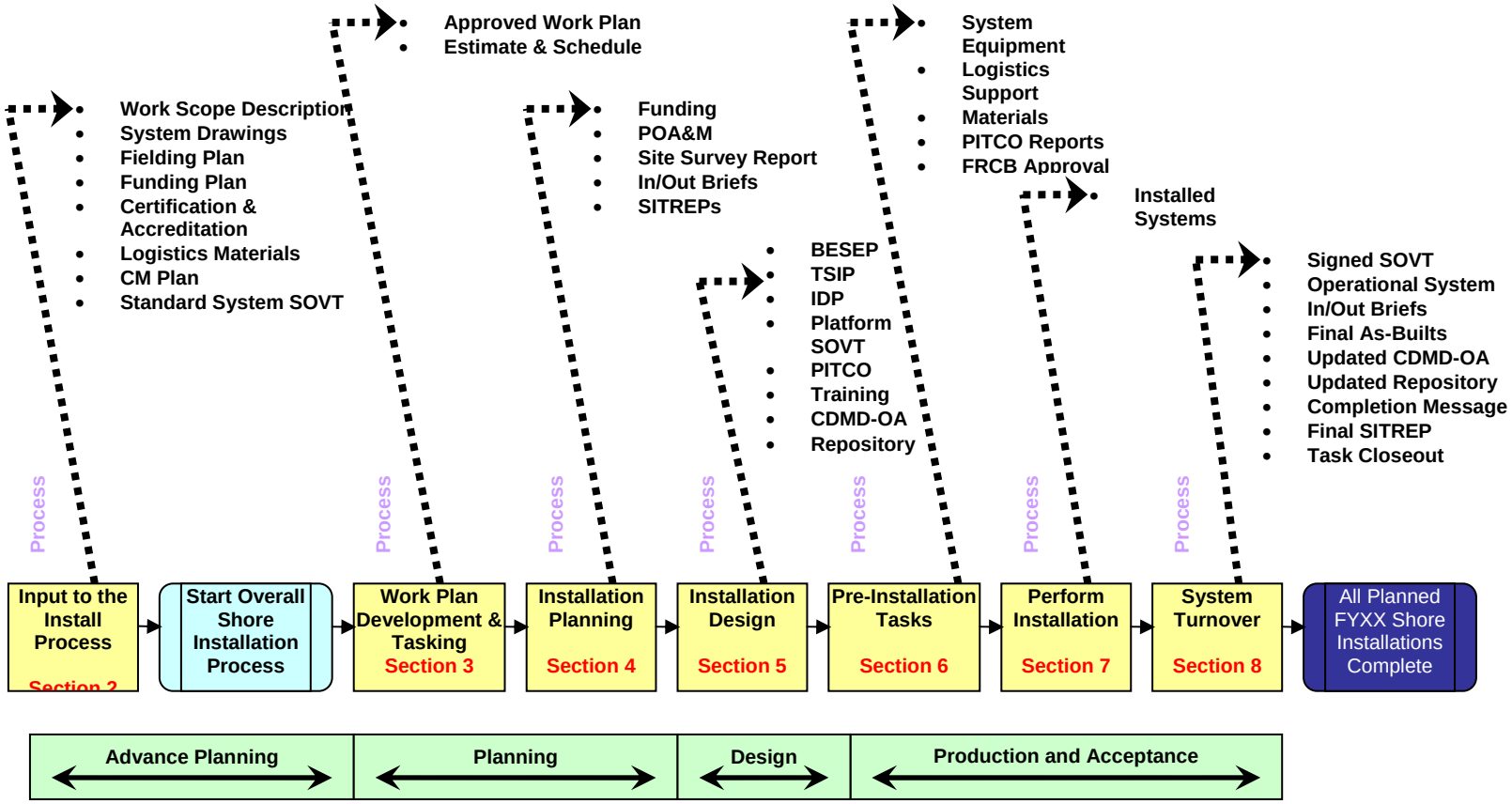

Figure 1-1. Shore Installation Process

1.2.1 The structure of Sections 2 through 8 is identical in that:

- Each section contains a "block diagram flow chart" similar to Figure 1-1 that pictorially documents the major elements of the process detailed in that section;
- The details within the section expound upon each block in the diagram;
- Major "products" of the block diagram are shown above and below the block in which they occur;
- The end of each section refers to a checklist contained in Appendix A of this handbook. The checklist provides an aid for the process user to double check that all relevant elements of that section have been completed. Completion of the checklist for that section is the last major block on each section's "block diagram flow chart";
- Each step of the process is a precursor for the step that follows. However, in many instances parallel activities do occur; and
- Detailed templates or samples of documentation required to support the major products in each section of the process are included as appendixes to the handbook.

1.2.2 Section 9 provides additional requirements for integration of C4ISR systems with Military Construction (MILCONs) projects and for other large or special interest projects. Section 10 provides guidance on how to tailor the six step process and deliverables for special requirements.

1.3 Milestones

The Shore Installation Process is designed to be "event" rather than "schedule" driven and different installation projects can be, and often are, accomplished over very different timelines. However, since the Navy's budgets are based on annual appropriations, a notional schedule (list of timeline milestones) based upon fiscal realities and comptroller benchmarks is outlined in Table 1-1. The more challenging projects may need design and production activities separated into multiple fiscal year tasks. Each task must result in entirely completed deliverables. The Installation Management Activity (IMA) and the Installation Manager (IM) play a key role in these activities. See Sections 1.4.2 and 1.4.3.

- The process depicted in Figure 1-1 notionally begins in December with identifying Fielding Plan requirements for the following fiscal year (FY+1) Work Plan (WP). The Work Plan lists all installations with proposed schedule dates, equipment availability, mission critical dates if applicable, and programmed costs. See Appendix A checklist for a detailed listing of required information.
- Planned installation projects for FY+1 should be fully described and provided to the Installation Activity (IA) no later than May for scheduling and cost estimating activities. The IA estimates and prepares an initial schedule for each project taking into consideration all available scheduling data including customer blackout dates resulting from operational/exercise commitments. When possible,

installations are planned, estimated, and executed in a consolidated fashion with other installations. For details on IA responsibilities see Section 1.4.4.

- The cost estimates and initial schedules for the FY+1 installations are normally completed by the IA within 60 days (by July). This information is used to finalize work requirements with the budget for the coming year. Subsequent revisions to the Work Plan should be estimated and scheduled by the IA within 30 days.
- All issues related to work scope or cost estimates are resolved by August.
- An approved Work Plan along with Funding Documents is provided to the IA at the beginning of each fiscal year. This gives the IA the entire fiscal year for execution.
- To meet comptroller benchmarks, all onsite installation work is to be started no later than 30 December of the following fiscal year. Funds are to be expended by 30 March.

Table 1-1. Shore Installation Timeline Milestones

Dec	IMA starts identifying Fielding Plan requirements for the following Fiscal Year (FY+1) Work Plan ▪ Assess availability of equipment ▪ Consider Mission Critical Dates and related Afloat requirements ▪ Assign preliminary installation dates ▪ Look for opportunities for integration ▪ Ensure that installation scope is fully defined
May	Provide planned installation projects for the following FY to the IA for cost estimates.
Jul	IA submits cost estimates and initial schedules for the FY+1 proposed installation projects.
Aug	IMA resolves all cost estimate or work scope issues for the following Fiscal Year (FY+1)
Sep	IMA provides an approved Work Plan to the IA and initiates Funding Document preparations.
Oct	IMA funds installations for the new fiscal year and IA commences installation planning.
Dec	IA has at least started all onsite production work for the prior year Work Plan. IMA starts identifying requirements for the next Fiscal Year (FY+1).
Mar	IA has expended or returned all funds associated with the prior year Work Plan.

Another timeline, primarily used in planning afloat installations, is one that is keyed to availability or in the case of shore installations, an installation start date. This approach is not as useful or reliable for shore installations, because unlike ships and submarines, shore facilities are not usually tied to availabilities. However, for those who desire a notional timeline keyed to an installation start date, Figure 1-2 is provided. This “I minus” timeline is only intended as an aid for early planning and should not be considered absolute as installations differ vastly in complexity and maturity. The Shore Installation Process is designed for early and continuous customer involvement aiming for excellence in customer satisfaction.

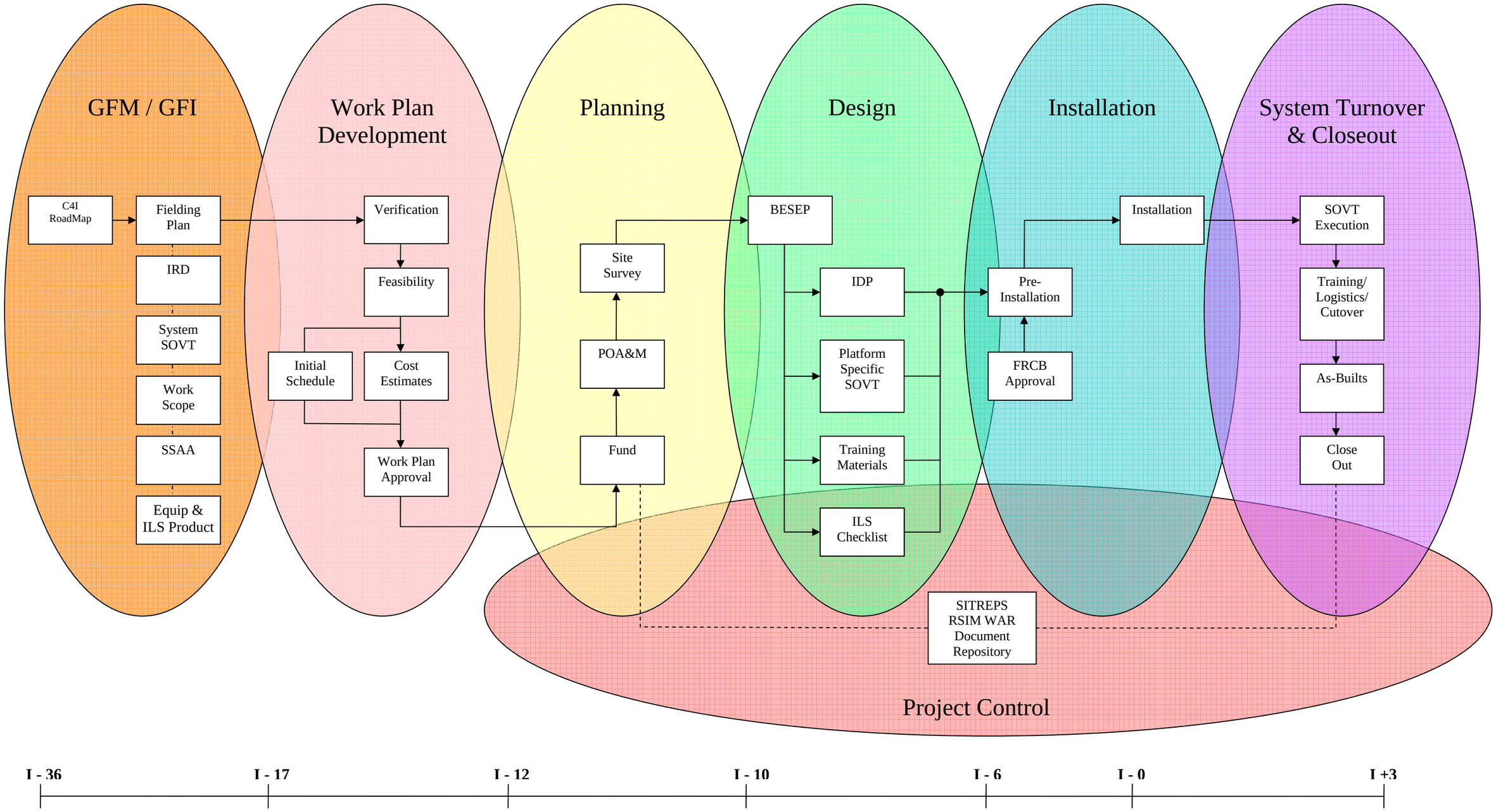

Figure 1-2. Shore Installation Process Notional "I Minus" Timeline

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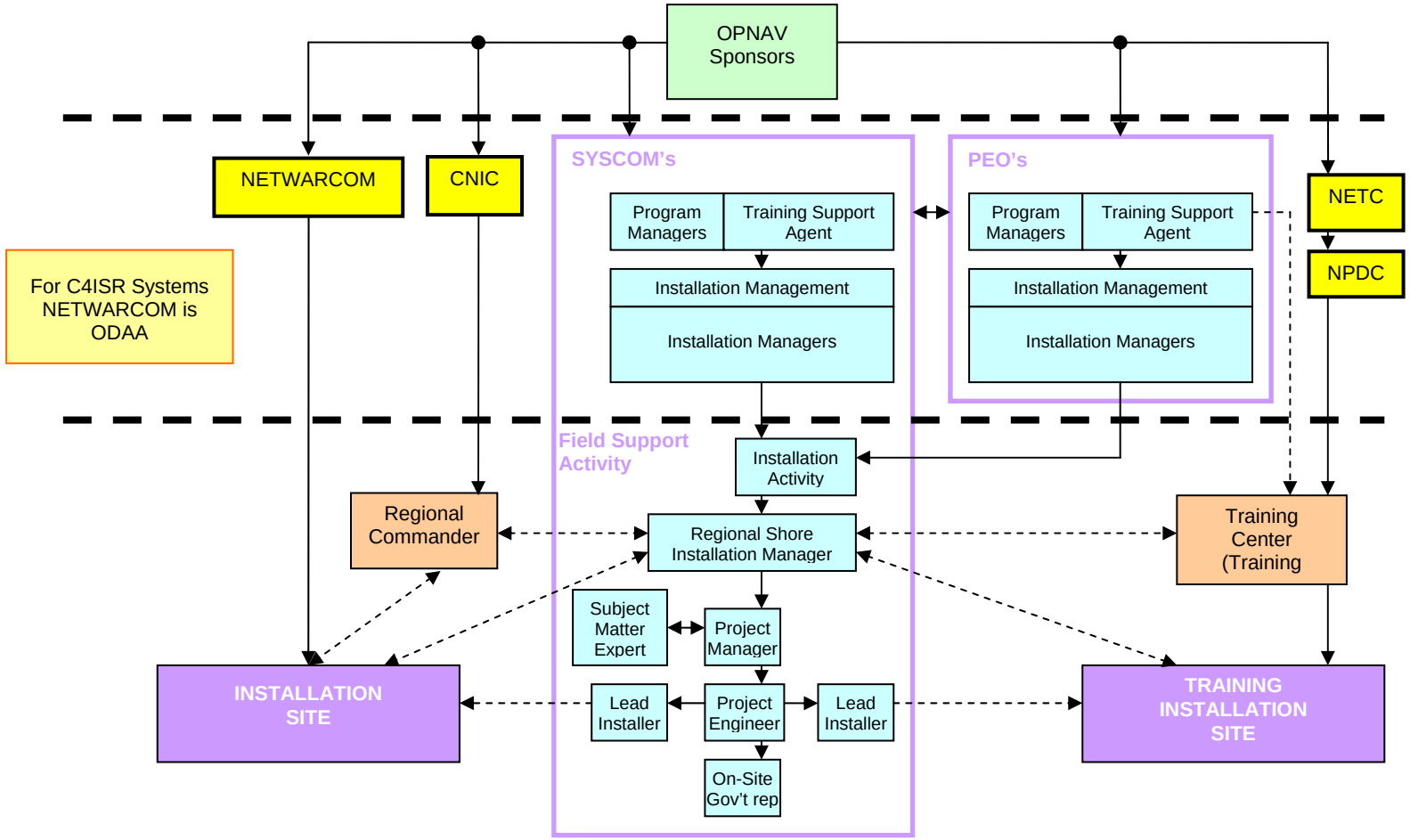

For SPAWAR and related PEO Installations:

- **The Installation Activity is normally the SSC Installation Management Office (IMO); and**
- **The TSA is normally the associated Program Office**
- **Installation Managers are appointed by the IMA.**

Figure 1-3. Organizational Relationships

1.4 Organizational Structure and Relationships

The following paragraphs define generic roles that are used by the Shore Installation Process. While many generic roles are described, not all roles are necessarily employed for each installation, and some roles can be conducted by the same individuals. Figure 1-3 outlines the basic organizational framework and relationships between the organizations and roles described below. Solid lines indicate a directive relationship and/or the direction of information flow. Dashed lines indicate an advisory, customer relations, or reporting relationship. Arrows indicate the direction of these relationships. Program requirements for C4ISR Installations are normally tasked by the Office of Chief of Naval Operations (OPNAV) to Program Managers. Program Managers develop and field systems to meet these requirements. The majority of C4ISR, Information Technology (IT), and Space related installations are under the auspices of Program Executive Office (PEO) C4I, PEO EIS, and PEO Space. A SPAWAR Systems Center (SSC) normally acts as the IA for these organizations. Commander, Navy Installations Command (CNIC) and Naval Facilities Engineering Command (NAVFAC) organizations are primarily involved with those installations requiring construction activities. The key interface roles within the organizational structure that support the installation process are defined below. The Regional Shore Installation Manager (RSIM) is the primary point of contact between the sponsoring activity, the installing activity and the site receiving installations within the region. The Project Engineer and On Site Government Representative (OSGR) work directly with the installation site.

1.4.1 Program Manager. The Program Manager is the designated individual with responsibility and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. The Program Manager is accountable for credible cost, schedule, and performance. The Program Manager shall ensure that all members of their Program Office are aware of and comply with Navy policies and required processes including the Shore Installation Process, the Fleet Readiness Certification Board (FRCB) requirement, and the requirement to coordinate all site visits with the RSIM.

1.4.2 Installation Management Activity (IMA). The IMA is normally part of the organization that sponsors the installation. The IMA is usually a Systems Command (SYSCOM) or Echelon II component organization. For PEO C4I, for example, PMW 790 has been appointed as the IMA. For PEO EIS, the IMA resides within the PEO staff. The IMA develops regional installation strategies and provides integrated solutions through the development and management of comprehensive work packages.

1.4.3 Installation Manager (IM). The IMA will appoint IMs to oversee shore installations within a geographical area. Team SPAWAR shore installations are divided into three Areas of Responsibility (AOR); Atlantic (LANT), Pacific (PAC), and European and Southwest Asia Central Command (EURCENT). The IMs, previously referred to as Area Installation Managers (AIMs), will oversee all shore installations, associated processes, and process elements that apply to their area of responsibility. IMs will:

- Act as the liaison between the IMA and the Installation Activities (IA);
- Track the installation Plan of Action and Milestones (POA&M) to successful completion;
- Track and coordinate the resolution of all installation-related issues;
- Analyze Work Plans to manage costs and to identify efficiencies and scheduling issues;
- Facilitate review and endorsement of Base Electronic System Engineering Plans (BESEPs);Interface with Fleet Commanders and other customers to identify and resolve scheduling issues to make best use of available resources;
- Be an authoritative source on the:
  - SPAWAR Shore Installation Process as outlined in the SPAWAR Shore Installation Process Handbook;
  - Installation standards and experiences leading to successful performance of shore installations; and
  - Application of sound program or project management processes such as developing a Work Breakdown Structure (WBS), performing critical path analysis, establishing risk management, using Project Controls (e.g. Earned Value Management (EVM) to manage performance and cost, applying system engineering, supporting logistics and configuration management, and enforcing statutory and regulatory defense contract management requirements.
- Provide IMA supervision and leadership in maintaining an effective shore installation program; and
- Fully understand the roles and responsibilities of Contracting Officer Representative (COR).

1.4.4 Installation Activity (IA). The Installation Activity is the organization responsible for conducting the installation at a designated site. The Installation Activity is usually a Field Support Activity or Echelon III component organization. For example, COMSPAWAR has directed that the Commanding Officers of SPAWAR Systems Center (SSC) Pacific and Atlantic to centralize the planning and execution of all installations through Installation Management Offices (IMOs) as the only authorized IAs regardless of source of funding or sponsor for SPAWAR executed installations. The IA's IMO shall assign the Project Engineer (PE) and other appropriate staff and levels of expertise required to support the installation. The size and complexity of the installation determines what personnel are required. A PE will be assigned to each installation or consolidated group of installations. Other personnel may also be assigned if necessary such as a Subject Matter Expert (SME), an On-Site Government Representative (OSGR) and assistant project engineers. In many installations the PE will also function as the SME and the OSGR.

For major installations such as, Military Construction (MILCON) Projects and other large installations, the IA will assign a Project Manager who will coordinate and manage the activities of several Project Engineers (PEs) and all system installations. The Project Manager is held accountable by chain of command to support the IMO's management authority and for following the Shore Installation Process as defined in this handbook. Often these large projects are funded from multiple resource sponsors, have multiple mission sponsors, and have senior level special interest. SYSCOM management support may be necessary and may be assigned to support Echelon III project execution from initiation (i.e. NAVFAC initial DD1391 planning) through all phases of the MILCON C4I Integration Process (See Section 9) resulting in Full Operational Capability (FOC). The assigned SYSCOM management works with the Echelon III IMO and assigned Project Manager to oversee project milestones events and support required coordination with the customer's senior leadership. Responsibilities of the IA include:

- Identifying /reviewing opportunities for consolidation or integration;
- Ensuring that all cost estimates correctly provide for all applicable SIPH deliverables and required approvals;
- Maintaining financial accountability and appropriate controls;
- Ensuring assigned project engineers employ sound project management processes and prepare weekly Situation Reports (SITREPs) in accordance with Appendix B;
- Reviewing and submitting installation cost estimates, BESEPs, POA&Ms, and actual costs;
- Electronic submission of the Shore Installation Process products to the SYSCOM designated installation database and repository when each deliverable is completed, e.g. cost estimates, spend plans, POA&Ms, Site Survey reports, BESEPs, Installation Design Plans (IDP), Signed SOVTs, As-built drawings, and actual costs. For SPAWAR, the designated installation database and repository is SPAWAR and PEO Installation Date Environment and Repository (SPIDER);
- Maintaining a Time Line Summary (TLS) depicting schedule and progress for all installations listed on the Work Plan;
- Liaison between IMA, IM, and Regional Shore Installation Managers (RSIM);
- Designation of the installation team responsible for performing the installation. Key members of the Installation Team will normally consist of the PE, On Site Government Representative (OSGR), Quality Assurance Evaluator (QAE), and Lead Installer (generally a contractor). The PE will determine the appropriate staff and level of expertise required to support the installation. The size and complexity of the installation determines what trade specific installation personnel are required. An Installation Team can be assigned to an individual installation or consolidated group of installations. Other personnel may also be assigned if necessary;

- Ensuring that all site visits including In-Service Engineering Agent (ISEA), Subject Matter Experts (SMEs), Fleet Support Engineering Team (FSET), and Project Engineer (PE) visits to plan future or perform ongoing installation efforts are coordinated through the assigned RSIM prior to conducting site visits, site surveys, on-site production, and post installation requirements; and
- Contracting for installation services through approved vendors. For contracted installations, the IA ensures that appropriate government oversight is available to validate the quality of all specified vendor C4I deliverables, the installation, and the assurance of customer acceptance.

1.4.5 Regional Shore Installation Manager (RSIM). The Regional Shore Installation Manager (RSIM) is responsible for a defined region within a geographical area. For SPAWAR, each AOR (PAC, LANT, and EURCENT) is broken down into regions and each region is assigned a SPAWAR RSIM. Appendix AD provides the SPAWAR regional breakdown. Other SYSCOMs may select a different geographical breakdown, but the intent is that the IA coordinate all their shore installations through RSIMs. Each SPAWAR RSIM oversees all SPAWAR installations within their region, acting as an ambassador for the IMA and IA as well as single point of contact for the customer to resolve all installation issues within a given region. The RSIM provides liaison between the customer, the IMA, and the Installation Activities conducting the installations. The RSIM is responsible for the quality, schedule, and cost of SPAWAR shore installations within his or her region. The IA is responsible for appointing RSIMs based upon qualification standards that are defined in Appendix C1. The RSIM and their assistants will:

- Be the single point of customer contact for all installation issues in their region;
- Oversee all SPAWAR installations at Naval Shore Sites and Activities within their Region, including exempt, non-exempt, and other-command-funded tasks;
- Act as a liaison between customer, IMA/Sponsor and Installation Activities (IA);
- Ensure installations and associated documentation are in compliance with the SPAWAR Shore Installation Process Handbook;
- Ensure that all installation data and products that result from the installation process are uploaded in their native electronic form in the designated SYSCOM repositories;
- Ensure Quality, Schedule and Cost of shore installations within their Region;
- Be the stakeholder in the development of installation consolidation/integration plans;
- Coordinate the resolution of installation related issues;
- Prepare Weekly Activity Report (WAR) summarizing installation, Command/Site issues and concerns warranting being raised to the IM;
- Ensure all installations have FRCB approval in accordance with NAVNETWARCOMINST 12271.1 “Policy and Procedures For The Fleet Readiness

Certification Board (FRCB) Process". Report all violations to the IA, IM, and SPAWARSYSCOM 4.2;

- Report all Shore Installation Process violations to the IA, IM, and for SPAWAR executed installations to SPAWARSYSCOM 4.2;
- Report all instances warranting stop work action to the IA, IM, and SPAWARSYSCOM 4.2. This report should identify what corrective actions are required, and project when affected installations will be able to proceed.
- Coordinate POA&Ms with the IA, IMA, and the customer;
- Track installations through to task completion;
- Participate in the Installation In-Brief and Out-Brief whenever feasible;
- Identify, document, and disseminate lessons learned to IA/IMA;
- Be an authoritative source on the:
  - SPAWAR Shore Installation Process as outlined in the SPAWAR Shore Installation Process Handbook;
  - Installation standards and experiences leading to successful performance of shore installations; and
  - Application of sound program or project management processes such as developing a Work Breakdown Structure (WBS), performing critical path analysis, establishing risk management, using Project Control (EVM or other) to manage performance and cost, applying system engineering, supporting logistics and configuration management, and enforcing statutory and regulatory defense contract management requirements.
- Assist with education and training of PEs concerning shore installation processes, procedures, and tools;
- Ensure Situation Reports (SITREPs) are promptly submitted for every installation in the form provided in Appendix B; and
- Fully understand the roles and responsibilities of a Contracting Officer's Representative (COR).

1.4.6 Project Manager. For major installations such as Military Construction (MILCON) projects and other large, multi-system, multi-sponsor installations, the IA will usually have both an IMO and a project lead code assigned for project end-to-end planning, design, integration and implementation. In these cases, the IMO and lead code designated Project Manager will work in concert to ensure project planning milestones and installations are executed in accordance with this document. The IMO will have cognizance over all installation aspects of the project including installation planning, design, production, testing, and customer turnover; while, the Project Manager is responsible to ensure all integrated project planning milestones are met from project conception through to project Final Operating Capability (FOC). Project Managers

manage and coordinate the activities of many Project Engineers. Project Managers are senior, highly experienced, qualified project engineers with extensive project management experience that are recognized as experts in all aspects of the Shore Installation Process. They are entrusted with special interest or high value projects. See Section 9, MILITARY CONSTRUCTION (MILCON) AND OTHER LARGE PROJECTS for more details. The Project Manager will:

- Apply the SPAWAR Shore Installation Process and applicable installation standards and be exceptionally knowledgeable with the processes and milestone deliverables called out in Section 9;
- Supervise and coordinate the activities of many Project Engineers as an integrated or consolidated effort;
- Implement and maintain a Project Control, Earned Value Management System (EVMS) or equivalent, that manages and forecasts cost and schedule performance, a detailed Work Breakdown Structure (WBS), project critical path, risk management, engineering milestone reviews, and configuration management; and
- Fully understand the roles and responsibilities of a COR.

1.4.7 Project Engineer (PE). The IA is responsible for appointing PEs based upon qualification standards that are defined in Appendix C2. The PE is responsible for the overall cost, schedule, and quality management of assigned installations. The Project Engineer represents the IA and is responsible for various planning and coordinating tasks described in Sections 3 through 8. When no other On-Site Government Representative (OSGR) is assigned, the PE will also function in the OSGR role. The PE will submit weekly Situation Reports (SITREP) as outlined in Section 7 and in the format provided in Appendix B or the command sponsored electronic media (e.g. database, virtual network, etc.) format so long as the same information is provided. PE will:

- Follow the SPAWAR Shore Installation Process and applicable installation standards to all installations assigned;
- Prepare Cost Estimates in a basic Work Breakdown Structure (WBS) in accordance with Appendix G that regardless of sponsor or funding source take all applicable Shore Installation Process deliverables into consideration. (Note: All SPAWAR System Center estimates for any type of installation work regardless of sponsor or funding source shall be reviewed by the IMO prior to forwarding);
- Prepare Spend Plans, POA&Ms, and all other installation products that are part of the Shore Installation Process;
- Implement and maintain a project critical path, and risk management approach;
- Take responsibility for the quality of all aspects of the installation process including the safety of personnel conducting the installation;

- Provide RSIMs with advance copies of all installation deliverables, e.g. BESEPs, IDPs, SOVTs, In-Briefs, etc, for review before they are turned over to the customer;
- Upload all SIPH deliverables (in/out briefs, site survey report, BESEP, IDP, signed SOVT, As-builts, etc) that result from the installation process in their native electronic format to the designated repository; and
- Fully understand the roles and responsibilities of a COR.

1.4.8 Assistant Project Engineer. The Assistant Project Engineer is described as a Project Engineer In Training (Apprentice). While performing the duties of an Assistant Project Engineer, the person in this position should obtain knowledge and experience in meeting PE qualification standards defined in Appendix C2 as well as in:

- Basic project management concepts such as coordination of daily meetings, project planning and execution tracking (cost, scheduling and performance), and contract implementation and management;
- SPAWAR Installation Process as outlined in the SPAWAR Shore Installation Process Handbook; and
- Defense contract management or acting as a Contracting Officer's Representative (COR).

1.4.9 On-Site Government Representative (OSGR). The OSGR is the person assigned by the IA to be the on-site coordinator for the installation. If no Project Engineer is assigned, the OSGR assumes the role of the PE. For larger, more complex installations, one or more OSGRs may be assigned to support the PE and/or the implementation Project Manager. The OSGR will act as the intermediary between installers (contractors or government), the customer, and the PE. It is preferred for the OSGR to also be a designated Contracting Officer's Technical Representative (COTR) or a technical authority for the work to be performed by the contractor. Sections 6 through 8 describe the activities performed by this person in greater detail. The OSGR should:

- Be able to apply the SPAWAR Shore Installation Process and applicable installation standards to all installations assigned;
- Understand the scope of the contracted installation services and deliverables to be made to the government and report any discrepancies or readiness issues;
- Validate that a Base Electronic Systems Engineering Plan (BESEP), Installation Design Plan (IDP), and FRCB approval is obtained before on-site production commences;
- Inform the site of team composition, arrival time, and specific purpose;
- Coordinate with the site regarding site personnel required to operate and maintain the new system, their availability to participate in the System Operational Verification Test (SOVT) and to receive On-The-Job Training (OJT);

- Be familiar with the Navy's safety policies (see Appendix AC) and ensure that the installation is conducted in a safe manner;
- Participate and coordinate in-brief and out-brief meetings with site personnel as well as status meetings as frequently as daily or as requested by the site;
- Ensure that frequency approval has been granted prior to activating any emitters;
- Coordinate outage and cutover requirements with all affected site personnel;
- Coordinate with the site for Public Works services, scaffolding, crane and/or rigging services as necessary to complete the installation;
- Coordinate with the site to verify availability of connectivity and testing support; to locate and stage installation materials; to obtain keys, badges, and escorts (if required) to gain access to the installation area; and to obtain COMSEC and keying material for the installation from the CMS custodian;
- Ensure that weekly input to the SITREP is provided;
- Ensure OJT is provided to site personnel and that the names of all personnel trained are recorded in the Installation Completion Report (ICR) (see Appendix W);
- Ensure system documentation is delivered to the site via DD-1149 or letter of transmittal including accreditation, logistics, operations, maintenance, and configuration management documents;
- Conduct periodic inspections/surveillance of the installation and coordinate correction of deficiencies and ensure reporting of all unresolved deficiencies in the SOVT;
- Provide a draft Completion Message to the site during the Out-brief;
- Coordinate disposition and disposal of residual equipment and material;
- Review IDPs, redlines, and As-builts to confirm pre and post installation configuration;
- Ensure that copies of all completed documentation, e.g., signed SOVT, are provided to PE for upload to the shore repository;
- Solicit feedback (positive and negative) from the customer and report any feedback to the IA, RSIM, and IMA to improve future installation efforts; and
- Be knowledgeable in management of DoD contracts and fully understand the roles and responsibilities of a COR in order to help prevent unauthorized commitment of government funds.

When addressing the concept of the OSGR, the PE must use a "Reasonable Man" approach. In other words, the PE must think through the assignment of a specific OSGR for each installation in a manner that makes sense to a reasonable person. The PE should never ask the customer to be the OSGR. The IA, not the customer, is responsible for the IA contractor's work performance. Some options to consider are:

- If several installations are being performed in the same area within reasonable commuting distance, a PE could assign one OSGR to be responsible for several installations as long as the Customer's needs for support and communication are met and the PE maintains control and accountability for the quality of the work conducted on a daily basis and for compliance with SIPH processes and standards.
- If an installation is a great distance away such as in a foreign country, it could be prudent from a cost perspective to request assistance from other government personnel that the IA may have in the area to act as the OSGR.

1.4.10 Lead Installer. The Lead Installer is responsible for the hands-on management and oversight of the installation and is usually the individual that is continuously conducting the installation. The Lead Installer will coordinate installation matters with the IA, OSGR, customer representative(s), and others as discussed during the Site Survey and production in-briefs. The Lead Installer could be a government employee in an all government team, but may also be a contractor. When the Lead Installer is a government employee, he or she may take on the roles performed by the OSGR. Sections 6 through 8 contain more detailed descriptions of some of the Lead Installer's duties.

1.4.11 Quality Assurance Evaluator (QAE). The QAE is assigned by the IA and is a person that has Quality Assurance (QA) training and an extensive background in the methodology of QA as it pertains to quality surveillance (quality assurance and control) of an installation. The size and complexity of the installation determines what and how much QA is required. In all cases, a QAE must meet the qualification standards defined for PEs in Appendix C2. These individuals shall ensure that all components of the Statement Of Work (SOW) and SIPH deliverables are verified and validated. Responsibilities of the QAE include:

- Assisting the IA in Installation Planning (Section 4) especially in the areas of Contract/Delivery/Task Orders development and review as it pertains to federal, state, host nations, and local directives/regulations for the site in which the installation is to be completed;
- Preparing Installation Management Surveillance Plans (IMSPs) based on Definable Features Of Work (DFOW) for the type system being installed as detailed within the contract, delivery, or task order and the System Installation Design Plan (IDP) Drawings;
- Reviewing the Lead Installer's Quality Control Plan to verify that items such as names, qualifications, duties & responsibilities, work item procedures, documentation, and Quality Control (QC) will be accomplished and advise the IA of its acceptability;
- Monitoring quality system usage, safety (OSHA/DOD), security violations, and installation practices (workmanship) and reporting those findings to the IA;

- Conducting site visits to perform Spot Checks and evaluate the process and performance methods to provide the IA with data to assist in Contractor Performance Assessment Reporting System (CPARS) inputs;
- Preparing summary QA reports and submitting them to the IA members; and
- Assisting in preparation of technical research, when required, or as a situation may dictate or warrant.

1.4.12 Subject Matter Expert (SME). A SME is a technical person with detailed system or equipment knowledge or installation design standards knowledge. Programs, vendors, or engineering activities may provide these experts.

1.4.13 Training Agent (TA). For training installations, this is the office, bureau, command, or headquarters that exercises command of, and provides support to the Navy's formalized training effort.

1.4.14 Training Support Agent (TSA). For training installations, this is the office, bureau, command or headquarters that is responsible for supporting the Training Agent. This is usually the program office. The TSA may provide material and other forms of support within the cognizance of the office, bureau, or command involved. The TSA provides the initial training for the equipment/system until the Training Agent can obtain the capability for training.

1.5 Special Case Installations

The process and deliverables described in Sections 2 through 8 of this Handbook are intended for the typical installation task that includes all elements of hardware and software installations to deploy a fully functional system. There are some special cases where not all process elements of the SPAWAR Shore Installation Process (SIPH) may apply or may be simplified such as:

- Software only installations/upgrades;
- Mail out installations/upgrades;
- Engineering Changes;
- Temporary installations;
- Installation design only tasks; and
- Extraordinarily simple installations.

The Shore Installation Process is scalable. Understanding the purpose of specific processes and resulting deliverables is essential to understanding the extent of tailoring that would be appropriate while still satisfying the requirement or intended purpose. A new Section 10 is included in Version 3.0 of the SIPH to help the PE with correctly tailoring processes and deliverables to best fit the needs of the specific project.

1.6 Conclusion

A tenet of the Shore Installation Process is that customer involvement early and continuously throughout the process results in improved customer satisfaction. Another tenet is that adherence to comprehensive, standardized, and mature processes leads to repeatable quality and cost effective results. The Shore Installation Process Handbook provides the standardized guidance and process for all shore system installations.

2.0 CRITERIA FOR INPUT INTO THE INSTALLATION PROCESS

2.1 General

The Program Manager is responsible for meeting Program and Milestone Decision Authority mandatory requirements as outlined in the Defense Acquisition System (DODD 5000.1) and as implemented by DODI 5000.2. This directive and instruction provides guidance on all aspects of successfully developing, testing, acquiring, installing, and supporting defense technology projects and acquisition programs. Each Program Manager of acquisition programs or of defense technology projects must ensure that required elements identified in DODD 5000.1 and DODI 5000.2 have been completed prior to starting the installation process. The installation process is initiated by promoting an installation requirement from the Program Manager's Fielding Plan to the IMA's Work Plan for a specific fiscal year. The Program Manager conducts "Advance Planning" activities that produce the Government Furnished Information (GFI) and Government Furnished Material (GFM) required by the IMA and the IA to successfully plan, design, and complete the installations. This applies to both temporary installations; such as exercise support, concept demonstration, developmental testing, and operational test and evaluation; and permanent installations. This section describes the minimum criteria that the IMA shall consider before authorizing installations for inclusion on the Work Plan. The Program Manager should complete programmatic activities and documentation required to successfully complete a Milestone "C" Milestone Decision Authority (MDA) review for Acquisition Category (ACAT) I-IV and Abbreviated Acquisition Program (AAP) programs. For technology projects, the Program Manager shall conduct equivalent activities that are necessary in support of the installation process. Temporary installations need to be self sufficient and tailored to meet the intentions of each installation and they shall not remain in place longer than one year or one deployment cycle, whichever is shortest.

The major activities discussed in this section are funding, design, testing, Fielding Plan and Work Scope development, cost estimating, Certification and Accreditation (C&A), spectrum certification, Electromagnetic Environmental Effects (E3) consideration, logistics support development, and Fleet Readiness Certification Board (FRCB) submission. The outputs of these activities are system standard drawings also referred to as Installation Requirements Drawings (IRDs), testing certification documentation, Fielding Plans, Work Scopes, Program Manager's cost estimates for installation, implementation strategies, cutover strategies, standard system System Operational Verification Test (SOVT) plans, logistic supportability plans, Type Accreditation documentation, and Spectrum Certification. While the activities and products described in this section are usually completed by a Program Office, those installations not sponsored by a Program Office must still meet statutory and regulatory requirements discussed in this section. Other activities and products are also enablers for beginning the installation process. Missing enablers, such as IRDs or System SOVTs, may increase cost, risk, and/or cause delays to the installation project. The process flow diagram

shown in Figure 2-1 depicts the activities discussed in this section and the major outputs. Figure 2-1 is notional and the steps depicted in the process may often occur concurrently.

2.1.1 There are conditions/activities that may affect the timely and cost effective execution of a C4ISR installation of which the Program Manager must be cognizant. Some of these conditions are controllable and some are beyond the control of the Program Manager.

2.1.1.1 Program Manager Controllable Conditions. Some conditions or activities that are usually within the control of the Program Manager and yet have frequently caused installation delays are:

- Complete Work Scope;
- Delivery of funding and equipment;
- Delivery of system design drawings (IRDs) and logistics support materials; and
- System or Type accreditation.

When a Program Manager provides tasking to an IA, the Work Scope must be clear and contain all elements of the Installation that are required of the IA. The Work Scope must communicate all of the technical and programmatic information to include any mission critical dates. Incomplete Work Scope could result in lower quality cost estimates and installations, missed schedules, and/or unmet expectations. Appendix D contains the Work Scope template and instructions.

The Program Manager should ensure that the IA receives funding in time to support the IA contractual and planning activities as stated within the project Plan of Actions and Milestones (POA&M). Insufficient funding or late funding affects the IA's ability to plan and conduct the installation in a timely and cost effective manner. The same condition or guidance applies to delivery of the installation equipment to the IA. The IA must schedule the installation based on several factors; one key factor is equipment availability. The Program Manager should provide equipment delivery estimates in the Work Plan that are as accurate as possible. Only the IA can determine if an installation schedule is feasible, when equipment delivery will not occur within 120 days prior to the on-site installation.

System design drawings, e.g., IRDs, are critical to the installation design process. Quality and timely system design drawings improve configuration management, optimize cost, enable logistics planning, and will significantly reduce installation risk. For these reasons, a new standard for system design drawings that are input to both shore and afloat installation processes was defined by a Lean Six Sigma team. The IRD has replaced standard plan drawings and is defined by SPAWARINST 4720.5. The IRD package is needed by the IA very early in the process to prepare a cost estimate and the Installation Design Plan (IDP). For installation requirements not sponsored by a Program Office and where the system design drawings do not exist, the PE needs to gather and develop the equivalent design information to develop the IDP.

Non-availability of System or Type Accreditation is one of the most common causes of installation delay. Program Managers need to be very proactive in ensuring that the

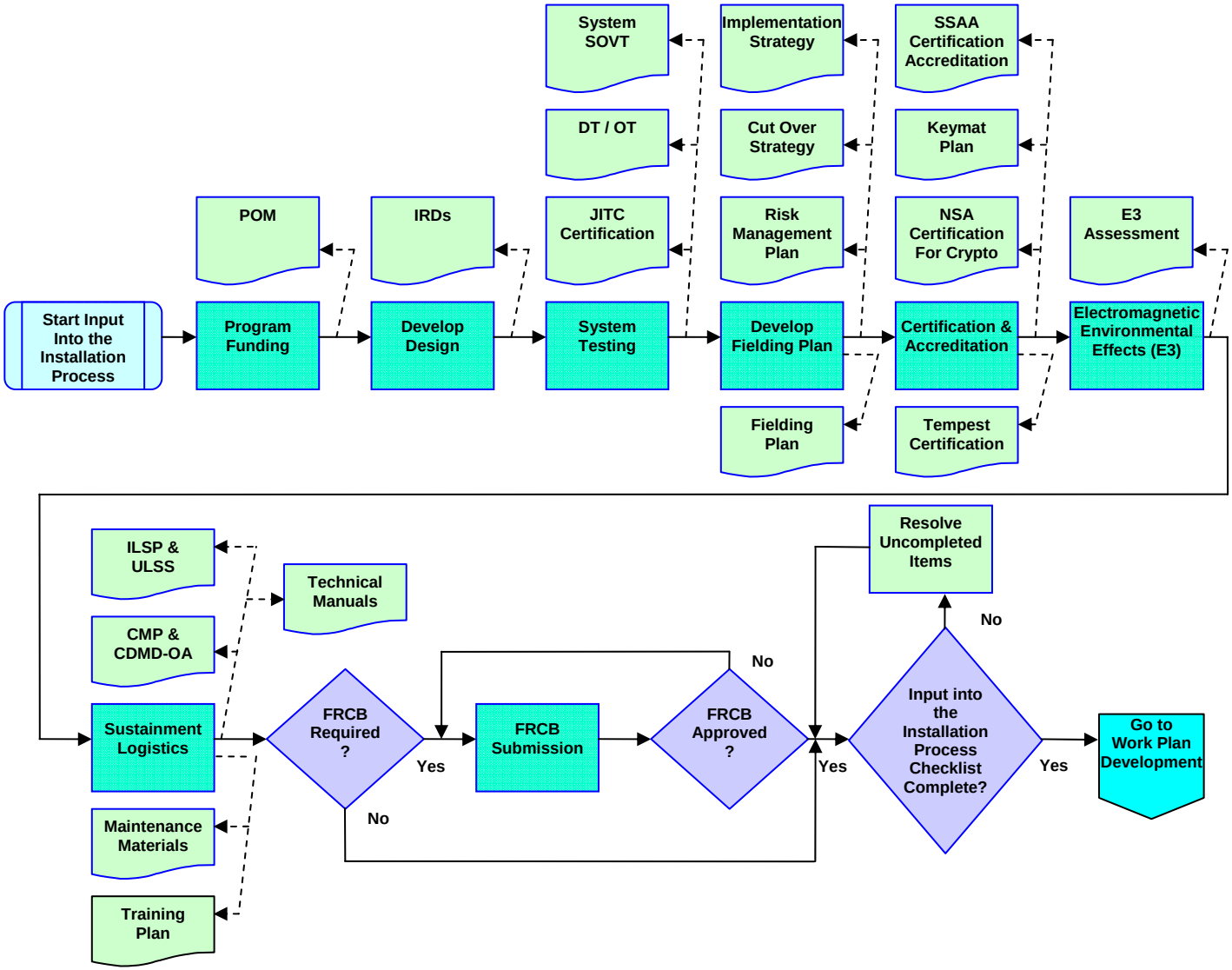

Figure 2-1. Input into the Installation Process

security accreditation is completed at least 90 days prior to the on-site installation to allow for FRCB processing/review and NETWARCOM approval.

2.1.1.2 External Activity Controllable Conditions. There are known and unknown conditions that may impact installation planning and execution. For example, C4ISR installations conducted in foreign countries may require special approvals before installations can proceed. The local base or RSIM can provide guidance in these areas. Some of these unique planning considerations may include:

- Host Nation Approval (HNA);
- Mixed Commission (Italy Only);
- Requirements of the Office of Defense Cooperation (ODC) (Spain and Italy);
- Electromagnetic Environmental Effects (E3) requirements in foreign countries;
- Status Of Forces Agreements (SOFA); and
- Special facility or site approval requirements.

Because the site at which a C4ISR system is planned for installation is in a foreign country, the Program Manager must remember that while it may be a US or Allied base, the US does not necessarily control what can be installed, modified, or removed. In those cases, a HNA may be required. The site can assist in coordinating the HNA approval, but the installation activity must provide all the system technical data as well as provide an E3 study.

After World War II, the Italian government and North Atlantic Treaty Organization (NATO) allies established a regulatory commission in Italy to facilitate the installation of systems at NATO/US bases. In recent years, the Mixed Commission approval has become a requirement for many C4ISR systems, especially systems with Radio Frequency emitters. The Program Manager will most likely experience a one-year delay in the installation process in order to obtain a Mixed Commission approval for installations in Italy.

While US Government personnel (military and civilian) can easily gain access to US or NATO bases in Spain, the Spanish Government requires special approval for US contractors. A request for access to a US or NATO base by US contractors must be submitted to the Office of Defense Cooperation in Madrid certifying that the contractors have sufficient liability insurance with a Spanish insurance company or with an insurance company recognized in Spain.

Foreign regulatory bodies may need proof of E3 analysis and safety in the unit of measurement used in the country in which the C4ISR system is being installed. The Italian Mixed Commission requires that all E3 studies be conducted and submitted in reference to the current applicable Italian Environmental/Electromagnetic Safety regulations.

The United States has SOFA treaty agreements with some of the countries in which there are US bases that dictate what can and cannot be done within the country by US forces or personnel. Some of the agreements may limit or affect the ability of a PE or US contractor to complete a C4ISR installation.

Special facility or site approval is sometimes required when installations on Navy controlled property have the potential to affect the safety of people, impact the environment, are in an airport runway flight path, or involve designated historical buildings.

2.2 Funding

The Program Manager is responsible for ensuring that adequate funding is in place to support the planned temporary or permanent installation of the system in order to achieve task completion. Funding is allocated to support all program activities required to meet installation benchmarks. The IMA should become an integral part of implementation planning and fielding plan development and budget discussions in direct support of the Program Manager. Installations should be transferred from the fielding plan to the Work Plan only if the funding is identified and available. Unfunded installations should not be added to the approved Work Plan. The IMA is responsible for reconciling the aggregate costs for installations included on the Work Plan with the amount of funding required to support the cost of the installations. Non Program Office sponsors are responsible to ensure funding is available to correctly plan, design, install, test, and document the installation in accordance with the Shore Installation Process.

2.2.1 The Program Manager obtains the installation funding through utilization of the Planning, Programming, and Budgeting System (PPBS). The PPBS is an iterative planning and control process that sets forth, in terms of dollars, the validated requirements for all Department of Defense (DOD) programs. It is imperative that the IA provide actual costs for completed installations to the Program Manager as feedback into the programming process for the out year budgets to meet future shore installation requirements. Cost estimates are refined and become more definitive and accurate each year as the installation moves from the implementation plan, to the fielding plan, and finally to the work plan. The Program Manager must ensure that the Program Objective Memorandum (POM) includes all costs for the IMA and IA to accomplish the installations.

2.2.2 For SPAWAR executed installation activities, Program Office funding documents that include a shore installation component shall be forwarded to a SPAWAR IMO for acceptance. Sponsoring activities are encouraged to engage the SPAWAR installation competency via IMOs and not forward installation related funding documents directly to SPAWAR technical codes. This policy is intended to promote process consistency, orderly implementation of product delivery, and quality assurance.

2.3 Design

The Program Manager is directly responsible for finalizing all aspects of the system design in accordance with SPAWARINST 5400.3. Development of approved IRDs is a

part of the Program Managers normal acquisition and project development process. Core and as-required information is contained in the IRD as described in enclosure (3) of SPAWARINST 4720.5. Appendix AC of the Shore Installation Process Handbook contains information about important installation standards and requirements that the Program Manager's system developer may also need to consider. The level of detail in the IRD will depend upon the complexity of the system. The system design as documented by the IRD ensures the system is designed to meet TEMPEST requirements.

IRDs are used to complement the scope of work for obtaining detailed installation cost estimates. The IRD also provides a baseline configuration in support of conducting a site survey and significantly reduces the time required to develop site-specific drawings. Some of the benefits derived are:

(a) Consistency of installations across the naval shore infrastructure;

(b) Standardization of equipment and spare parts support;

(c) Standardization of design of cable plant interfaces;

(d) Reduction in training of personnel as they rotate from site to site; and

(e) Reduction in time for IDP development.

2.4 Testing

For permanent installations, preference is for developmental and operational testing to have been completed before entry into the installation process. When this is not practical, operational risk should be reduced through extensive laboratory and on-site testing of the first operational site. In those cases where a new system "touches" an existing Defense Information Systems Agency (DISA) system, additional DISA approval and testing may also be required. The Program Manager's full testing philosophy and plan is laid out in the Test and Evaluation Master Plan (TEMP) document.

Temporary installation requirements shall appear in the Work Plan to support the various phases of development to include concept demonstrations, exercises, developmental, integration, information assurance, interoperability, DISA testing, and operational test and evaluation testing of hardware/software. Temporary installations may require additional test documentation for Limited Objective Evaluation (LOE). Usually, the primary purpose for a temporary installation is to conduct testing to gather results about the performance of a new system or capability. Therefore, temporary installations may require additional testing documentation other than what is contained in a normal System Operational Verification Test (SOVT) plan.

2.4.1 Interoperability and Regression Testing. The Program Manager is responsible for performing installation interoperability and regression testing to ensure that the system being fielded will operate with existing systems with which it will interface. All C4ISR systems that have potential to operate with other agency systems require Joint Interoperability Test Command (JITC) certification

2.4.2 Installation Testing Criteria. The Program Manager is responsible for developing a System Operational and Verification Test (SOVT) document and any other test acceptance criteria required by the IA. SPAWARINST 3084.1 provides requirements for format, content, and approval of SOVT documents.

2.4.3 Navy Network Policy Requirements. If required, the Program Manager will ensure that the system is evaluated against existing (or proposed) Fleet firewall and Navy Marine Corps Intranet (NMCI) policies to ensure compliance.

2.5 Fielding Plan Development

Program Managers develop Fielding Plans to prepare their programs for implementation. For PEO C4I, shore platform integration Program Manager, PMW 790, was established to assist the acquisition Program Manager and the technology Program Manager in developing product Fielding Plan(s). Advance Fielding Plans focus on the long-range aspects of the program to include budgeting in accordance with capability requirements documentation and support of milestone B and C MDA decision points if applicable. The Program Manager should ensure that Fielding Plans include:

- A comprehensive Work Scope that clearly details the proposed installation effort and identifies the sites, special requirements/risks, and required installation dates. The Work Scope shall be provided to the IMA and IA for use during cost estimating. Work Scope guidance is provided in Appendix D;
- Requirements prioritization, equipment delivery dates, and funding availability. All equipment delivery dates should be approximately 120 days in advance of the proposed installation dates;
- Technical Training Equipment (TTE) installations. OPNAVINST 1500.76A requires the Program Manager to complete installations and upgrades at training activities prior to Fleet installations. The Fleet needs qualified operators/maintainers for new and changed systems. The Program Manager is required to ensure that an interim training solution is in place, such as vendor training, until the permanent training system can be provided.;
- IA Accreditation, JITC Certification, and other approvals, as appropriate 90 days before start of on-site production;
- An Implementation Strategy that details the deployment sequence for the system(s) to be fielded;
- Notional power, space, and Heating, Ventilation, and Air Conditioning (HVAC) requirements;
- A Risk Management Plan that lists potential installation and operational risks that have been identified as part of a formal system risk evaluation. The Risk Management Plan will detail the Implementation and Cut-Over Strategies and other actions or procedures that the Program Manager will employ to manage the identified risks. See Appendix E for an example of a Risk Management Plan.

Additional information on Risk Management is contained in the DOD publication, "Risk Management Guide for DOD Acquisition". This document was explicitly developed to assist DOD and contractor Program Managers, program offices and Integrated Product Teams (IPTs) in effectively managing program risks; and

- A Cut-Over Strategy that describes the installation procedure approach to be used. The four possible situations that will define the Cut-Over Strategy are:
  - **"Hot Cut-Over"** - A new system will be replacing an existing system that will remain in operation until the new system is activated. A complete new/additional system is normally required for this type of cut-over. A "Hot Cut-Over" requires the IA to develop a site-specific cut-over plan that transitions the customer/user from the existing system to the new system without the customer's/user's operational capability being impacted. The site-specific cut-over plan requires early customer notification and coordination;
  - **"Cold Cut-Over"** – An existing system will be deactivated and possibly removed before the new system is installed or activated. This also could apply when a system is deactivated and moved from one location to another. During this type of cut-over, the customer/user loses operational capability until the newly installed or moved system is activated;
  - **"Warm Cut-Over"** – A hybrid Hot/Cold Cut-Over is feasible, because the equipment may be relocated or upgraded in phases or another command may assume the "guard" for a coordinated period of time. The customer/user transition to the new, updated, and/or moved system is done in such a manner that is transparent and seamless to the customer/user. In this type of cut-over, the customer/user does not lose operational capability; and
  - **No Cut-Over Required** - This occurs when the system being installed provides a new or expanded capability for the site. In this case, no system/capability is deactivated, de-installed, or moved.

In summary, the major outputs of the Fielding Plan are Scope of Work, Requirements Prioritization, Technical Training Equipment, Information Assurance and Certifications, Implementation Strategy, Cut-Over Strategy, and Risk Management Plan.

2.5.1 MILCON projects are generally long term efforts and require special attention and effort; often for a period of six to eight years. The challenge is to provide flexible and accurate Fielding Plans and the funding for installations associated with MILCON projects. Extensive interaction between the multiple acquisition Program Managers, the implementation Project Manager, CNI, NAVFAC, OPNAV and the customer is required to develop a well thought-out program plan that includes funding requirements for all aspects of the C4ISR integration. Section 9 provides details on activities that support integration planning.

2.6 Information Assurance, Certification and Accreditation (C&A)

All DoD Information Systems (IS) that store or process unclassified or classified information that is acquired, operated, or sustained require security Information Assurance (IA) Certification and Accreditation (C&A). DoD IS are organized and managed in the IA categories; Automated Information System (AIS) applications, enclaves (which includes networks), outsourced IT-based processes, and platform IT interconnections. This includes the development of a new Automated Information System (AIS) or the incorporation of AIS into the existing infrastructure, prototypes, reconfigurations, or upgrades to existing systems and legacy systems. Certification and Accreditation of AIS are met by completion of the documentation required for the appropriate phase of development. The Operational Designated Approval Authority (ODAA) will issue a letter stating a security Authority To Operate (ATO), Interim Authority To Operate (IATO), or Interim Authority To Test (IATT) has been granted. In the case of an IATO, the ODAA has accepted the risk and established conditions that must be satisfied before an ATO is granted. An IATT is granted by the ODAA to deploy the system to an operational environment with the sole purpose of conducting tests. The IATT is authorized for a specified period of time in order to complete the tests. A Navy ODAA IA accreditation decision is required in addition to other service/agency's IATO/ATO for any installation interfacing with Navy networks.

Special Security Officer (SSO) Navy is the DAA for SCI systems. SSO Navy issues an IATT to allow testing SCI systems in an operational environment. For an SCI system to receive an ATO from SSO Navy, the Trusted Agent conducts security testing on the system and reports the results prior to SSO Navy DAA adjudication. Recently, the SSO Navy DAA changed the term IATO to an "ATO with POA&M." SSO Navy issues 30, 60, or 180 days deadlines on an ATO with POA&M to allow corrections to be made. SSO Navy tracks and follows compliance before issuance of an ATO. SSO Navy issues an ATO when the testing is completed without Category 1 findings and limited Category 2 findings, based on certain criteria of the specific system.

Department of Navy (DON) Chief Information Office (CIO) Memo 01-09 dated 30 Jan 2009 was issued to ensure that Platform Information Technology (PIT) systems have appropriate IA capabilities embedded within the system and the IA objectives are documented and validated. A PIT is not subject to the IA C&A process; although, Platform IT is subject to the IA policies. All PIT Information Systems (IS) must have their IA controls documented and validated prior to operation and/or deployment and a PIT ATO/IATO/IATT must be received from the appropriately designated PIT DAA. Legacy and deployed PIT IS, which at the time of the policy issuance have a Navy ODAA/Marine Corps Enterprise Network (MCEN) DAA PIT designation letter, are required to obtain a PIT authorization to operate (ATO) within 24 months of policy issuance.

The following are key governing documents:

- CJCSI 6510.01E, Information Assurance (IA) and Computer Network Defense (CND) of 15 August 2007;

- DoDI 8510.01, DoD Information Assurance Certification and Accreditation Process (DIACAP) of 28 November 2007;
- DoDD 8500.01E, Information Assurance (IA) of 24 October 2002; and
- DoDI 8500.2, Information Assurance (IA) Implementation of 6 February 2002.

2.6.1 ***Development Phase***. During development of any AIS system, or upgrade/reconfiguration to an existing legacy system, the Program Manager is responsible for obtaining a formal Type Accreditation. Type Accreditation provides approval for the operation of an information system that will be installed at multiple locations within the same type of computing environment. Typically, Type Accreditation is developed and implemented under the support of a program office at an organization, such as SPAWAR, Naval Air Systems Command (NAVAIR), or Naval Sea Systems Command (NAVSEA) that specializes in providing systems to DoD operational commands.

2.6.2 ***Operation/Implementation Phase.*** The Program Manager, via the Installation Activity, shall deliver the system Type Accreditation package with the system to the site, thus enabling the site to use relevant Type Accreditation information for obtaining their Site Accreditation. It is the responsibility of the site to obtain Site Accreditation approval. When an existing system is relocated to a different site without modification to the system configuration and the system is relocated into the same type of computing environment, a new Type Accreditation may not be required; however, the Site Accreditation will be impacted.

2.6.3 ***Program Manager Responsibility.*** Program Managers are responsible for:

- Planning, programming, and budgeting for accreditation & certification and associated security measures for their AISs throughout the entire life cycle;
- Submission of Cryptographic or Communications Security (COMSEC) equipment validation requests for approval;
- Development and distribution of a Keying Material (KeyMat) Plan for all proposed crypto systems;
- Development and distribution of a schedule with the National Security Agency (NSA) for the production of supporting KeyMat and the distribution as the "competent authority; and
- Ensuring Secret and Below Interoperability (SABI) actions have taken place.

2.7 Spectrum Certification

Spectrum certification is required for all Radio Frequency (RF)-dependent systems developed, procured, or operated by the DOD.

2.7.1 For the Department of the Navy (DON), CNO has issued the following guidance for complying with this requirement:

- DOD Directive 5000.1 - The DOD Directive for the Defense Acquisition System;
- DOD Instruction 5000.2 - The description of the operation of the Defense Acquisition System;
- OPNAVINST 2400.20F ("Navy Management of the Radio Frequency (RF) Spectrum") - Policy guidance and procedures for Navy and Marine Corps use of the electromagnetic (EM) spectrum;
- OPNAVINST 2450.2 - Assigns responsibilities for EM Compatibility (EMC) in the Navy;
- SECNAVINST 5000.2C - Implements DOD Directive 5000.1, and DOD instruction 5000.2 in the DON and mandates spectrum certification; and
- MCO 2400.2B - Provides policy guidance and procedures for Marine Corps use of the EM spectrum.

2.7.2 Section 4 of the National Telecommunications and Information Administration (NTIA) Manual of Regulations and Procedures for federal RF management contains the national and international tables of frequency allocations. These tables should be used as a general spectrum planning tool for all Navy and United States Marine Corps acquisition/procurement authorities buying or developing spectrum-dependent equipment. Consideration should be given to the selection of an appropriate frequency band for a given service (e.g., radiolocation, radio navigation, etc.). The tables are available on the Web at http://www.ntia.doc.gov/osmhome/redbook/redbook.html via the Section 4 link. All DON acquisition/procurement authorities of spectrum dependent equipment should consider the most spectrum-efficient designs and applications.

2.7.3 OPNAVINST 2400.20F ("Navy Management of the Radio Frequency (RF) Spectrum,") requires that funds shall not be obligated for the development, production, or procurement of Communications-Electronics (C-E) RF dependent equipment (including COTS/commercial items, Non-Developmental Items and Advanced Concept Technology Demonstration systems/programs) beyond the conceptual stage until a frequency allocation for the equipment (DD 1494) has been approved by OPNAV. An approved DD Form 1494 is not an approval or authorization for use of specific frequencies at particular locations or test sites. A separate frequency assignment must be obtained through appropriate channels as defined in OPNAVINST 2400.20F.

2.7.3.1 To facilitate the electronic file transfer of DD Form 1494 data, the Joint Spectrum Center has developed the Spectrum Certification System software. All DON activities are directed to use this software application when developing and submitting a DD Form 1494. The software can be obtained on the web at http://www.jsc.mil .

2.7.3.2 The Naval Electromagnetic Spectrum Center (NAVEMSCEN) is designated by Chief of Naval Operations (CNO) as the single focal point for the coordination of DD Form 1494s with the other Military Departments (MILDEPs), unified commands, the NTIA, and other federal agencies. Additionally, each Systems Command (SYSCOM) has a central POC for Spectrum Management and Electromagnetic Environmental Effects (E3) issues. NAVEMSCEN and the SYSCOM POC should be consulted early in the acquisition process to assist in the planning and use of the spectrum.

2.7.4 It is critical that all spectrum-dependent equipment planned for deployment outside the United States and its possessions obtain appropriate Unified Commander coordination and Host Nation Approval (HNA) to use C-E equipment on and around foreign land. Coordination for HNA can be a lengthy process and should, therefore, be started as early as possible in the acquisition cycle.

2.7.4.1 Some foreign countries, such as Italy and Spain, have special requirements for obtaining HNA for the installation or to use a contractor work force. For that reason, local authorities should be contacted to identify all country-specific special requirements.

2.8 Electromagnetic Environmental Effects (E3)

OPNAVINST 2450.2 requires that for new acquisition, new construction, and modernization programs to achieve E3 compatibility in the operational EM environment, E3 requirements must be invoked in the Initial Capabilities Document, Capability Development Document, Capability Production Document, contract specifications, etc. When a new RF emitter is planned, when an existing RF emitter is to be modified, or when the Electromagnetic Environment is to be modified, the Program Manager must obtain a new or updated Shore E3 review and certification for all proposed locations. The E3 review will include Electromagnetic Interference/Compatibility (EMI/EMC) and Radiation Hazard (RADHAZ), including Hazards of Electromagnetic Radiation to Ordnance (HERO), Hazards of Electromagnetic Radiation to Personnel (HERP), and Hazards of Electromagnetic Radiation to Fuel (HERF) surveys.

2.9 Site Approval

"Site Approval" is required for projects on Navy controlled property that will or could:

- Affect airfield safety and clearance criteria;
- Have explosives safety implications;
- Create an area of electromagnetic illumination;
- Change the use of a facility; and
- Change the land use or physical layout of an area.

Other possible site constraints may involve environmental permitting, controls placed on historic and prehistoric resources, and endangerment to protected species. Additional guidance on the "Site Approval" process and other controls can be found in NAVFACINST 11010.45 and Appendix AC of this Handbook.

2.10 Sustainment Logistics

The Program Manager is responsible for meeting the life cycle support requirements of the system. DODI 5000.2 requires that the Program Manager plan sustainment activities to include supply, maintenance, transportation, sustaining engineering, data management, configuration management, manpower, personnel, training, habitability, survivability, environment, safety, occupational health, protection of critical program information, anti-tamper provisions, and Information Technology (IT) supportability and interoperability. For systems that require follow-on Navy training, Program Managers must develop a Training Planning Process Methodology (TRPPM) and submit an appropriate Navy Training System Plan (NTSP) consistent with OPNAV and Commander of Naval Education Training (CNET) requirements. NETWARCOM has also issued a directive that all capability changes to Navy C4ISR operational systems at designated sites shall be recorded in the Navy's Configuration Data Managers Database – Open Architecture (CDMD-OA). For sites that do not have an assigned Configuration Data Manager (CDM) and do not reside in CDMD-OA, a 4790CK form is still used. Program Managers are responsible for determining what logistic support activities are required to sustain and optimize system readiness including:

- User Logistics Support Summary (ULSS) documentation for the system;
- Configuration Management – e.g. Configuration Management Plan (CMP), nomenclature, system drawings, software, CDMD-OA entry, 4790CK, etc;
- Supply Support/Support & Test Equipment (S&TE) – e.g. Allowance Parts List (APL), spare parts, specialize purpose test equipment, etc;
- Technical Manuals - e.g. equipment technical manuals, System Operators Manual (SOM), System Operations and Maintenance (O&M) Manual, etc;
- Maintenance – e.g. warranty information, Planned Maintenance System (PMS) Products (MIPs/MRCs), ISEA points of contact, etc; and
- Training – e.g. NTSP, training curriculum, computer based training, vendor training, and On-The-Job (OJT) training materials, etc.

2.11 Implementation Support

When deploying a new system developed by a contractor, the Program Manager may need to arrange for initial system training for the IA. When a new crypto is being utilized for the first time, the Program Manager may need to arrange for initial crypto training. This training enables the IA to conduct the installations and it also allows the Program Manager to establish organic government capability that may support lifecycle support activities. The Program Manager should also provide a standard training guide for customer On-The-Job Training (OJT) that will be conducted during the installation.

2.12 Fleet Readiness Certification Board (FRCB)

In order to facilitate the FRCB process, the submitter must ensure that the input criteria addressed in Section 2.0 have been completed prior to submitting an FRCB package for NETWARCOM approval. The current version of NETWARCOMINST 12271.1 provides policy for the FRCB process. This instruction and FRCB forms and guidance can be obtained at https://www.fleetforces.navy.mil/netwarcom/Readiness/FRCB/default.aspx . SPAWARINST 3090.2 implements the NETWARCOM FRCB policy for Team SPAWAR. This instruction is located at https://cne.spawar.navy.mil/portal/page/portal/Enterprise/CNE_Landing_Page.

When an FRCB submission is for multiple installations of the same system variant, approved type documentation is required. For example, IRDs are required for FRCB submissions of multiple identical installations. However, in those cases where IRDs are not available, the Project Engineer will either develop an approved IRD or will submit an FRCB package for a single installation containing an IDP for that installation.

2.13 Checklist Completion

Appendix A of this Handbook contains a checklist that can be used to aid Program Managers, Project Managers, and Project Engineers in preparing for the Shore Installation Process.

3.0 WORK PLAN DEVELOPMENT AND TASKING

3.1 General

The Work Plan Development and Tasking is the first major step in the Shore Installation process. The Work Plan and the associated Work Scopes provide tasking for all shore installations planned for the current fiscal year plus one (FY+1). The details include site and system identification, proposed timing/scheduling, funding information, responsible installing activity, and a unique tracking number. The Work Plan can be utilized to identify individual installations for possible consolidation in order to improve efficiencies, reduce total installation cost, and minimize the impact on the customer. An excerpt of a sample Work Plan is shown in Appendix F. Each job or installation has a unique tracking number assigned and has a defined Work Scope using the instructions and template provided in Appendixes D1 and D2. The major activities of this section are finalize requirements, determine feasibility, cost estimating and scheduling, update and review, approval, customer coordination, and checklist completion (Appendix A). The outputs are a requirements list and associated Work Scopes, cost estimates, notional schedule, and ultimately the approved Work Plan. The process flow diagram shown in Figure 3-1 depicts the sequence of events and major outputs.

3.2 Finalize Requirements

Program Offices formalize program fielding requirements in the Program Objective Memorandum (POM) pertaining to their programs. Tabulated installation requirements are also found in the Program Office Fielding Plans. When the installation requirement and funding are confirmed and the Work Scope is deemed accurate and complete, it is promoted to the proposed FY+1 Work Plan. The act of moving a list of installation requirements and associated Work Scopes from the Fielding Plan to Feasibility Review (see Section 3.3) initiates the Work Plan development and approval process. Prior to moving a proposed installation requirement from the Fielding Plan into the Work Plan development and approval process, the Program Office will address the criteria outlined in the “Criteria for Input into the Installation Process Checklist” (Appendix A).

Each itemized requirement is given a unique tracking number in a 7 character format as follows, the fiscal year, a dash, and a unique four digit sequential number, e.g. 09-4010. The fiscal year represents the year of funding appropriation. Work Plans for several fiscal years may be in various stages of completion simultaneously.

3.3 Feasibility Review

The Program Office installation representative, the IMA, and the IA, will analyze the installation requirements to ensure:

- Unique project tracking numbers are assigned;
- Schedule drivers such as equipment and software availability are provided;

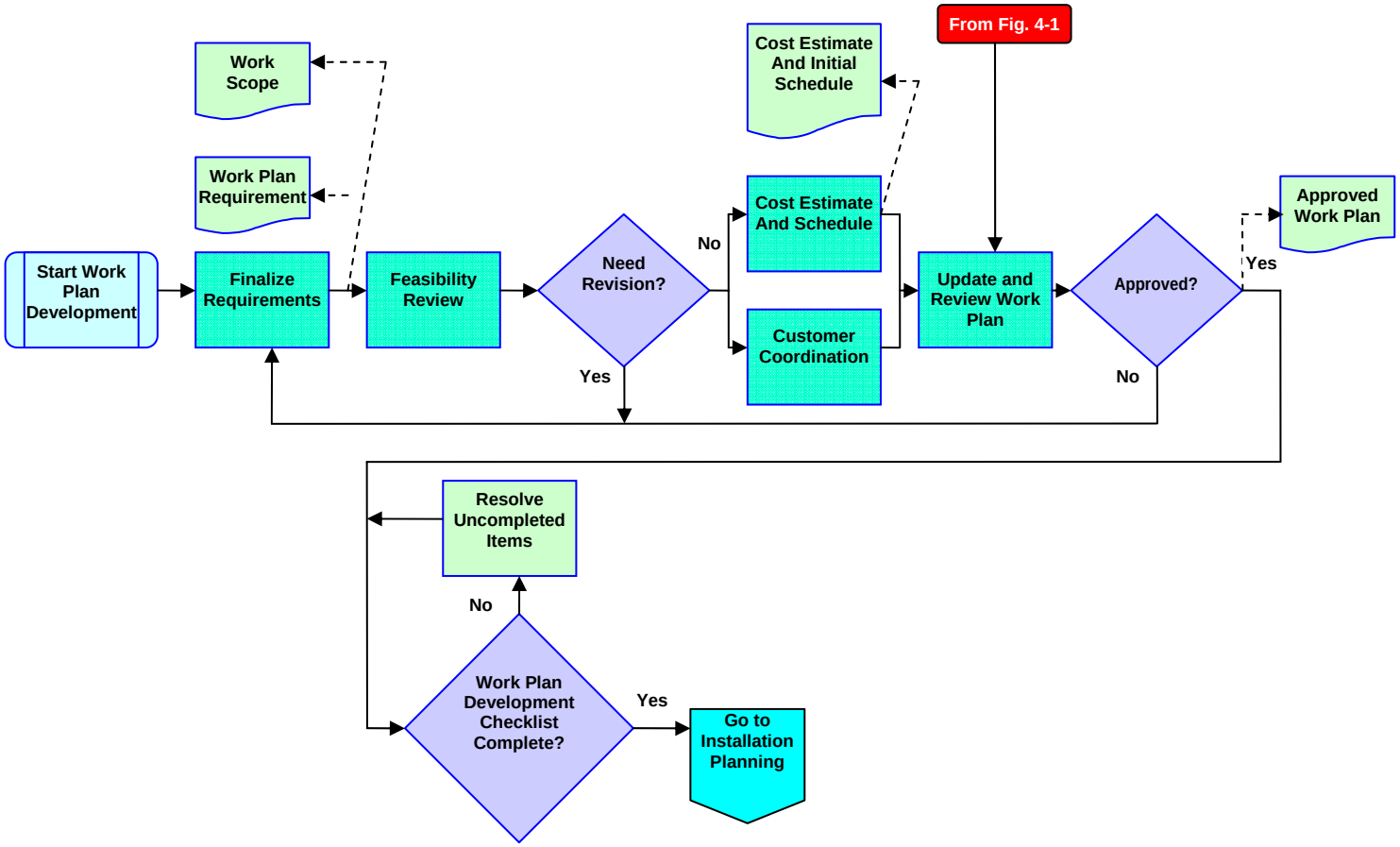

Figure 3-1. Work Plan Development and Tasking

- Installations are identified by geographic region and Command;
- Beneficial Occupancy Date (BOD) (for schoolhouse installations and MILCONs) are identified;
- Ready for Training (RFT) date (for schoolhouse installations) are identified;
- System name and financial data are complete;
- Subject Matter Experts and other Points of Contact are provided;
- Work Scope description and Installation Requirements Drawings are executable;
- Installation dependencies and special requirements, if any, are noted in Work Scope; and
- Potential opportunities for integration and consolidation are identified.

3.4 Cost Estimating and Scheduling

Using the information contained in the proposed Work Plan requirement, the Work Scope, and the Installation Requirements Drawings, the IA shall prepare the Performing Activity Initial Estimate (PAIE) using the work breakdown structure provided in Appendix G (Cost Estimates for Installation Projects). An initial installation schedule showing start and completion dates for all installation deliverables and major activities, e.g. site survey, on-site installation, SOVT execution, etc shall be prepared. Appendix H provides a sample initial POA&M. A revised and more detailed POA&M should be prepared after receipt of funding. MILCON C4I Integration Projects require a much more sophisticated performance tracking methodology due to their complexity, dollar value, and often special interest. See Section 9 for more information on MILCON C4I Integration Projects.

3.4.1 Whenever a new RF emitter is installed, an existing RF emitter is modified, or upgraded, or when an installation, modification, or upgrade to a non-RF emitter modifies the Electromagnetic Environment, a new or updated Shore E3 review and spectrum certification is required. The Shore E3 review and certification/recertification may or may not require a physical Radiation Hazard (RADHAZ) Survey. The cost of the Shore E3 review must be included in the total installation cost estimate.

3.5 Update and Review Work Plan Requirement

If the cost estimate is higher than that budgeted by the program office or the proposed schedule does not meet the Program Office or sponsoring activity requirements, the IA and IMA will conduct a review with the Program Office or sponsoring activity. This review will validate that a common understanding of the requirement exists among all parties and it will determine if any cost, schedule, and Work Scope changes are possible. The result of this review and any associated changes should be an approved cost estimate. If the estimated cost and/or schedule can not be resolved, the Program Manager or sponsoring activity may need to delay the project until additional funding can be obtained or a better schedule opportunity is available.

3.5.1 During the course of project execution, e.g. after site survey, the IA may identify additional unknown cost or schedule drivers that will cause a change request to be submitted to the IMA.

3.5.2 The IMA and IA shall also strive to maximize the number of consolidated installations in initial planning activities in order to gain efficiencies in cost, resources, and schedule, and to minimize the impact on the customer/shore facility.

3.6 Customer Coordination

A tenet of the Shore Installation Process is that we strive to keep the customer or the receiving/using Command aware of proposed new installation requirements. During the initial Work Plan Development process and resulting from any subsequent changes to the Work Plan, the RSIM plays a key role in keeping the primary shore customers aware of the status of new proposed installation projects. Customer coordination is a continuous process. In scheduling the installation projects, the PE should consult with the RSIM and/or customer to determine any installation concerns or constraints such as installation site availability or blackout dates.

3.7 Work Plan Approval

When the project estimate and schedule are approved, the installation requirement is approved for entry into the official Work Plan. Once posted into the approved Work Plan, the IA is authorized to expend project designated funds to initiate installation planning and design. On-site production work may only commence after FRCB approval. Should an installation requirement be canceled after it is entered into the Work Plan, it goes into a suspended state. If funds were spent against the canceled requirement, these funds are tracked as associated “sunk” costs.

3.8 Checklist Completion

Appendix A of this Handbook contains a checklist that can be used to aid the Program Manager, the IMA, IA, and Project Engineers in completing the Work Plan Development and Tasking phase of the Shore Installation Process. It should be noted that the IA may have started some of the actions in the Installation Planning phase before the completion of all actions in the Work Plan Development and Tasking phase.

4.0 INSTALLATION PLANNING

4.1 General

The next major phase of the Shore Installation Process is planning the actual system installation. The major activities include funding the installation project, updating and detailing the Plan of Action & Milestones (POA&M), reviewing system specifications and existing site configuration, conducting a site survey, and updating project planning and cost data. The process flow diagram shown in Figure 4-1 depicts the sequence of events and major outputs. The end products of this phase are a funding document, site survey in/out briefs, site survey report, and only when necessary a revised POA&M and Estimate at Completion (EAC).

4.2 Fund Task

The Work Plan Development and Tasking process as explained previously in Section 3 resulted in the approved cost estimate and Work Plan tasking. The first step in commencing Installation Planning is providing funding for the approved installation project(s). The sponsoring or funding activity shall prepare, issue, amend (as required), and forward appropriate funding documents to the IAs. Until the required funding documentation is received and processed, actual installation planning, design, production, and turnover activities are delayed.

4.3 Develop Plan of Action and Milestones (POA&M)

An initial POA&M resulted from the cost estimation phase of Work Plan Development and Tasking. However, site and resource availability may have changed since the time the initial POA&M was developed, so a revision may be necessary. During the Installation Planning phase, additional definition is required to adequately plan and schedule all installation project activities. The PE is responsible to prepare and maintain an accurate project schedule and to communicate that schedule to the IMA, IA, RSIM, and other participating and interested organizations. Appendix H provides a template POA&M and associated critical path example for a typical installation. The POA&M and the Statement of Work (SOW) also represents Government Furnished Information (GFI) for those installation projects requiring contractor support. As a minimum, the POA&M will provide schedule information that addresses the timelines and required dates for key deliverables and activities such as:

- Required funding date;
- Required system equipment delivery date;
- Required FRCB approval date;
- Required IRD package availability date;
- Required System SOVT availability date;

- Required ILS material availability date;
- Required system SOVT plan date;
- Site Survey;
- Site Survey Report;
- BESEP;
- IDP;
- Installation material;
- Platform SOVT plan;
- ILS checklist;
- Training materials;
- Pre-installation preparations, PITCO, & shipping;
- On-site installation ;
- Perform SOVT;
- ILS material turnover;
- Training;
- Operational cutover;
- Installation Completion Report;
- As-built Drawings;
- Completion Message; and
- Task closeout.

4.3.1 Other POA&M Planning Factors. Contract lead times, complexity of integration, shipping time, identification of long-lead time materials, required operational dates, and battle group deployments are important factors that should be considered during the development and approval of the POA&M.

4.3.2 Develop Time Line Summary (TLS) Report. The IA provides to the IMA comprehensive data that is used to create a TLS report that documents the schedule, cost, and status of all installations. This is accomplished by compiling the POA&M schedule and cost estimate data for each project into an integrated report such as is illustrated in Appendix I. Timely and accurate PE generated SITREPs provide the IA with the required information to keep project schedule and cost status current in the TLS report. The TLS is the principal tool used by the IMA to develop metrics in order to monitor and manage installations. SPAWAR has automated this process by incorporating scheduling and cost estimating functions into the installation database applications. SPAWAR

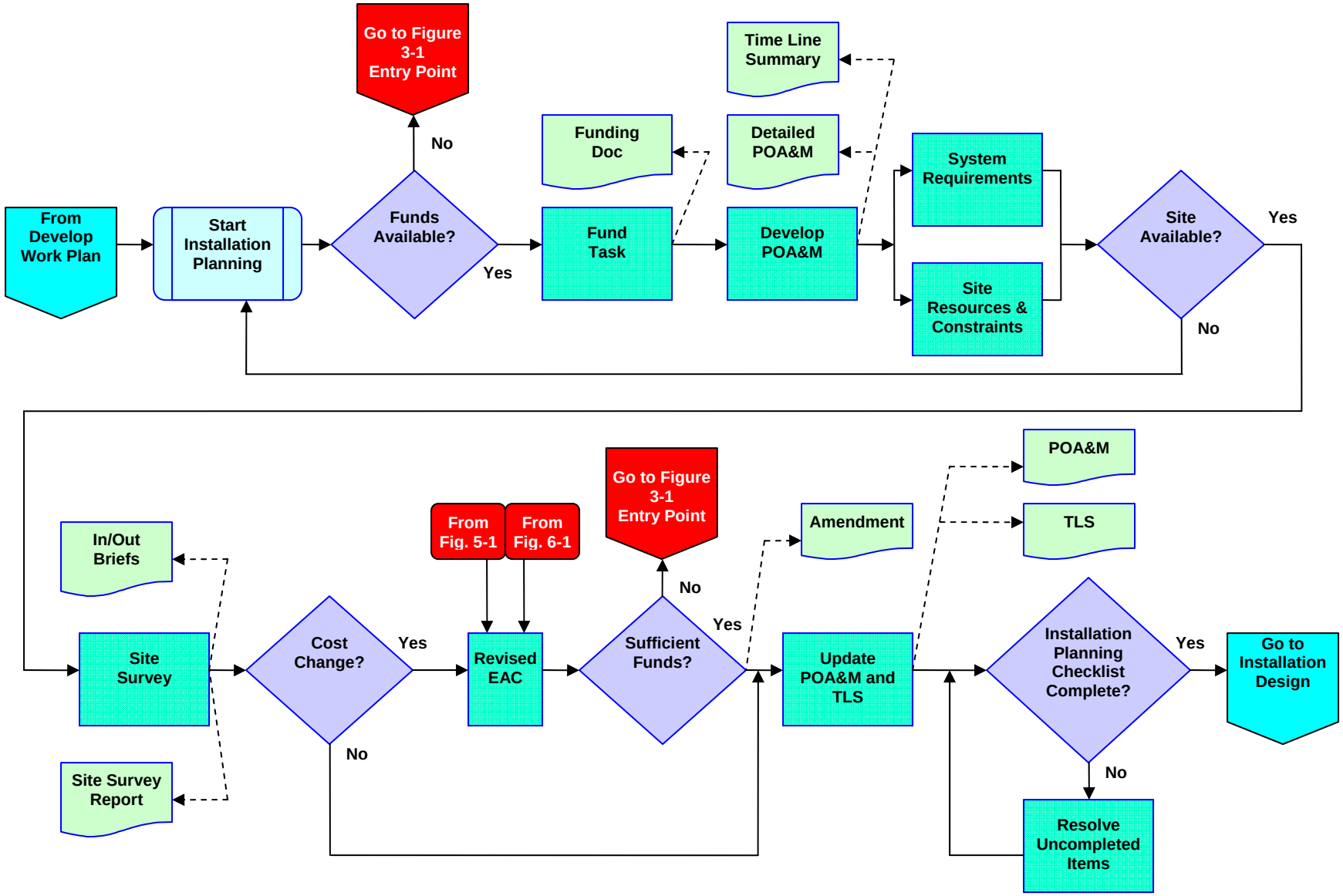

Figure 4-1. Installation Planning Phase

SITREPs are also generated by the IA database tools, thus ensuring that all schedule updates are automatically populated into the TLS reports.

4.3.3 Special POA&M Events for MILCONs and Training Installations. The POA&M for training installations and MILCONs must include a Building Occupancy Date (BOD). In addition, training installations must include the Ready for Training (RFT) date. The BOD for installations is the date that the site will be available for installation. The (RFT) for training installations is the date when the system is functional and the TSA transfers the training responsibility to the cognizant TA.

4.4 System Requirements

The IA will obtain system requirements from the IRDs, any existing IDPs, system specifications, and any other relevant system documentation that is available. System power, HVAC, connectivity, COMSEC, Internet Protocol (IP) addresses, ILS requirements and other special system requirements shall be identified in preparation for conducting a Site Survey. Requirements for consolidated or integrated installations shall be considered.

4.5 Site Resources and Constraints

In preparation for a site survey the PE will obtain and review site Master As-built Drawings. If Master As-built drawings are not available, it may be necessary to deduce a more complete picture of the site from a number of separate As-built drawing packages. The Project Engineer will make an initial assessment of what resources may be available at the site to meet the system installation requirements. Items to be considered include the availability of space for equipment storage, staging, and installation; cable pathways; power; and HVAC; as well as any site-specific communication and COMSEC resources. If available resources are determined to be insufficient, the PE will develop a notational plan that addresses how the facility can best be modified to meet the needs of the installation. Constraints such as environmental conditions or station ground limitations should be included in this assessment.

4.6 Site Survey

Often more in-depth information is needed than what can be obtained from the available site As-built drawings. The site survey provides the PE with an opportunity to assess the system requirements against the resources that are available at the site. It also provides the opportunity for the PE to discuss the future installation with the site personnel and to address any concerns and answer their questions. A key tenet of the Shore Installation Process is that the PE and RSIM engage early and often with the Command personnel that will receive and operate the planned new or upgraded system capability. Proactive and frequent coordination and communications can mitigate potential concerns and issues that if left unaddressed may impact or delay the installation or affect customer satisfaction.

4.6.1 Site surveys shall be conducted in accordance with the requirements contained in Appendix J. A Site Survey In-Brief shall be provided for each site survey using the outline provided in Appendix K1 and the example provided in Appendix K2 as guidance. A Site Survey Out-Brief shall be provided for each site survey using the outline provided in Appendix L1 and the example provided in Appendix L2 as guidance. The results of the site survey shall be documented in a report that shall contain all applicable information required by Appendix J. A sample Site Survey Report is provided as Appendix M.

4.6.2 Members of the Site Survey Team should be familiar with OPNAVINST 11010.20G, Facilities Projects Instruction, and with what is defined as "construction" and as "equipment installation". Construction is the erection, installation, or assembly of a new real property facility; or the addition, expansion, extension, alteration, conversion, or replacement of an existing real property facility; or the relocation of a real property facility. The installation of "built-in equipment," that is engineered and built into the facility as an integral part of the final facility design is normally classified as "construction", because it is intended that this equipment be permanently affixed as a part of the real property facility. Some examples include hard-wired systems for fire alarms, public address systems, raised flooring, Heating, Ventilating, and Air Conditioning (HVAC) systems, and electronic generators and Uninterruptible Power Supply (UPS) for the facility. However, the installation of operational equipment that can be easily removed without damage to the building or equipment is normally classified as "personal property" or "collateral equipment". When it is necessary for a PE to install supporting infrastructure in an existing facility in conjunction with the installation of operational equipment, such as power connections, grounding systems, HVAC equipment, voice and data cabling, cable ways, etc, then the PE can provide these items as integral to supporting the operational equipment. The intent is to permit the work normal to the equipment installations to be accomplished as an integrated undertaking. The intent is NOT to permit accomplishment of construction work under the guise of an equipment installation. Current Appropriated Fund (APF) minor construction is limited to $750,000 for all projects except those that correct a life, safety, or health deficiency for which the limitation is $1,500,000. The PE should review the latest issuance of OPNAVINST 11010.20 for current threshold limitations for minor construction and consult with the local NAVFAC authority before committing plans to upgrade supporting infrastructure in conjunction with an equipment installation.

4.6.2.1 Definition of "Alteration". A common error made by those experienced with shipboard installation policies and procedures is to refer to a shore "equipment installation" as a shore "alteration". A shore "alteration" is actually defined as the work required to adjust the load bearing walls of an existing real property facility so that it can be more effectively adapted to or utilized for its designated purpose. A shore "alteration" is classified as "construction" and is therefore the wrong language to use when coordinating an "equipment installation" with shore facility personnel.

4.7 Revised Estimate at Completion (EAC)

Upon completion of the site survey, the IA shall assess if the project cost estimate is still accurate. When necessary, the IA shall prepare a revised EAC based on data obtained and conclusions reached during the survey. The IMA will review the estimated installation costs to ensure that they are within the scope of proposed efforts and adequately address the intent of tasking requirements. If necessary, the IMA will direct changes of scope and negotiate the EAC with the IA. The IMA will also review available funding and determine whether the installation can proceed as planned.

4.8 Update POA&M and Time Line Summary (TLS)

The PE will update the previously prepared POA&M and TLS so that any revision to the schedule for all installation activities is accurately defined. All changes that impact installation completion dates are to be approved by the IA in coordination with the IMA.

4.9 Checklist Completion

Appendix A of this Handbook contains a checklist that can be used to aid Project Engineers in planning shore installations. The IA or RSIM may also use this checklist as a tool to determine if all necessary planning activities have been completed. It should be noted that some of the actions in the Installation Design phase may have already commenced before all actions in the Installation Planning phase were completed.

5.0 INSTALLATION DESIGN

5.1 General

Developing the installation design, testing, and training documentation is the next major phase of the Shore Installation Process. The design phase produces the most critical and technical documentation. The process flow diagram in Figure 5-1 depicts the sequence of events and major outputs. The end products are a BESEP, a spectrum assignment and updated Shore E3 review (for new or modified RF emitters or when the Electromagnetic Environment is modified), IDP, SOVT document, and a Cut-Over Plan. The unique project identifier or "tracking number" assigned during the Work Plan development shall be referenced on all documents and reports. With the exception of installation drawings and SOVT documents, which will be addressed later in this section, the document deliverables shall use the common file naming convention of "*document type-tracking number- date*". Appendix C3 provides the qualification standards required for the approval of IDPs.

5.1.1 Installation design must take into account whether the "equipment installation" will require any work normally classified as "construction" per OPNAVINST 11010.20. Some, but not all, infrastructure modifications to existing facilities may be allowed when the work is integral to the equipment installation, such as power connections, grounding systems, HVAC equipment, voice and data cabling, cable ways, etc.

5.1.2 Coordination for local requirements such as site approval and Host Nation Approval (HNA) can be a lengthy process and should, therefore, be started as early as possible. Some foreign countries, such as Italy, have special requirements for obtaining HNA to use RF emitters on their soil. For that reason, the RSIM and local authorities should be contacted to identify all country specific special requirements.

5.1.3 When performing a SPAWAR installation at a training facility, additional requirements are mandated as outlined in Appendix N and as explained in Section 5.4.

5.2 Review Installation Design Standards and Guidance

Common engineering standards and guidance that installation PEs and OSGRs should know are discussed in Appendix AC. These standards should be available for reference and are to be used to govern the design and installation of electronic systems. The documents discussed in Appendix AC cover most, but not all types of installation work.

NAVFAC Guidance. Shore facilities come under the purview of CNIC (Commander, Naval Installations Command) and NAVFAC (Naval Facilities Engineering Command). Project engineers should be familiar with the contents of NAVFAC INST 11010.45, which covers Site Approval, Special Projects, and Cultural Resources. Project engineers should also be aware of the Unified Facilities Criteria (UFC) and of the Unified Facilities Guide Specifications (UFGS). The UFC and UFGS are joint documents developed

concurrently between the U.S. Army Corps of Engineers (USACE), the Naval Facilities Engineering Command (NAVFAC), the Air Force Civil Engineer Support Agency (AFCESA), and the National Aeronautics and Space Administration (NASA). Appendix AC has additional summary information on these documents, and NAVFAC has a wealth of information at **www.navfac.navy.mil**.

5.3 Spectrum Assignment and Electromagnetic Environmental Effects (E3)

When a new RF emitter is installed, a frequency assignment is obtained. OPNAVINST 2400.20F provides information on the requirement and approval process. The PE should accomplish this action through the frequency manager assigned for that local command/location.

An E3 study and certification is required whenever a new RF emitter is installed, an existing RF emitter is modified or upgraded, or when an installation, modification, or upgrade to a non-RF emitter modifies the Electromagnetic Environment. The certification/recertification may or may not require a physical RADHAZ Survey. The requirement for the E3 study and certification is documented in the following instructions:

- **NAVFACINST 11010.45.** This instruction specifies procedures for site approval required for selected shore installations as outlined in Section 2.9. This instruction requires site approval for any project that creates or is proposed to be in an area of electromagnetic illumination or involves electromagnetic transmission. Installations of this type are required to have a safety certification in order to obtain site approval. Safety certification includes HERP, as well as HERO and HERF, and EMI. SSC Atlantic is the reviewing authority for HERP, HERF, and EMI for all shore stations except those within the Pacific Naval Facility (PACNAVFAC) geographical region. Installations on facilities within this region must be reviewed by SPAWARSYSCEN Pacific. Dahlgren Division, Naval Surface Warfare Center is the reviewing authority for HERO.
- **OPNAVINST 5100.23G.** This instruction requires a surveyed safety certification of all shore facilities having RF emitters. The certification is required to ensure all RF sources have been evaluated, safe separation distances have been determined, warning signs posted and any other safety measures have been defined. When new RF emitters are added or existing ones are modified, a theoretical or calculated safety evaluation is required to maintain certification. A re-certification is required via an instrumented site survey or desktop analysis every 3, 5, or 10 years depending on the number and types of RF emitters on the base. SSC Atlantic is the certifying authority for all shore stations except those within the PACNAVFAC geographical region. Facilities within the PACNAVFAC geographical region must receive certification from SPAWARSYSCEN Pacific. Complying with the E3 study and Spectrum Certification requirement ensures that the installed systems are in compliance with NAVFAC and OPNAV requirements before the systems are turned over to the customers

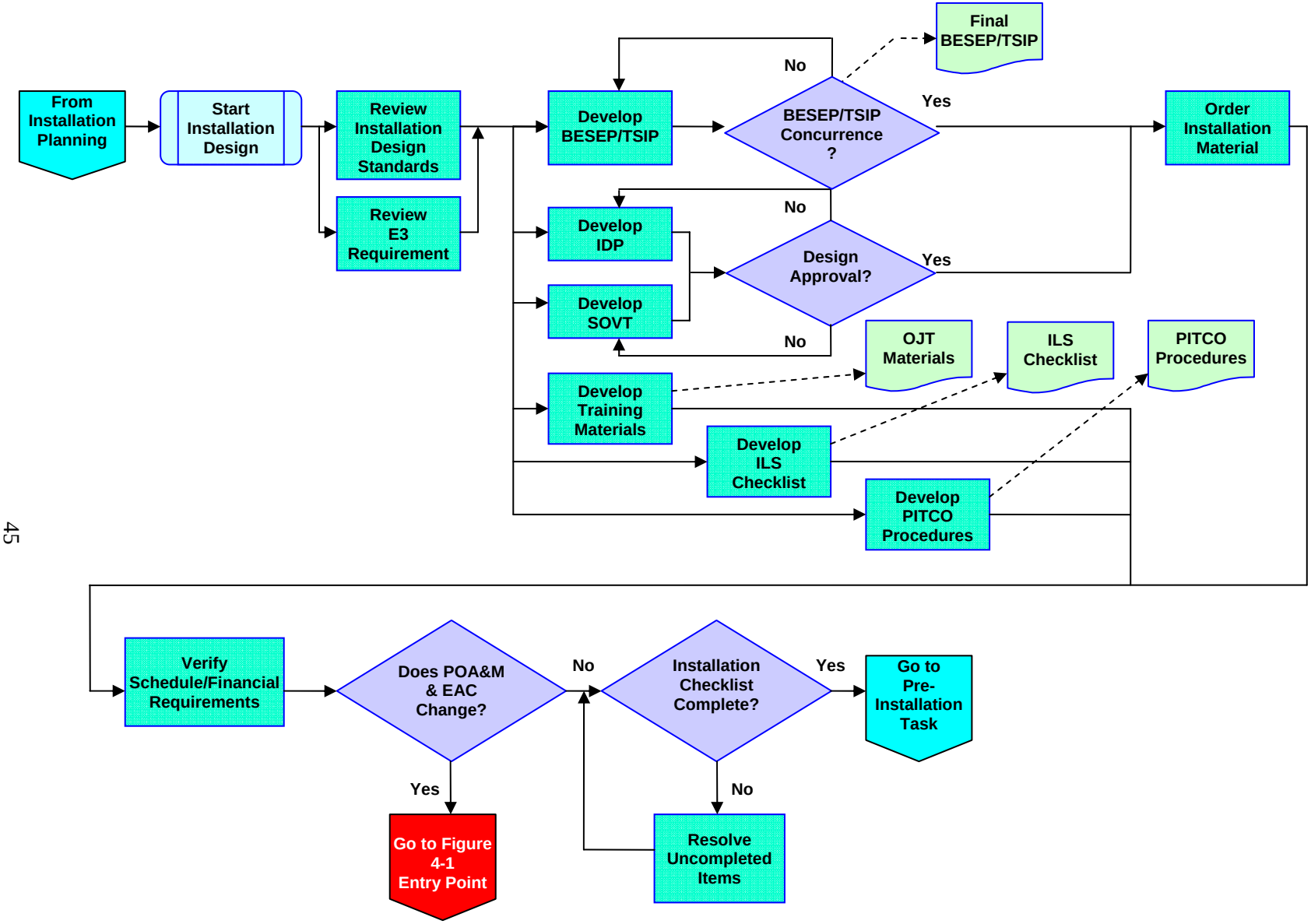

Figure 5-1. Installation Design Phase

5.3.1 The local NAVFAC should be notified when an E3 study and/or Spectrum certification/recertification is required. The local NAVFAC facility will normally request that the E3 study be performed. However, because a typical E3 study could take as long as 90 days from receipt of funding, Project Engineers should contact and fund the E3 Certification Authorities as soon as the E3 study requirement is known. If this is done, the E3 testing/certification can begin early in the installation design process. This will allow the testing/certification to be completed prior to the request of information by the local NAVFAC and will avoid delays in the installation schedule.

5.3.2 Installations at shore stations within foreign countries may require additional HERP and EMI analysis and/or testing to obtain installation approval from the host country. As with any HNA, this process can be lengthy as well as costly; therefore, installation planning, budgeting, and scheduling should take these additional requirements into account. Some foreign countries, such as Italy, have special requirements for obtaining HNA to use RF emitters on their soil. The reviewing authorities can assist with identifying these requirements and determining cost and scheduling considerations.

5.4 BESEP Development

Installation Activities (IAs) are required to coordinate an installation agreement between the IA, the site receiving the installation, and all other parties that are affected or have responsibilities associated with the installation. In some circumstances, there will be occasions where the PE is unable to obtain an agreement with the customer on the approved approach for an installation. These issues can vary over a wide range of topics and concerns. PE's should report these issues to the IA and the IMA to facilitate the development of a plan that is agreeable to the IA, IMA and the customer.

The document used to record an installation agreement with all shore activities except schoolhouses is a Base Electronic System Engineering Plan (BESEP). With the accelerating evolution of new technologies and capabilities, BESEP development and approval practices are streamlined to support faster implementation cycles. This handbook provides guidance that streamlines prior BESEP practices while still accomplishing the main purpose of the Installation BESEP, which is to document the agreements made between the Installing Activity/PE and the Site and to enumerate who/what organization is responsible for implementing those agreements. The BESEP will be prepared by the PE, a draft will be reviewed by the RSIM, the site, and all those organizations affected or having responsibilities associated with the installation. The final coordinated BESEP is released by a designated release authority at the IA no less than 30 days prior to the installation commencing.

5.4.1 ***BESEP Format***. BESEPs are official documents released by those having Command release and/or signatory authority. The two accepted formats for an Installation BESEP are Naval message or Naval letter with enclosures. The choice of using either "record traffic" option shall be coordinated between the PE and the customer. The specified content as described in the following paragraphs shall be followed for both formats. The BESEP will define the installation plan as well as the physical, mechanical, electrical, safety, testing, training support, and operational transition requirements of the installation. It is important that the BESEP clearly and succinctly define how associated

commands are affected and the actions or responsibilities that are expected by all participating activities. In short, it documents the agreement of principal commands on:

- What is to be installed;
- Who will provide the equipment to be installed;
- Who is responsible for each part of the installation; and
- What is affected by this installation?

5.4.2 ***BESEP Contents***. The content for either a Message BESEP or a Letter BESEP is identical. While a Message BESEP is preferred, the size and complexity of the installation may dictate the use of a Letter BESEP with brief enclosures. The areas or subjects that will be included when preparing a BESEP are:

- Scope and Purpose of the Installation (Sponsor statement of need);
- System Description;
- Installation Sites and Location Details;
- Facility Requirements (e.g. power, HVAC, minor construction);
- Environmental and Safety Concerns;
- Security Requirements;
- Communications Connectivity;
- System Timing and Synchronization;
- System Testing, Transition, and Operational Cut-Over;
- Logistics Support, Test Equipment, Training Requirements;
- Removal and Disposal;
- Other Special Considerations; and
- Actions or Responsibilities Assigned to Involved Activities.

Appendixes O1 and O2 contain sample Message and Letter BESEPs to be used for all shore sites except training sites.

5.4.2.1 The opening paragraph of the BESEP should include a brief description of the project scope and purpose of the installation including a review of the historical requirement leading to the establishment of the project. The purpose of this paragraph is to identify the need that is met or the capability that is provided by this installation. This paragraph will also define the limits of any planned construction, alteration, disestablishment, or demolition of facilities as well as the modification or disposal of existing electronic systems or equipment.

5.4.2.2 The system should be described in broadest terms that will convey an understanding of what is being installed. For example, it would be sufficient to describe an installation as “EHF SATCOM Terminal and required interfaces, consisting of the Communications

Equipment Group (CEG), High Power Amplifier (HPA), Antenna Group (AG), and the Remote Terminal Control Unit (RTCU). EHF SATCOM Terminal interfaces include electrical power, cooling water, dry air, alarm system, baseband equipment, and terrestrial extensions."

5.4.2.3 When describing the installation site and location details, use brief descriptions and common locators. It is not necessary to describe the geographic location in great detail. The installation location should be given in terms of base/site name, building number, room number, and spaces and cabinets affected. If necessary, a floor elevation and/or duct plan may be included as an enclosure.

5.4.2.4 Facility requirements such as structural, power, lighting, HVAC, and other physical plant aspects will be defined in the BESEP as appropriate. The BESEP should state the impact to and the intended solution for any floor loading, raceways and cable ducts, structures, power panels, Uninterruptible Power Supply (UPS), HVAC system, or other physical plant problem. If a site's existing resources are not sufficient for the project's requirements, the PE will need to address the issue with the IA, IMA, and the customer to obtain an agreement on how to upgrade the existing facility. This agreement needs to be documented in the BESEP. Review OPNAVINST 11010.20 and consult with the local NAVFAC on whether the upgrade will be allowed if completed as an integral support for the system installation.

5.4.2.5 Environmental and safety concerns are very important and must be identified in the BESEP. Any potential hazard to the safety of personnel, equipment, or software must be identified along with any possible environmental effects that could result during the installation or operation of the system. Examples of some safety issues to be considered are:

- Presence of asbestos and/or lead;
- Proper ventilation, especially if installers will be working in manholes or other spaces where dangerous gases can accumulate;
- Electromagnetic Radiation (EMR), HERP, HERO, and HERF concerns;
- New or updated Shore E3 review and spectrum assignment that is required due to installation of a new RF emitter, modification or upgrade to an existing RF emitter, or an installation, modification, or upgrade to a non-RF emitter that modifies the Electromagnetic Environment;
- Compliance with electrical safety code requirements;
- Requirements for Fire Watch; and
- Agreements with the facilities manager and Fire Marshal for any site-unique requirements for fire and safety inspections.

Depending on the installation, a Safety Criteria Certification (SCC) can be required. Safety certifications could include Explosives Safety Certification, Electromagnetic Radiation (EMR) Safety Certifications, and Airfield Safety Certification. When a safety certification is not applicable to the installation, the BESEP should state that, based on a

technical review by the cognizant command(s), no explosive, EMR, or airfield safety hazards are anticipated. When safety certifications are required based upon the criteria specified in NAVFACINST 11010.45, the BESEP should identify what certifications are required. In general if a safety hazard is anticipated, the BESEP must describe this hazard along with the recommended/planned steps for its elimination.

5.4.2.6 The BESEP will address security requirements pertaining both to the systems being installed and to the site itself. These security requirements would include:

- Physical Security;
- COMSEC;
- Transmission Security (TRANSEC);
- INFOSEC; and
- TEMPEST.

5.4.2.6.1 The BESEP should state the following physical security requirements:

- Classification level of the information processed by the equipment;
- Special security requirements affecting site operations or the method of installation;
- Facility upgrades that are required to meet physical or communications security requirements;
- Security clearance required of the installation personnel; and
- Need for site escort requirements for installation personnel.

5.4.2.6.2 COMSEC/TRANSEC requirements will be addressed in the BESEP. The CNO Validation Number should also be provided. A clear statement of need as well as a schedule will be provided in the BESEP for the affected site's CMS Custodian to take appropriate action. As stated in Section 2.6.3, the Program Office is responsible for submitting the U.S. and Coalition COMSEC/TRANSEC validation request to OPNAV. The site's CMS custodian shall request the required equipment from DCMS by referencing CNO validation message.

5.4.2.6.3 Required Accreditation actions should be identified in the BESEP. If Type Accreditation exists, the BESEP should state that it will be provided. If no Type Accreditation exists, the Site Accreditation will need to be updated and receive ODAA approval before the installation can proceed. A copy of the Accreditation package must be submitted to DISA for NIPRNET/SIPRNET connection approval. If required, the BESEP should request the site to submit a TEMPEST Requirements Questionnaire (TRQ). See Appendix P for a sample TRQ.

5.4.2.7 Any connectivity required in support of installation testing and normal operations will be identified in the BESEP. If existing connectivity was identified and agreed upon during the site survey, the BESEP will identify the connectivity and describe which system or testing requirements this connectivity will support. The BESEP should

specify what resources such as multiplexer or router ports, cable strands, and station patch panel ports are reserved for the installation. Required new terrestrial connectivity should already have been identified in the Site Survey Report (see Appendix J). However, the BESEP will repeat the new connectivity requirement including the required technical circuit data. See Appendix O2, enclosure 3 for an example of the technical information normally expected in identification of new terrestrial connectivity requirements. The site is normally responsible for submitting the FTSR and obtaining the new connectivity. FTSR information can be found at DISA's Web site at http://www.ditco.disa.mil/corporatelibrary. Connection approval to NIPRNET and SIPRNET is obtained through the Connection Approval Process (CAP) as described at: https://iase.disa.mil/documentlib.html - CAPDOCS.

5.4.2.8 Timing and synchronization issues must be addressed in the BESEP to document system requirements such as signal type (i.e., 1 PPS, 5 MHz, 100 kHz), number of and type of connections to new and existing equipment, and impacts to existing equipment and systems. Specific details of the timing and synchronization system are a required part of the IDP. If new timing and synchronization equipment, or an expansion to existing equipment is required, it must be done in a manner that meets all known requirements and facilitates future expansion plans.

5.4.2.8.1 The use of commercial Course and Acquisition (C/A) Global Positioning System (GPS) receivers is not authorized for timing and synchronization functions in accordance with Chairman Joint Chiefs of Staff Instruction (CJCSI) 6130.01D, dated 13 April 2007. All new GPS-based timing and synchronization installations shall be in compliance with Selective Availability/Anti Spoof Module (SAASM) requirements.

5.4.2.9 System testing, transition, and operational cut-over requirements will be identified in the BESEP. Special requirements to support the SOVT at either the receiving site or remote activities will be described. Site personnel should be requested to participate in and witness the performance of the SOVT. If operations will transition from an existing system to the newly installed system, the BESEP should identify those special considerations or actions that must be taken by the site or other participating activities. The final step in the installation is the cut-over of the system(s) to operational status. The BESEP will identify any special plans, steps, or additional personnel requirements necessary to support initial operations.

5.4.2.10 Logistics support, test equipment, and training requirements necessary for a successful installation and system turnover will be identified in the BESEP. For example, the BESEP would normally identify the general purpose test equipment the site is expected to have available in order to support the installation as well as the life cycle of the system. The BESEP should also identify requirements for special purpose test equipment and confirm agreement of those who will provide that equipment. If training is to be conducted on-site, the BESEP should state the number and type of personnel to be trained and request the facilities required. If there are special storage or transportation requirements for the installation materials, the BESEP should state what they are and who will provide them.

5.4.2.11 Removal and disposal requirements and plans should be included in the BESEP. If a local Defense Reutilization and Marketing Office (DRMO) is available, the PE needs to identify for the site what assistance the PE may need to turnover decommissioned equipment and cable to DRMO. If a local DRMO is not available, the PE will need to make arrangements for packing and shipping of the decommissioned equipment and cable back to SPAWAR for disposal. It is not lawful to abandon cable in cableways or under raised floors at the site. All installation contracts shall require that decommissioned cable be removed and prepared for disposal.

5.4.2.12 Other special considerations may be included in the BESEP such as requirements for frequency allocation authorization, network addresses, special access, continuity of operations, and requirements for a new or updated Shore E3 review and spectrum certification, or site support. The process of integrating multiple installations may create special needs or problems. When appropriate, the BESEP will address these special needs. For example, a significantly large consolidated installation may create the need for a new UPS, an upgrade to the station's power distribution system, a building expansion, or even an upgrade to the outside cable plant. Special support from the site, public works, NAVFAC, or another activity may be needed.

5.4.2.13 Assignments of responsibilities to participating government activities will be detailed in the BESEP. Contractor responsibilities will be listed under those of the government agency managing the contract. Schedules for actions requiring completion at a specified time prior to or after the installation commences will be stated in the BESEP.

5.4.3 Approval and Distribution. The final coordinated BESEP will be sent to all Commands affected by the installation or with responsibility to perform a role in support of the installation at least 30 days prior to the installation commencing. As a minimum NETWARCOM, SPAWARSYSCOM, the local NAVFAC Facilities Engineering Command, SSC LANT, SSC PAC, and the sponsoring organization, e.g., PEO C4I, PEO EIS. A draft copy of the BESEP shall be provided to the Commands previously with sufficient lead-time to allow for review, comment, and concurrence. The BESEP will be revised to address comments received prior to release and distribution. The BESEP process seeks concurrence rather than approval. BESEP formal release is only authorized by those having been designated in writing with the authority to release record message or letter correspondence on behalf of the originating command.

5.5 TSIP Development

The document used to record an installation agreement with schoolhouses is a Training System Installation Plan (TSIP). The TSIP requirement as defined in OPNAVINST 11102.2 is applicable to installation or modification of training systems (e.g. Technical Training Equipment (TTE), Training Devices (TD), simulators, and logistic support) that are used to establish and sustain formal training at training commands. The TSIP identifies the plan for a specific installation, identifies the Training Support Package (e.g. spares, test equipment, tools, technical manuals, curriculum, software, etc), obtains approval to install, identifies facility requirements, and formally transfers ownership of the training system through a three (3) phase approval process. Depending on the complexity of the installation project, the OPNAVINST 11102.2 defines the TSIP

process as taking from 8 months to 6 years. Equipment only installation projects (i.e. no construction) are projected as taking from 8 to 14 months. PEs can anticipate that projects for which there is no facility impact such as software only installations, field changes, and equipment only installations into existing cabinets for which sufficient power, HVAC, and station ground already exists should be achievable in 8 months. Installations with minimal facility impact such as those installations that may include the installation of additional cabinets for housing electronic equipment and for which no facility modifications are required such as the addition or expansion of power or HVAC distribution systems and for which no construction, alteration, demolition, addition, expansion, or extension to floors, walls, ceilings, fire suppression, and other built-in real property is required may take as long as 14 months. It is essential that continuous, ongoing coordination between the Training Support Agent (TSA) (normally the Program Manager), the Training Agent (TA), and the Installation Activity (IA) and/or their designated representatives be maintained throughout the process.

The TSA shall notify the TA during system acquisition to assist in identifying available space. The TSA shall prepare a Training Change Proposal (CP) Form in accordance with OPNAVINST 11102.2, enclosure (2), Figure 7 and submit the completed form to the TA for concurrence via e-mail. Upon TA concurrence the TSA shall task an Installation Activity to conduct an initial site survey and begin installation design work to facilitate the development of the TSIP.

5.5.1 ***TSIP Format***. The prescribed format for the TSIP is in document format. See Appendix N for the TSIP document template. The document includes a formal signature page for each of the three TSIP process phases.

5.5.2 ***TSIP Number***. A unique 14 digit number is assigned to each TSIP document. The first digit in this number represents the SYSCOM. SPAWAR is assigned the letter “E”. The letter “E” is followed by a dash, a four digit consecutive number is obtained from SPAWAR 4.3 (e.g. 0001), another dash, and the 7 digit installation tracking number assigned by SPIDER (e.g. 09-6010) resulting in E-0001-09-6010 as the TSIP number.

5.5.3 ***TSIP Contents***. The required content for the TSIP is defined in OPNAVINST 11102.2. The TSIP is released as a total plan that includes all three phases. All currently available data shall be included each time the TSIP is published. In other words, following the site survey, all data elements contained in all phases are provided to the extent feasible. As a minimum, the Phase I portion of the TSIP shall be signed and the document distributed immediately following the site survey in the place of the Site Survey Trip Report (see Appendix M). The Phase II portion of the TSIP must be finished, signed, and the document redistributed prior to the on-site installation commencing. When all data elements are known and complete for equipment only installations, both Phases I and II should be finished, signed, and the document distributed in order to accommodate a more rapid deployment. Phase III of the TSIP document is completed following the completion of the installation and at close of the installation project.

The Installation Design Documentation (IDD) is defined by the OPNAVINST 11102.2 as an integral component of the TSIP. IDD includes the Installation Design Plan (IDP) drawings and associated procedures for the test and check out of the facility support and

training equipment. The OPNAV instruction does not require a specific format for this documentation. It is the intent of the OPNAV instruction to avoid duplication of data and effort while maintaining minimum data requirements that effectively support installation and transfer of a Naval training capability. SPAWAR prepared IDD shall conform to SPAWAR requirements for IDPs and System Operational Verification Test (SOVT) plans. Include any drawing depictions such as floor plans and elevations that may serve to amplify the TSIP data at Phase I. Include approved IDPs and SOVT plans at Phase II. Include approved As-built drawings, a signed SOVT, and an Installation Completion Report at Phase III. Appendix N provides a detailed template for the TSIP.

5.5.4 Approval and Distribution. The TSIP document shall be prepared by the PE and reviewed by the RSIM, TSA, and TA. Each phase of the TSIP is signed approved by the TSA and the TA. Distribution is electronic via email to all those associated with the installation. Approved copies are uploaded into the SYSCOM designated repository by the PE and by SPAWAR 4.3 to the Navy Knowledge On-line (NKO).

5.6 Installation Design Plan (IDP) Development

The PE is responsible for the development and the coordination of obtaining an approved IDP. An IDP shall be developed for every installation that has a hardware component in accordance with the format and content described in Appendix Q. Drawing number guidance is contained in Appendix Q. If there are any additional questions regarding the assignment of drawing numbers to IDPs, the PE shall direct their questions to the IMO for clarification.

An IDP is a drawing package containing all of the information needed to allow installers to successfully complete and troubleshoot an installation. The IDP shall specify methods and materials in enough detail to enable trained installers to complete an installation that meets all applicable requirements. The use of notes containing statements such as “Installation shall meet the requirements of the National Electric Code (NEC)” does not absolve the developer of this responsibility. Ideally, the IDP should enable trained installers to efficiently complete the installation without referring to any other documentation. If any other documentation is required, the IDP developer, PE, or OSGR (possibly the same person) should ensure that it will be readily available at the installation site. The IDP should also contain drawings that are traditionally provided for troubleshooting. Block Diagrams and Circuit Diagrams are drawings that usually fit into this category.

5.6.1 Installation Requirements Drawing (IRD). IRD packages are a required standard for systems that will deploy to multiple sites or platforms. The IRD standard is found in SPAWARINST 4720.5. Once an IRD package has been developed and approved for either the system or for a subsystem, then the IRD shall form the basis of the development for all IDPs used to install that system or subsystem. Approved IRDs are available in the SPAWAR PEO Installation Data Environment and Repository (SPIDER).

5.6.2 Requirements for the Use of Electronic Media. IDPs shall be developed in AutoCAD and distributed in an AutoCAD .dwg format. To maintain compatibility (fully readable

and editable), it is recommended that drawings be saved in the oldest version of AutoCAD available for ordering through the Navy and Marine Corps Internet (NMCI) program. (See CLIN 0023 applications at https://www.homeport.navy.mil.)

5.6.3 Requirements for Drawings Prepared by an Architect-Engineer (A-E) for Minor Construction.

Federal Acquisition Regulations Part 36 prescribes policies and procedures peculiar to contracting for construction and Architect-Engineer (A-E) services. Contracted construction work and A-E design services should only be performed through a contract that complies with FAR Part 36. Part of this requirement includes registration of designers and the inclusion of the following clause in the contract.

"Architects or engineers registered to practice in the particular professional field involved in a State, the District of Columbia, or an outlying area of the United States shall prepare or review and approve the design of architectural, structural, mechanical, electrical, civil, or other engineering features of the work."

A-E drawings shall be signed by a responsible person of corporate status in the architect-engineer firm and stamped with his/her registration seal when the seal is authorized by the country where the project is to be constructed.

5.6.4 Definition of Master As-built Drawings. Creating As-built drawings from redlined IDPs has been the accepted practice for many years. However, the definition of what As-built drawings contain has not been consistently understood or implemented. Many PEs obtain new drawing numbers and create new installation drawings for each upgrade to an existing system. As-built drawings then that are based solely on these new installation drawings fail to update the original As-built drawings. This practice has resulted in multiple As-built drawing packages (different drawing numbers for the same system) that only reflect a portion of the entire system and at different points in time. Even when all the As-built drawings are individually analyzed, the customer as well as future PEs often cannot identify the correct as-is configuration of the entire system. This flawed practice has over the years had a significant impact on configuration management and sustainability at Navy shore facilities.

A single As-built drawing package that documents each system in its totality and is continuously revised with each subsequent system upgrade is the shore installation design process. To bring better clarity to the process, this document is defining As-built drawings that result from the original installation of that system to be considered the "Master" As-built drawings and from that time forward any PE conducting a shore installation that modifies the existing system configuration shall use the redlined IDP resulting from the upgrade to update the Master As-built drawings. When valid Master As-built drawings exist, revision to those drawings shall constitute the only acceptable As-built deliverable. Each Master As-built drawing revision shall document the system in its totality and thus only one As-built drawing set per system shall be continuously revised and updated for the life of a system at a specific shore site. Appendix Q

provides additional information on Master As-built drawings and how they are identified and maintained throughout the installation process.

5.6.5 Approval of IDP and As-built Drawings. All shore IDPs and As-builts shall be in accordance with the design, drawing, and installation standards discussed in Appendixes Q and AC and when an approved IRD is available, the IDP/As-built shall conform to the IRD to maximum extent possible. PEs shall contact the IA's IMO for current drawing approval guidance. The approval process is used to certify that drawings are technically accurate, compliant with design and installation standards, and conform to standardized drawing format requirements. Only personnel with a thorough knowledge of the design, drawing, and installation standards shall be given the authority to approve IDPs and As-built drawings. Appendix C3 identifies qualification standards for those who approve installation drawings.

The drawing Title Block is very similar to IRDs. Like IRDs, it includes an Approval Block that has provision for signature by "PE/ISEA", "Reviewer", "Approval", and final "APPD FOR SPAWAR". The "Approval" entry is for a competent system subject matter expert and the "APPD FOR SPAWAR" entry is reserved for those authorized to approve installation drawings for the IA. Final approval requires both approval signatures attesting to the validity of the system and installation design, as well as compliance with design, drawing, and installation standards.

5.6.6 Navy Digital Data and Record Management Program Requirements for Drawings. The Navy's digital data policy requires SYSCOMs and PEOs to maintain technical data such as drawings in an Integrated Digital Data Environment (IDDE) that encompasses the entire organization. The Navy's Record Management Program specifies document type and duration retention requirements. For As-built type drawings the retention requirement is until the system is no longer deployed at that site or the drawings are otherwise no longer required to support that system. The intent of these policies is for the technical data and other valuable information to be visible, available, and usable by those authorized individuals who need it for future work or downstream processes.

IDPs and As-built drawings shall be maintained in their native AutoCAD ".dwg" format in the SYSCOM designated repository. A copy of each drawing revision (e.g., Rev −, Rev A, Rev B, etc.) shall be kept in electronic form in the repository. To record final approval in the repository, a Memorandum of Record shall be signed by the approval officials, scanned into digital form (PDF format), and maintained with the IDP and As-built drawings in the repository (see Appendix Q2 for an example). Master As-built drawings are identified as masters when they are uploaded into the repository and thus will automatically appear in a Master Site Index that facilitates future retrieval and reuse.

5.7 System Operational Verification Test (SOVT) Development

The SOVT Document is used to implement the SOVT process and to record the results of that process. It is required for every shore installation, whether large or small. As per the SPAWARINST 3084.1, SOVTs are defined as either System or Plaform SOVTs.

The System SOVT is typically a program office prepared document that reflects the common or standard test procedures to be used for a specific variant. The Platform SOVT is a site/installation specific SOVT that is tailored from the System SOVT. In cases where the System SOVT does not exist refer to SPAWARINST 3084.1 and the IA's IMO.

5.7.1 ***SOVT Process Purpose.*** The purpose of the SOVT process is to test the newly installed system/equipment or modification and demonstrate to the site that it is ready for operational use, because it has been properly installed and works as intended. The proper installation of the system is demonstrated by conducting tests and inspections. The SPAWAR SOVT test strategy is a "staged" or building block approach, where each subsequent test stage builds upon known test results from previous test stages. The SOVT will contain sufficient detailed testing to fully exercise the system and the equipment capabilities including built-in redundancy.

5.7.2 ***SOVT Standardized Format and Content***. The format and content of SOVT Document shall be standardized in accordance with SPAWARINST 3084.1.

5.7.3 ***Project Engineer Responsibility For SOVT***. The PE is responsible to ensure that the system/equipment and all interfaces are fully operational and that all other systems impacted are also operational. A Subject Matter Expert (SME) from the In Service Engineering Agent (ISEA) may be assigned by the PE or the IA to develop the Platform SOVT document beginning with the standard System SOVT document if one is available (See paragraph 2.4.2). While someone other than the PE may develop and then later execute the SOVT as the SOVT Manager, the PE is still responsible for all aspects of the installation and will ensure that the SOVT developer has a copy of the IRD or IDP, and makes use of the standard System SOVT. The Platform SOVT document shall meet the format and content requirements of SPAWARINST 3084.1. The PE is also responsible for coordinating any cutover requirements including cutover strategy in advance with the affected commands. For example, when operational circuit downtime is necessary, the PE is responsible to obtain approval for the downtime well in advance and the PE also formally documents that agreement in the installation BESEP.

5.7.4 ***Approval of SOVT Documents.*** All SPAWAR SOVT documents shall be approved in accordance with requirements specified by SPAWARINST 3084.1.

5.7.5 ***Repository Requirements for SOVT Documents***. Approved Platform SOVT documents are to be retained in the SYSCOM designated repository in accordance with SPAWARINST 3084.1. Signed/completed Platform SOVTs with all testing results are also retained in the SYCOM designated repository. Status and closeout of corrective actions shall be reported in PE SITREPs and uploaded into a discrepancy tracker, which for SPAWAR is SPIDER.

5.7.6 ***Cut-Over Plan Development.*** Cut-Over Plans will be based upon the Cut-over Strategy developed by the Program Office as outlined in Section 2 of this handbook and may be any of the following:

- **"Hot Cut-Over" -** The new system will be replacing an existing system that will remain in operation until the new system is activated. A complete new/additional system is normally required for this type of cut-over. A "Hot Cut-Over" requires the IA to develop a site-specific cut-over plan that transitions the customer/user from the existing system to the new system without the customer's/user's operational capability being impacted. The site-specific cut-over plan requires customer notification and coordination;
- **"Cold Cut-Over" -** Existing system will be deactivated and possibly removed before the new system is installed or activated. This also could apply when a system is deactivated and moved from one location to another. During this type of cut-over, the customer/user loses operational capability until the newly installed system/moved system is activated;
- **"Warm Cut-Over" -** The customer/user transition to the new/updated/moved system is not performed as a "Hot Cut-Over," but in a manner that is transparent and seamless to the customer/user. In this type of cut-over, the customer/user does not lose operational capability. For example, equipment may be relocated or upgraded in phases or another command may assume the "guard" for a coordinated period of time; and
- **No Cut-Over Required -** This occurs when the system being installed provides a new or expanded capability for the site. In this case, no system/capability is deactivated, de-installed, or moved.

When a Hot or Warm Cut-Over strategy is planned for an installation, a documented and formal Cut-Over Plan will be developed. The Cut-Over Plan should include a recovery and fall-back contingency plan. The PE, with site input and concurrence, will develop a Cut-Over Plan that informs all concerned parties of the cut-over schedule and the order in which the connections should be made, broken, and checked. The Cut-Over Plan should include a requirement to label all disconnected wires and cables so that old connections can be restored if new connections do not work. When a cutover is required to complete an installation, a Cut-Over Plan shall be incorporated into the SOVT or provided as a separate document that is referenced in the SOVT.

5.8 On-The-Job Training Materials Development

While OJT is not intended to replace more formalized training, the PE will ensure that OJT is provided as part of the installation. Normally, OJT does not exceed three to five days. The purpose of this OJT is to familiarize site personnel with the location of equipment, spares, cabling, and basic operation and maintenance of the equipment/system. Identification of the SMEs and trainers, scheduling and personnel training requirements, and development of training materials for OJT completion are some of the actions to be addressed by the PE. If the PE or the Site has reason to believe that OJT will not be sufficient, the PE and/or the Site shall communicate these concerns to the IMA. The IMA shall determine if alternative training such as Program Office sponsored vendor training can be obtained.

5.9 ILS Checklist Development

The PE will obtain or develop an Integrated Logistics Support (ILS) Checklist using Appendix W as a guide to what ILS materials are normally considered. As part of turnover, discussed in Section 8, the PE shall incorporate the ILS checklist into an Installation Completion Report (ICR) for the purpose of formally turning over the ILS materials to the customer.

5.10 Pre-Installation Test and Checkout (PITCO) Procedures

A PITCO provides a level of confidence that the equipment/system that will be delivered for installation is fully operational. The main advantage to conducting a PITCO is to reduce on-site production/testing time and mitigate risk. The cost-effectiveness and necessity for a PITCO is dependent upon the demonstrated level of quality of the system/equipment providers, the potential cost that would be incurred to replace defective equipment found during installation, and operational impact resulting from installation delays. The Program Manager is normally responsible for ensuring PITCO is accomplished on all applicable equipment and systems. When required, PITCO procedures should be formally prepared and a report showing the results of the PITCO should be included with the equipment when it is shipped to the installation site. Appendix S shows a sample PITCO report.

5.11 Ordering and Tracking Installation Material

The PE is responsible for ensuring that the source for all equipment and material required for the installation is identified during the Installation Design phase and correctly documented in the Master Parts List in the IDP. If items are to be supplied by a Program Office, those items should have been identified in the IRD Master Parts List as Supplied With Equipment (SWE). All parts identified in the IRD Master Parts List as Installation Activity Furnished (IAF) are the responsibility of the IA and PE to obtain/procure. All IAF material should be ordered during the design phase as soon as the IDP Master Parts List is approved. Long lead items should be identified early and ordered as soon as possible in advance of the rest of the installation materials. The PE is responsible for ensuring that all IAF material is ordered, tracked, and inventoried with the rest of the project installation material. Part of the PE's SITREP report includes the status and any issues associated with installation materials.

5.12 Verify Scheduling and Financial Requirements

5.12.1 Installation Schedule. Often the project documentation completed during the Installation Design phase will take longer than any other installation preparations. Prior to completing the Installation Design phase, the PE should review the POA&M schedule to ensure that no scheduling conflicts have arisen such as military exercises, site availability or blackout dates, availability of key personnel, late delivery of installation material, or availability of special installation equipment or test and checkout equipment. Schedule changes shall be coordinated with everyone associated with the installation and appropriately reported in the weekly SITREP. Often the receiving Site

will schedule other work, personnel leave, classroom training, etc., around the project's original schedule. No change to the installation schedule is authorized without the approval of the IA's IMO.

5.12.2 Installation Estimate at Completion (EAC). With the completion of the documentation developed during the Installation Design phase, the PE knows considerably more about the cost requirements of the installation. The PE and the IA should review the install cost estimate to determine if it is still correct. If a revised EAC is required, the IA will advise the IMA. If there is a forecasted cost increase, the IMA must approve the increase; negotiate a reduction in scope; or lower cost by some other means.

5.13 Checklist Completion

Appendix A of this Handbook contains a checklist that can be used to aid Project Engineers in designing shore installations. The IA or RSIM may also use this checklist as a tool to determine if all necessary design activities have been completed. It should be noted that some of the actions in the Pre-Installation phase may have already commenced before all actions in the Installation Design phase were completed.

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6.0 PRE-INSTALLATION

6.1 General

Pre-installation tasks are those steps that must be completed prior to performing an actual installation of hardware or software. Failure to complete this prior-planning phase could result in unnecessary expenditure of resources, project delays, and a potentially flawed installation. The major pre-installation activities are Installation Team Preparation; Prefabrication and PITCO; Installation In and Out Brief Preparation; Verify Equipment, Material, and Site Preparations; and Final Installation Preparations. These activities are outlined in the flow diagram shown in Figure 6-1. Outputs of the Pre-installation phase are a ready installation, SOVT and OJT team; pre-fabricated system components; tested and functional equipment; an Installation In-Brief and Out-Brief; staged and inventoried installation and logistics material; completed site preparations; confirmed receipt of all shipped material; and if changed a revised POA&M/Schedule.

6.2 Prepare Installation Team

It is important to ensure that the installers are fully prepared to accomplish the installation prior to arrival on-site. Based on a review of a comprehensive Work Scope and the IDP and a determination of the extent of the work to be conducted, the PE will determine the installation, system testing, and OJT expertise and quantity of team members required for the installation.

6.2.1 Safety Preparations. Another check of federal, state, local directives, the Site Survey Report, the BESEP, and the IDP should be made for safety issues such as hazardous materials or exposure to RF/microwave fields, high voltage, etc. The Project Engineer will verify that all members of the installation team, both government and contractor, are field-experienced and have received the proper safety training. If not, the PE and Lead Installer (contractor lead) shall arrange for the necessary training.

6.2.2 Quality Preparations. When the installation team consists of contractor personnel, the contract or task order shall include a requirement to provide the government with a Quality Management System (QMS). The QMS is the documented process that the contractor intends to use to manage the quality of the contracted deliverables. The PE should review the contractor's documented QMS process to ensure it supports the specific installation. The PE can request assistance from IA personnel that are designated Quality Assurance Evaluators (QAE). See paragraph 1.4.11 for an explanation on QAE roles and responsibilities. The QMS shall include Quality Control Documentation (QCD) tailored specifically to the conduct of shore installations. Prior to beginning installation production work, the PE will review the contractor Lead Installer's QCD. When necessary, the QAE will assist the PE by holding a Quality Assurance (QA)/ Quality Control (QC) meeting to discuss QA procedures and controls. In this meeting the contract's Lead Installer should be prepared to explain details of the QMS and how this

system will handle control of production, review and submittal of documentation deliverables.

6.2.3 Security Clearance and Travel Preparations. The PE shall ensure that security clearance information for each member of the installation team is sent to the site 30 days in advance of the installation. When foreign travel is required, the PE shall ensure that a foreign travel request is completed and submitted to appropriate overseas organizations (e.g. embassies). The PE shall also ensure that necessary transportation and housing arrangements have been made by the installation team. Finally, foreign travel shall also be coordinated 30 days in advance with the RSIM.

6.3 Prefabrication and Pre-Installation Test and Checkout (PITCO)

6.3.1 Prefabrication Preparations. Cables, rack foundations, equipment, and other special materials will be prefabricated and tested, where practical, prior to sending the installation team to the site. The PE will be responsible for prefabrication and testing. Prefabricated cables will be marked with labels that correlate to the IDP cable numbering scheme as detailed in Appendix Q. It may be best to fabricate some cables on-site or terminate only one end of the cable during prefabrication. Best engineering practices will be employed to ensure all items including cables fit correctly at the time of installation.

6.3.2 PITCO Preparations. For all system equipment for which it has been determined that a PITCO is required, the PE will ensure that this action has been completed and documented. In many instances, the PITCO will have been previously performed by SMEs working for the Program Manager. In this case, the SME will develop a PITCO report, and include a copy of the report with the equipment shipment, and appropriately tag all equipment. When this process is followed a new PITCO is not required. A sample PITCO report and equipment tag are shown in Appendix S. For new installations, a system level PITCO is preferred. For upgrade type installations, a component or sub-component PITCO maybe more feasible. When equipment and software are required to be integrated, documentation is needed to show correct configuration. The PE will need to ensure that all system components are still working properly after the integration.

6.4 Develop Installation In-Brief and Out-Brief

The PE shall prepare the Installation In-Brief in accordance with Appendix V and a draft installation Out-Brief in accordance with Appendix X. The briefs will be prepared using Microsoft PowerPoint or other comparable/suitable software. The intent is to leave hard copies of the briefing material with the customer. Provide an advance copy of the In-Brief and Out-Brief to the RSIM for review and concurrence.

6.5 Verify Equipment, Materials, and Site Preparations

6.5.1 Equipment and Material Preparations. The PE will ensure that three sets of the approved IDP drawings are prepared for the installation. See paragraph 7.8.6 on redlining IDP requirements. The PE will ensure that all equipment and material as itemized in the

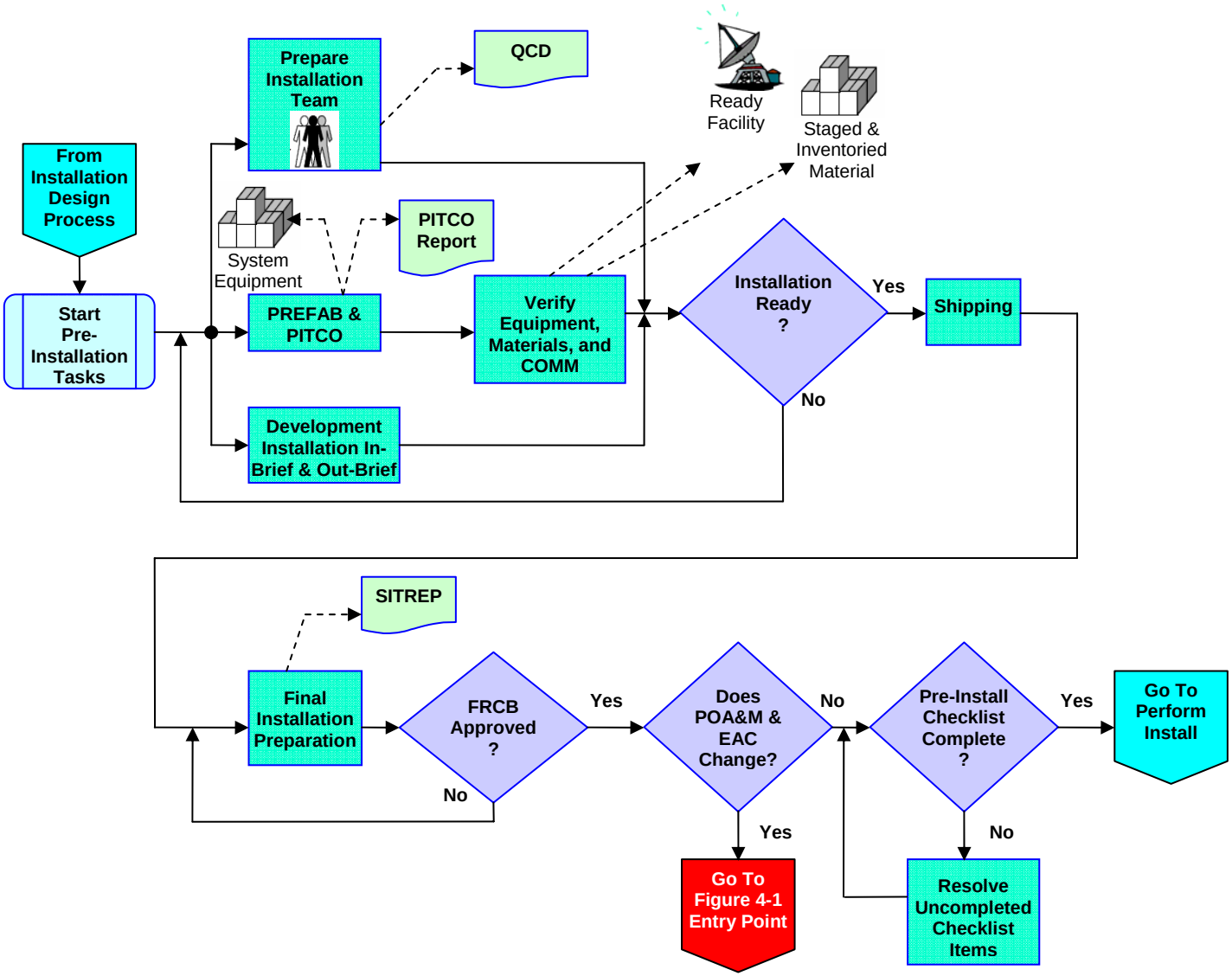

Figure 6-1. Pre-Installation Phase

IDP Master Parts List has been received, inventoried and staged for shipment. The PE will coordinate with the applicable Program Manager or IMA to ensure that all required logistics support material is also received, inventoried, and staged along with the installation material for shipment.

6.5.2 ***Site Preparations.*** When site preparation work is required prior to the commencement of the installation, the PE will verify that it has been completed before the installation team travels to the site. Typical site preparation work may include building or site modifications, the installation of generators, HVAC equipment, telephone switches, or preparations related to a minor construction or MILCON project.

The PE shall also verify that the required connectivity and cryptographic materials including keying material are available before shipping the installation material and sending the installation team to the site. All final preparations should be complete to activate the required connectivity (including SPIRNET and NIPRNET connectivity). If applicable a Telecommunications Service Order (TSO) should have been issued, and the established connectivity should have passed required Quality Control Checks. See DISA Circular 310-130-1 at DISA's Web site http://www.ditco.disa.mil/corporatelibrary.

No later then 30 days prior to shipment of material and equipment, the PE will coordinate with the site-receiving officer to ensure that the site is ready to accept and store these items until the installation begins. If the site cannot accept the equipment, the PE will be required to make alternative storage arrangements. The PE should ensure that the receiving officer is notified of any equipment/material requiring special handling.

6.6 Shipping Preparations.

The PE will have the appropriate logistics personnel prepare installation material for shipment and determine appropriate means of safely transporting and tracking the material to the site. The PE shall ensure that the installation tracking number as well as the statement that the shipped item is to be held for the designated OSGR or Lead Installer is recorded on all shipping containers and shipping documents to facilitate identification at the site storage facility. The PE's contact information should also be recorded on the shipping containers and shipping documents. Copies of all shipping and receiving documents (e.g. DD-1149) are provided to the installation team for tracking purposes.

6.7 Final Installation Preparations

Prior to departing for the installation site, the PE shall conduct a final installation preparation review to mitigate on-site installation production risks.

6.7.1 The PE and/or OSGR will confirm that key site personnel are aware of the team's composition, arrival time, and specific purpose. The PE and/or OSGR will work with the site to identify the site personnel designated to operate and maintain the new system, to participate in the SOVT, and to receive the OJT. Any scheduling conflicts that may have

arisen since the site survey briefings will be identified at this time. Final verification of Host Nation Approvals (for overseas installations) should also be conducted.

6.7.2 The PE will confirm availability of any outside agencies (e.g., ships or other shore sites) that will support any aspect of the installation. The PE will also identify and coordinate with other organizations or technical support personnel as needed for verifying/certifying the system as operational. The PE will ensure that OJT preparations are complete. This will include the coordination of any assigned OJT teams, as well as the forwarding of student materials.

6.7.3 Before proceeding to a site with the installation team, the PE and/or OSGR will verify that Fleet Readiness Certification Board (FRCB) approval was received. The PE will notify the RSIM of the project readiness or any problems or delays. The PE will also confirm with that the installation materials and equipment are on-site. The PE will update the SITREP with the current status and any issues.

6.7.4 The PE will make any changes necessary to the POA&M/schedule and forward it to the IA for approval. The IA will make any applicable changes to the TLS and forward the TLS to the IMA. All schedule changes impacting a Mission Critical Date (MCD) in the Work Plan will require immediate IMA notification and approval.

6.7.5 The PE shall submit monthly financial reports to the IA. If the PE's EAC of the installation has increased, the IA will report the increase to the IMA. Unless the IMA or the sponsoring Command has a different threshold policy, any deviation greater than +/- 5 percent (not to exceed $20,000) from estimated cost at completion shall be reported to and approved by the IMA.

6.8 Checklist Completion

Appendix A of this Handbook contains a checklist that can be used to aid Project Engineers in planning and completing Pre-Installation tasks. The IA or RSIM may also use this checklist as a tool to determine if all necessary Pre-Installation activities have been completed before starting on-site production work.

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7.0 INSTALLATION PERFORMANCE

7.1 General

After the planning, procurement, and preparations are completed the actual installation can begin. The installation results in an installed system that has been groomed or prepared for the SOVT.

7.2 Personnel Safety Requirements

Every Project Manager, PE, and OSGR shall be very familiar with the subject of safety and shall consider on-the-job safety as his or her top priority. The Project Manager, PE, and OSGR shall be familiar with the Navy's overriding safety instruction, OPNAVINST 5100.23G, Navy Occupational, Safety, and Health Program Manual. OPNAVINST 5100.23G covers many aspects of safety and provides additional references for more detail. Although OPNAVINST 5100.23G is the Navy's overriding safety instruction, the Project Manager, PE, and OSGR should also be familiar with the local command's safety policy.

7.2.1 All Navy contracts should require contractors to have safety training. However, the Project Manager, PE, and/or OSGR should not assume that the safety training is sufficient to ensure a proper observance of safety procedures. The Project Manager, PE, and OSGR should be constantly observant to ensure that the installation is conducted in a safe manner.

7.3 Major Safety Considerations

Some, but certainly not all, of the safety considerations that shall be observed during C4ISR shore installations are:

7.3.1 Energized Circuits or Power Panels.

Energized work is one of the most dangerous jobs that an installation team may be asked to perform. When working on equipment that is connected to an energized power panel, the normal practice is for the circuit from which the equipment is powered to be off and properly locked or tagged out, in accordance with station procedures. Working on live equipment/circuits/panels is the last alternative work practice to consider. Only when it is allowed by local Command, can the installation team perform work on energized equipment, circuits, or power panels with strict adherence to mandated safety requirements. Personnel performing this work and in the area near the work must have received the specified training, protective gear, proper tools, and proper authorization in writing by the authority have jurisdiction as required by OSHA 1910 and 1926, Unified Facilities Criteria (UFC) 3-560-01, and NFPA 70E. All energized work for the Navy is required to have job specific procedures approved, in writing, by the Commanding Officer/Executive Officer and considered necessary to support a critical mission, prevent human injury, or protect property. Only properly trained workers can perform this work

after determining that the job can be done safely based on assessment of the hazard, identification of required safe work practice, outfitting with protective equipment, and having all written procedures and authorization to perform the task completed. See details of electrical safety requirements in Appendix AC and referenced standards.

7.3.2 ***Fire Watches.*** If welding or any other process that produces heat is required during an installation, a "fire watch" is required to ensure that fires do not occur and that the installation area is under control. In many cases a Hot Work Permit may be required. The Base Fire Department can provide information about the presence of flammable material or the requirement for a Hot Work Permit.

7.3.3 ***Radiation Hazards.*** All installers shall be aware of all potential sources of radiation. When work is planned in an area where RF radiation could possibly be encountered, all potential radiation sources must be de-energized and the circuits must be locked and tagged to prevent potential RF exposure.

7.3.4 ***Asbestos.*** When an installation is planned that could affect the physical site, consideration shall be given to whether asbestos may be present. Asbestos has been proven to cause cancer and shall be handled only by persons trained in asbestos removal. If an asbestos concern exists, contact the command's Safety Manager or facilities office to determine if an asbestos survey has proved or disproved the presence of asbestos. If this proves to be inconclusive and a concern still exists, request that the site conduct an asbestos test to confirm or disprove the presence of asbestos.

7.3.5 ***Polychlorinated Biphenyls (PCB).*** Many transformers contain PCBs that have been proven to cause cancer. If work on an existing transformer is required, care should be taken to avoid damage to the transformer that could cause the PCBs to leak out. If a leak is seen, contact the Safety Manager to arrange for proper cleanup.

7.3.6 ***Hazardous Materials.*** The Safety Manager should be able to provide a list of hazardous materials that exist on the site. If hazardous materials do exist, the Safety Manager should be able to provide a Material Data Safety Sheet detailing the appropriate hazardous materials handling procedures. Material Data Safety Sheets shall be provided to the Safety Manager for all hazardous material taken to the site.

7.3.7 ***Confined Space Entry.*** Confined, unventilated spaces could contain dangerous gas build up. If work in a confined space is required during an installation, contact the Safety Office for testing to ensure that the space does not contain toxic gas. Installers should not work alone in confined, unventilated spaces.

7.3.8 ***Weight Handling.*** Weight handling equipment shall have a current certification for the weight to be handled during the installation. All persons operating weight-handling equipment shall be trained and certified to use the equipment. Installers should be trained in the proper method to lift and move material by hand.

7.3.9 ***First Aid and Cardiopulmonary Resuscitation (CPR) Certification.*** All personnel working on an electrical/electronic installation shall have a current first aid and CPR certification.

7.3.10 ***Personal Protective Equipment (PPE).*** Installers shall be properly trained in the use of any PPE that is required to be used during an installation.

7.3.11 ***Personal Protection Requirements.*** Each installation site should be evaluated to determine whether the installers must be protected from bodily harm. Installers should use earplugs in areas with excessive noise and eye, head, and foot protection as needed.

7.3.12 ***Reporting.*** All safety mishaps resulting in injury must be reported in accordance with OPNAVINST 5100.23G.

7.4 Performance of Installation

An outline of installation phase is shown in (Figure 7-1). The major steps in this phase are described in the paragraphs that follow.

7.5 Conduct In-Brief

The first step in the installation phase is to conduct an In-Brief. An outline and example showing the major topics to be covered is provided in Appendix V.

7.5.1 The purpose of the In-Brief is to introduce the key members of the installation team, review what equipment or systems will be installed, review the schedule, discuss potential impacts the install may have on the facility and security, request whatever assistance is required to successfully complete the installation and system turnover, and review the installation team and customer responsibilities as stated in the BESEP. Key members of the installation team will normally consist of the PE or an OSGR, and Lead Installer (generally a contractor). The RSIM will also attend, if possible. Recommended participants from the site and region include site Safety Officer, CMS custodian, Security Officer, PWO, Logistics/Supply Officer, Facilities Officer, Plans Officer, Electronic Maintenance Officer, Operations Officer, Communications Officer, and Officer In Charge (OIC) / Commanding Officer or command designated representative.

7.5.2 The in-brief shall include a discussion of working hours, the order in which tasks will be accomplished, any required downtimes, and the cut-over schedule (if applicable). Factors that could affect the installation schedule should also be discussed at this time.

7.5.3 The site should be made aware of both permanent and temporary impacts that the installation will cause to site facilities. The site may be aware of the final impact(s), but the site should also be warned of any temporary impacts that may affect the workspace, such as the temporary removal of floor tiles that may affect normal personnel access.

7.5.4 The site should be informed of the security clearance levels of installation personnel and the areas that will require access. Installation personnel shall have a security clearance

level that minimizes the disruption to the site and the use of escorts. If the installation will result in additional classified circuits and equipment being installed, the site should also be made aware of these circuits and/or equipment and any intended special access or use during the installation.

7.5.5 A good practice is to review the assigned responsibilities from the BESEP. Many misunderstandings can be avoided by thoroughly preparing the roles and responsibilities section of the BESEP and by reviewing them again with the customer in advance of starting the installation.

7.6 Coordination and Liaison

The PE must coordinate with a number of key personnel and participating organizations in order to ensure a successful installation. The PE or OSGR should communicate status and issues both before and at least weekly during the installation to the RSIM. During the installation phase, the OSGR will conduct status meetings with the appropriate site representative daily, or as requested by the site. If applicable, the responsible regional frequency coordinator must be contacted in order to coordinate frequency availability. Additionally, liaison must be made between the Fleet Commander, any Joint Commands affected, as well as any other participating organizations to ensure that proper approvals and support are available to successfully complete the installation.

7.6.1 Cut-over and outage times must be scheduled with the site. The PE or OSGR will coordinate for all Public Works (PW) services, scaffolding, crane and/or rigging services necessary for the completion of the installation.

7.6.2 The PE or OSGR shall coordinate with participating organizations to verify the status of interfaces for testing support. If required, ship and shore site support must be identified, prepared, and available to support system end-to-end testing.

7.7 Administration

7.7.1 Upon arrival at the site, the PE or OSGR and Lead Installer will locate and stage the installation equipment and material. The equipment and material will usually have been shipped to the site's receiving officer with instructions to hold the items in reserve for the designated PE, OSGR, or Lead Installer. Building accessibility for the installation material must also be confirmed.

7.7.2 The PE or OSGR should also begin coordination with the site's Security Office. Keys, clearances or badges, escorts, combinations, and any other item or information required to gain access should be obtained. Confirmation should be made that clearance messages or visit requests were received for all members of the installation team.

7.7.3 The PE or OSGR should verify that the established connectivity for this installation has passed required Quality Checks (see DISA Circular 310-70-1).

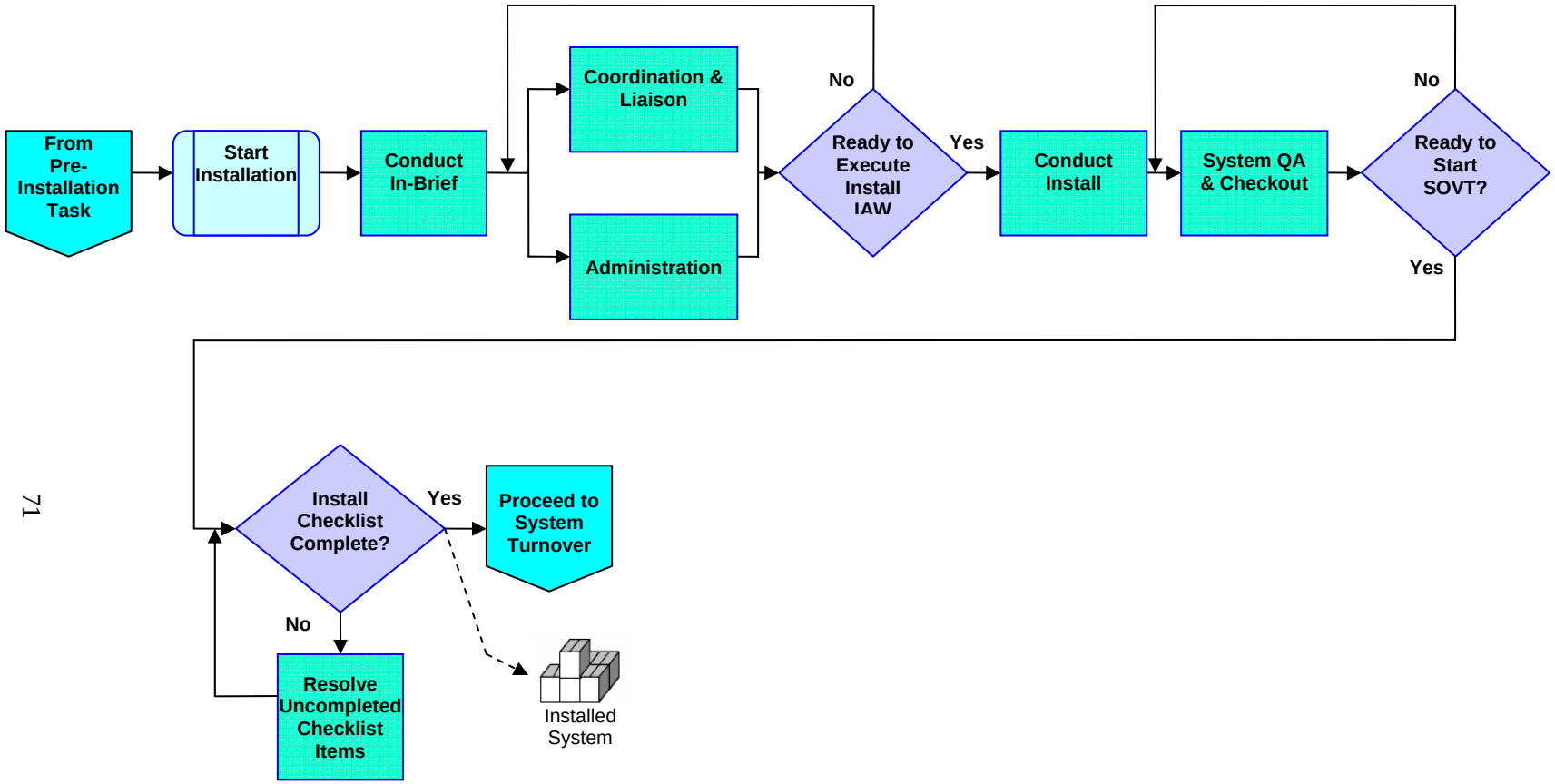

Figure 7-1. Installation Performance

7.7.4 COMSEC requirements were first identified to the site CMS custodian during the site survey. The BESEP formalized the specific COMSEC requirements to include the CNO Validation Number. The PE also verified the availability of required COMSEC material during the pre-installation stage. The PE or the OSGR will confirm with the local CMS custodian the availability of all required COMSEC materials and ensure that required on-site personnel are available to support the installation effort on all matters relating to COMSEC. The OSGR will coordinate with Communications personnel and the CMS custodian to schedule the delivery of COMSEC and loading of the keying material when needed.

7.7.5 The PE or OSGR will coordinate administrative actions for the SOVT Team. This includes verifying receipt of visit requests, coordinating security access, verifying arrangements for test equipment or other special requirements, and coordinating installation status with the SOVT Team to ensure they arrive at the proper time.

7.8 Conduct Installation

7.8.1 During the installation the PE or OSGR will conduct status meetings with the appropriate site representatives daily, or as requested by the site. These meetings should occur often enough to satisfy the site's organizations need for status information. When the PE is not on-site during the installation, the OSGR will also submit a weekly activity report to the PE. The PE is responsible for preparing weekly SITREPs and forwarding them to the IMA, IA, RSIM, customer, and all other participating organizations. A template for the Weekly SITREP can be found in Appendix B. The IA's IMO is also responsible for providing a monthly financial report to the IMA or sponsor activity indicating the estimated cost at completion of the installation project. If the EAC has increased, the IA will report the increase to the IMA. Any deviation greater than 5 percent (not to exceed $20,000) higher than the previously approved estimate shall be reported to and approved by the IMA.

7.8.1.1 Installation Reporting Process. Figure 7-2 shows the flow for the following installation status reports:

- Project Engineer's SITREP Report. (See Appendix B for template); and
- RSIM WAR. (See Appendix B for template);

Information velocity and problem area identification are paramount. At a minimum, the first SITREP is due six months prior to planned production start and monthly thereafter until one month prior to planned production start. At this point, the PE's SITREP is required weekly until the installation is complete. These reports will be color-coded (Green, Yellow, and Red) to indicate status and will be submitted via E-mail. The subject line of the E-mail shall indicate whether the overall status is red, yellow, or green. If any report item (see Appendix B) is red then the overall status is red. If no report items are red, but there are one or more yellow report items then the overall status is yellow. Only when all report items are green will the overall status be considered green.

Similarly, the RSIM will develop a regional Weekly Activity Report (WAR) using the information in the PE SITREP reports and other information that the RSIM is able to obtain concerning the installations in the region. The RSIM report shall be in the format shown in Appendix B. The RSIM's WAR is a key installation process report used by NETWARCOM, the SYSCOM, the IMA, and the IA to identify key issues and needed actions in each of the regions.

7.8.2 When the installation is an upgrade to an existing system, the PE or OSGR or an installation team member, along with station forces will perform a Pre-Installation Baseline Test (PRBT) (also sometimes referred to as Pre-Installation Check-Out (PICO)) to establish a functional baseline of the existing system. If any equipment or portion of the system that will be retained is identified as not functional, the PE or OSGR will coordinate with the site to obtain repair actions. A Baseline Test Message is recommended, but required to formalize results of the baseline test. See Appendix T for a sample message. The installation team should compare the existing equipment to the equipment shown in the installation drawings and note any differences.

7.8.3 The installer is normally responsible for removing replaced equipment. This process includes the removal of the equipment and all unused cabling, racks, cabinets, and foundations. Care should be taken during the removal of classified material to ensure proper controls and safeguards are maintained at all times. Normally, the installer is responsible for moving the removed material to a site designated location. Equipment and materials designated for disposal are usually sent to a Defense Reutilization and Marketing Office (DRMO) if one exists locally. If a local DRMO does not exist or if the old equipment or materials are to be recycled or salvaged, the OSGR will need to coordinate shipping to the IA or to an alternate location designated by the Program Office or sponsoring organization. Instructions for disposal of special equipment or material should be coordinated with station forces.

7.8.4 Power and equipment cabling shall be completed as defined during the site survey. This task includes running the cables inside the available cableways or ducts between equipment and frames. If existing cableways do not have enough room left to accommodate the needs of the installation, (see Appendix AC for code requirements) the installers will install additional cable trays or ducts as needed. Each end of each cable should be terminated on a terminal block or with a connector.

7.8.5 Cosmetic actions do not affect operations, but are required to give the installation a professionally finished appearance. Cables will be systematically dressed and secured with cable ties inside of the cabinets. Each end of the cable shall have a professionally printed or engraved label indicating the location of the cable. In addition:

- All equipment, power panels, and cabinets/racks affecting the installation should be properly labeled;

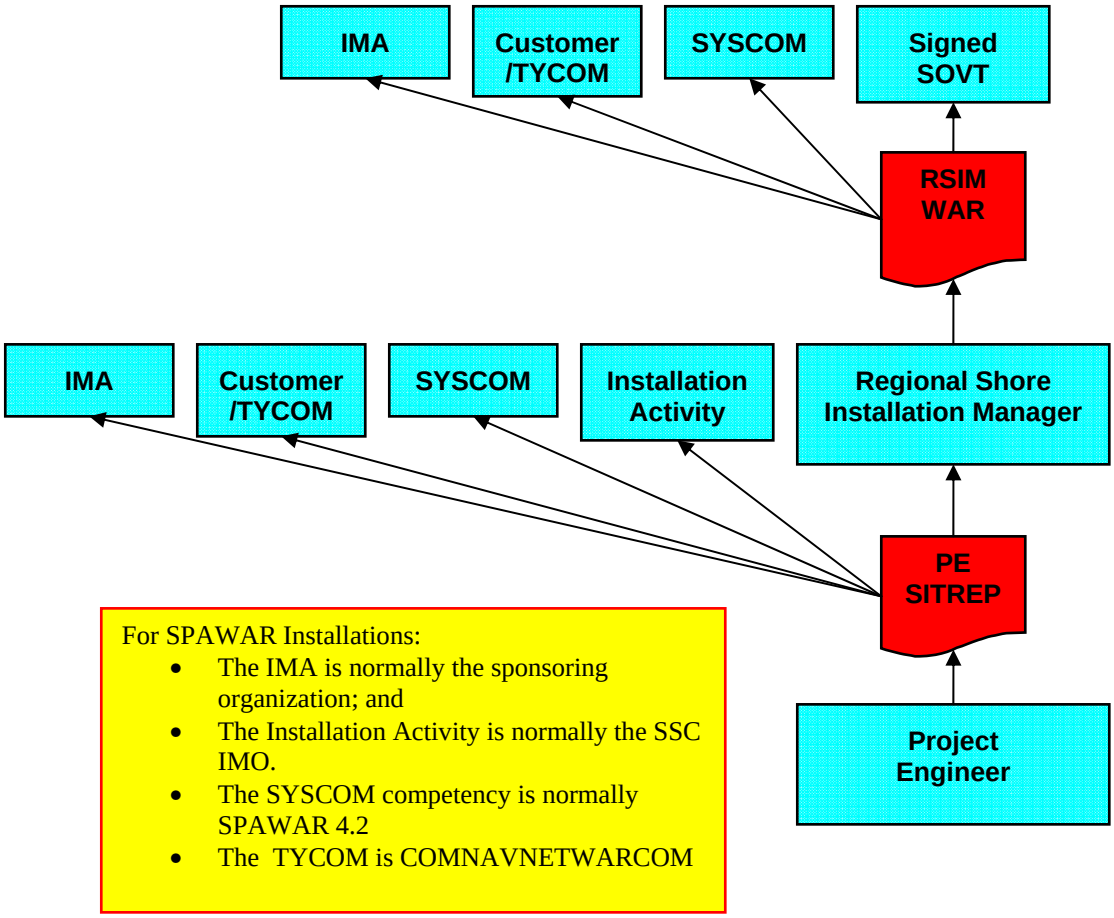

Figure 7-2. Installation Reporting Flow

- Cabinets/racks shall have a prominent label showing the originating power panel and breaker number;
- Existing handwritten labels affecting the installation should be replaced with professionally printed or engraved labels;
- Loose ends of cable ties should be removed;
- Floor tiles that were damaged as a result of the installation or that affect the professional appearance of the installation should be replaced;
- Blank panels should be installed; and
- Debris should be removed.

All labeling details will be included in the IDP (see Appendix Q of this handbook). The Lead Installer and OSGR will ensure that cosmetic actions are completed.

7.8.6 Often due to circumstances beyond the installation team's control, installations cannot always be performed exactly in accordance with the approved design documentation. Deviations to the IDP will be annotated in red on three sets of drawings. Redline drawings shall be updated daily. This is the preferred method of documenting configuration changes. Other changes to configuration settings not necessarily residing in the IDP will also be documented. For example, strapping, switch setting, software setup information, and firewall settings will be documented and duplicate printouts and electronic copies of all configuration settings are required. Once servers are up and running, a backup tape should be made and stored. When the installation has been completed, one set of the redline drawings should be left with the site, one set should be retained by the contractor to prepare the As-Built drawings, and one set should be retained by the PE for reference and review of the As-Built drawings.

7.8.7 The PE shall ensure that qualified personnel are available to install software and verify software loads. As systems have become more complex this effort has become a major part of system installations. Most software installations should have been performed at the pre-installation stage during PITCO. If software loads were not previously performed and verified, a highly skilled specialist may be required at this stage of the on-site installation.

7.9 System QA and Checkout

7.9.1 Prior to conducting the SOVT, a series of inspections will occur to verify that the quality of the overall installation is acceptable. The OSGR, Lead Installer, and subject matter experts will conduct a physical inspection, safety check, security check, continuity check, system groom/pre-SOVT, and post-installation troubleshooting.

7.9.1.1 The first check is a physical inspection. This action verifies that the equipment/system was properly installed, that the equipment and cabinets have proper grounding, that the labeling is complete, that all required physical connections have been completed, and that the installation has a professional appearance. Cabinets/racks should have a prominent label showing the originating power panel and breaker number.

7.9.1.2 The second check, sometimes referred to as a "cold check" of the system, involves a check of the continuity of wire and/or fiber-optic cables. Normally, the cold check is completed against the circuit diagrams of the IDP with each cable highlighted or marked off as each check is completed.

7.9.1.3 The third check is a system groom/pre-SOVT. The system is turned on and each piece of equipment is checked for correct operation, software loads are verified, and diagnostics are conducted if available. Verify that prior existing equipment identified as faulty during the PRBT has been repaired and is now fully functional.

7.9.1.4 During or after each check, post-installation troubleshooting will be completed to resolve identified deficiencies. Upon completion of the inspection and checkout, the OSGR should have a high degree of confidence that the customer will witness a successful SOVT.

7.10 Checklist Completion

Appendix A of this Handbook contains a checklist that can be used to aid the PE in planning and completing Installation tasks. The IA or RSIM may also use this checklist as a tool to determine if all necessary Installation activities have been completed before starting System Turnover work.

8.0 SYSTEM TURNOVER

8.1 General

The final phase of the Shore Installation Process covers those activities that occur after the installation, ending with final customer acceptance. The major activities occurring during this phase of the Shore Installation Process are the SOVT, the Cut-Over, Training, ILS turnover, Installation Completion Report, Out-Brief, post installation administration, and project closeout. Figure 8-1 shows the process flow for this step.

8.2 Conduct Security/Safety Walk-Through

The OSGR, Lead Installer, and Site Personnel will conduct a security/safety walk-through to certify the security and safety of the installation, to identify security/safety discrepancies, and to assign corrective action. The OSGR will annotate all discrepancies requiring correction in the SOVT document.

8.3 Conduct SOVT

The SOVT is the formal document used to test and document that the installed system/equipment is fully operational. The OSGR, SMEs, and site personnel will perform the SOVT in accordance with the SOVT document. The SOVT Team will conduct system-level testing of interfaces and functions as defined in the SOVT document, ensuring system operational functionality is demonstrated to site personnel who will witness successful completion of the SOVT by signing the SOVT document.

8.4 Arrange and Conduct Training

The OSGR will ensure that OJT is provided to site personnel and that it covers operation and maintenance features of the installed system. The OSGR will ensure that OJT is scheduled to provide timely training to site personnel. OJT Certifications will be provided, as applicable, to all site personnel successfully completing the OJT. Record the names of the site personnel to receive the training in the Installation Completion Report (ICR) in accordance with the template provided in Appendix W.

8.5 Type Accreditation Package

The OSGR will ensure that the Type Accreditation package for an AIS system is delivered to the site/local DAA so that Site Accreditation can be completed. In addition to requiring this information for the Site Accreditation, the Site needs the Type Accreditation package for submittal to DISA for NIPRNET/SIPRNET connection approval. Record turnover of the Information Assurance documents in the ICR in accordance with the template provided in Appendix W.

8.6 Logistics Support and Configuration Management

The OSGR will ensure that all logistics support documentation material is delivered. All equipment, spares, and documentation will be accepted by authorized site personnel,.

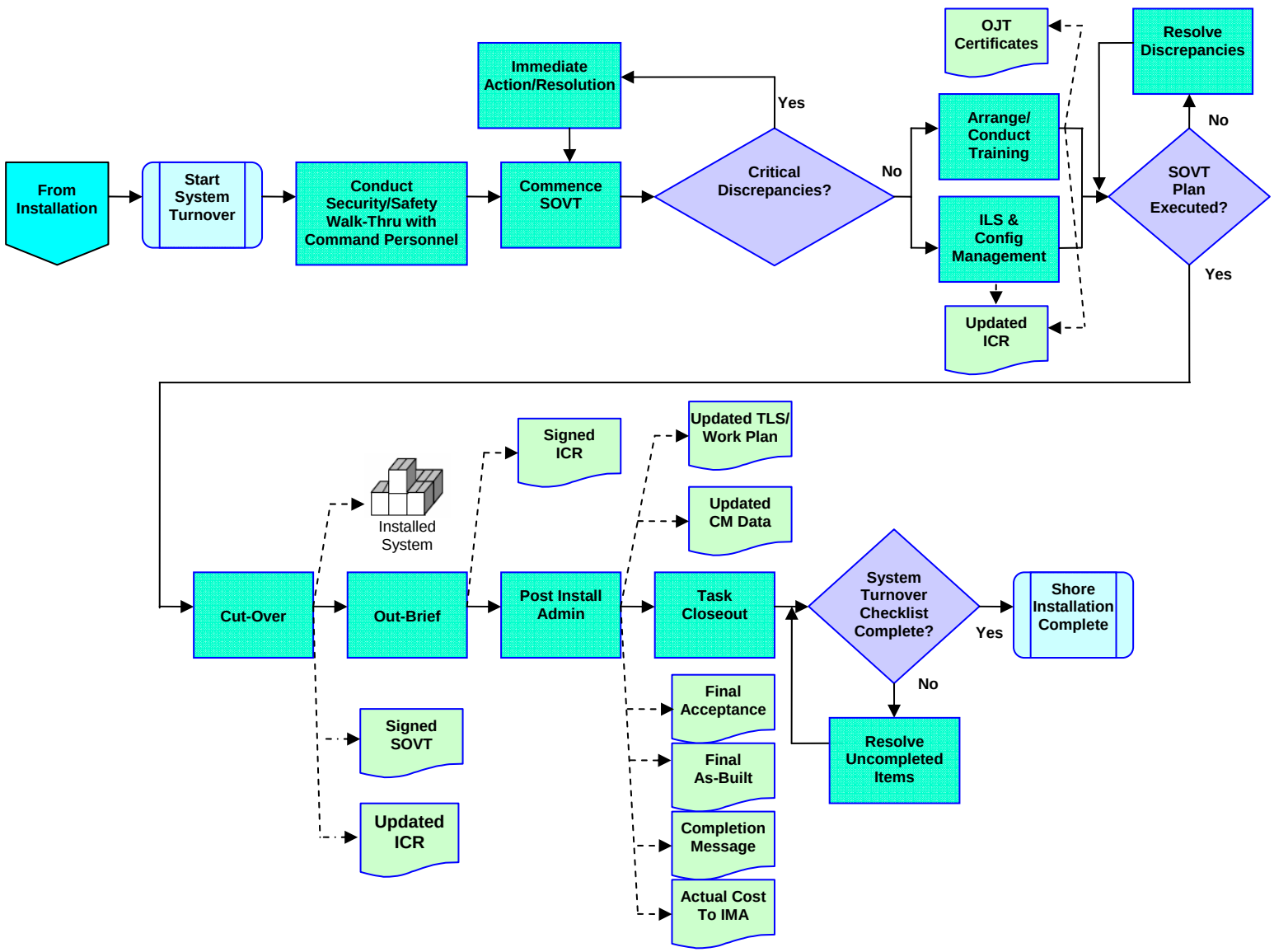

Figure 8-1. System Turnover

tracked using a DD 1149, and noted in the ICR in accordance with the template provided in Appendix W. In addition, it is the responsibility of the installation team to prepare a CDMD-OA Validation Report for NETWARCOM Managed Sites. A current listing of NETWARCOM managed sites can be obtained from the IA's IMO or SPAWAR 4.2. For sites that do not have an assigned Configuration Data Manager (CDM) and do not reside in CDMD-OA, a 4790CK form is still used

8.7 Cut-Over

When a Hot or Warm Cut-Over strategy (see Section 2.5) has been planned for an installation, a Cut-Over Plan will be developed. The Cut-Over Plan should include a recovery and fall-back contingency plan. The OSGR and site personnel will be responsible for executing the Cut-Over Plan. The Cut-Over should be integrated into the SOVT document when feasible. Actual Cut-Over to operational status is the responsibility of site personnel with support provided by the SOVT team.

8.8 Out-Brief

The PE and the OSGR will conduct the installation Out-Brief to the site. The RSIM will attend, if possible. The PE will normally invite the list of attendees that attended the In-Brief. The Out-Brief will explain the systems and capabilities that have been installed and will summarize the results of the SOVT. All outstanding discrepancies will be explained and action items will be assigned to the appropriate authority, with expected completion dates. Security and safety issues will be briefed, pointing out any personnel/equipment dangers such as new Radiation Hazards, software upgrades required to protect against viruses, and intrusion detection measures. The results of the On-The-Job Training (OJT) and ILS turnover will also be discussed. The completed Installation Completion Report (ICR) (Appendix W) will also be provided for signature acceptance of the installation. A template and an example for an Out-Brief can be found in Appendix X.

8.8.1 The OSGR will provide a draft Completion Message during the Out-Brief. A template for a Completion Message can be found in Appendix W. While it is preferred that the installation Completion Message be the final acceptance by the site with all discrepancies resolved, it is acceptable for the site to send a conditional acceptance listing the remaining unresolved deficiencies in the Completion Message.

8.8.2 Training Site Installations. After completion of the SOVT certifying that the installation and testing has been satisfactorily completed, the TA will perform whatever tests and pilot courses that the TA deems to be necessary to prove that the curriculum and training installation meets the TA's requirements. In addition, the PE will deliver the completed OPNAV 4790 CK documentation to the TA. After the TA tests and pilot courses are completed, the TA will:

- Send a Completion Message signifying final or conditional acceptance of the training installation and indicated Ready for Training status. If the system is Ready for

Training, but has deficiencies or issues that must be resolved prior to final acceptance, those deficiencies should be listed in the message. Ultimately the TSA is accountable for ensuring deficiencies are resolved either by the PE or by the TSA.

- After all installation deficiencies have been resolved, the TA will signify the installation is fully acceptable and Ready for Training by signing phase III of the TSIP document. For training site installations, the signed phase III TSIP includes an ICR within the TSIP Appendix B.

8.8.3 The Project Engineer or OSGR will solicit feedback from the sites/customers receiving installations regarding the installation itself, in an effort to improve future installation efforts. This feedback will be forwarded to the RSIM (if not present) as well as to the IA and IMA.

8.9 Post-Installation Administration

The PE shall enter all outstanding deficiencies into the SYSCOM designated installation database and shall work to resolve and track them until resolution. The PE shall report weekly to the RSIM on the status of all outstanding deficiencies. Upon completion of the outstanding deficiencies, the PE will arrange for final site acceptance of the installation and report the completion to the RSIM.

8.9.1 For the purposes of Configuration Management, the PE will submit final approved As-Built drawings to the site, the IA, and the IMA within 60 days after the completion of the installation. If Master As-Built drawings are available, they shall be updated and this update shall constitute the As-Built deliverable. See Section 5.6.4 for a definition of Master As-Built drawings. The As-Built drawings should be provided in hard copy for use by the site and also soft copy, if available/practical. Delivery of final As-Built drawings shall be via a DD-1149 or a Letter of Transmittal to formally document delivery. The final As-Built drawings shall represent the final as-is configuration including incorporating all corrections and changes marked on the redlined copies of the IDP that was provided to the site upon the completion of the installation.

8.9.2 The IA will finalize the actual installation costs and upload the actual cost of the installation into the SYSCOM designated installation database (for SPAWAR it is SPIDER). In addition, the IA will make available to the IMA a summary of installation's final cost broken down by the format outlined in Appendix G.

8.9.3 Some time after the installation, the RSIM shall contact the customer to get follow-on feedback concerning the installation. The RSIM will combine this data with similar feedback received from the Lead Installer, the OSGR, and the PE. The RSIM will include a post-installation report as part of the weekly RSIM WAR. In this way, lessons learned can be incorporated into future installation efforts.

8.10 Installation Task Closeout

The PE will coordinate the return of all excess installation materials to the appropriate activity, update the SYSCOM designated installation database, and upload all project installation documents to the SYSCOM designated repository before the installation project is closed.

8.10.1 After all installation-related charges have been paid, the PE shall return all excess funds to the IA. The IA shall identify excess funds to the IMA.

8.11 Installation Completion

An installation will be considered complete when all items in paragraphs 8.8, 8.9, and 8.10 are complete, all installation issues/discrepancies have been resolved, and the customer sends the Completion Message. If after 2 weeks the customer has not sent the Completion Message, the PE will contact the customer and request this transmission.

8.11.1 If the customer has not sent the Completion Message within 30 days after the Out-Brief has been completed, the PE will send a Completion Message notifying the customer that the installation has been completed. If there are any outstanding issues or discrepancies for the installation, such as As-Built drawings, they will be noted in the Completion Message along with actions planned and the expected completion date. Under this condition, the installation will be considered completed when all issues/discrepancies have been resolved.

8.12 Checklist Completion

Appendix A of this Handbook contains a checklist that can be used to aid Project Engineers in planning and completing System Turnover tasks. The IA or RSIM may also use this checklist as a tool to determine if all necessary System Turnover and post-installation activities have been completed before closing out the project.

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9.0 MILITARY CONSTRUCTION (MILCON) AND OTHER LARGE PROJECTS

9.1 Purpose

The purpose of this section is to provide an overview of special processes and actions that are required to install electronic systems in large multi-sponsor, multi-system, shore C4ISR/IT projects. These projects could be C4ISR/IT integration projects for MILCON, Command Centers, Operations Centers, or Master Telecommunications Facilities. The elements described in this section are in addition to the processes outlined in Sections 3 through 8. A more detailed description of the MILCON C4ISR/IT Integration Process is contained in Appendix Y.

9.2 Background

Sections 3 through 8 of this Handbook describe the normal Shore Installation Process for single or consolidated installations of medium size and complexity and relatively short duration. On the other hand, MILCON Projects and large scale integrated projects involving significant facility alterations that usually extend over longer duration and require project requirements identification and additional management structure, coordination, planning, documentation, customer and NAVFAC interface These special projects may include Command Center relocation and renovation projects.

The Naval Facilities Engineering Command (NAVFAC) is in charge of Navy requirements for the MILCON Process that can take up to eight years from initial NAVFAC requirement to C4ISR/IT Initial Operational Capability (IOC). These large “brick and mortar” construction projects are budgeted through the DOD Program Objective Memorandum (POM). However the C4ISR/IT systems that are to be housed within the MILCON building are planned, programmed, and resourced by multiple Resource Sponsors and Program Offices separately from the MILCON POM. These sponsors can be Mission Sponsors, like Navy Network Warfare Command, or Program of Record (POR) sponsors from one or more Program Executive Offices (PEOs). Often a Mission or Resource Sponsor will task a SPAWAR Echelon III field activity to act as the C4ISR/IT Project Office; responsible to develop and execute an integrated design of all the C4ISR/IT systems destined for that facility. The intent is that the end-user receives a facility that has fully integrated and interoperable C4ISR/IT capability designed, organized, and installed to satisfy the users operational and human interface requirements.

Sometimes the different technical terminology and the associated definitions used by SPAWAR and NAVFAC planners can lead to confusion. Close cooperation and communications with NAVFAC planners is required to ensure MILCON requirements are properly documented, understood, and met. For example, the word “installation” is often used by SPAWAR to refer to the act of installing equipment within a building, ship, or some other platform. This same word “installation” is often used by NAVFAC to refer to a building or command. The term “Information Technology” or IT is often used by

NAVFAC planners to refer to unsecure or secure telephone and data networks, whereas SPAWAR often uses the term "C4ISR" to refer to a broad definition of any equipment or system, standalone or networked, that provides Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance information processing services, which for SPAWAR includes telephony and network programs.

9.2.1 MILCONs are normally initiated through the completion of a NAVFAC managed DD Form 1391. After the MILCON is approved for Navy budget submission, the MILCON project architects/engineers require technical and programmatic information early in the design process in order to correctly specify environmental, grounding, power, and other facility parameters. Identification of these requirements is usually accomplished by preparing a MILCON BESEP also referred to as a Site Requirements Package (SRP). See Appendix Y for detailed guidance on preparation of MILCON BESEPS or SRPs. Examples of project requirements that must be provided include:

- Physical space for C4ISR/IT equipment
- Critical and non-critical electrical power
- Heating, Ventilation and Air Conditioning (HVAC)
- Lighting
- Grounding systems
- Environmental
- Physical security
- Fire protection systems
- Lightning suppression
- Computer Decking

9.3 MILCON C4ISR Integration Process

Over time, SPAWAR has developed a step-by-step, event driven approach to integrating NAVFAC's MILCON Process with the SPAWAR C4ISR/IT Installation Process. The combined process is a unique, more complicated case of the Shore Installation Process, and is depicted in Figure 9-1. This diagram shows the relationship between the NAVFAC MILCON Process and the Shore Installation Process. This integrated MILCON and Shore Installation Process is referred to as the MILCON C4ISR/IT Integration Process. SPAWAR 4.0 is the technical authority and process owner for the MILCON C4ISR /IT Integration Process and is responsible to maintain clear process guidance. This guidance is published in this section and Appendix Y.

C4ISR/IT facility design and integration work is required to support the MILCON process to ensure that the facility infrastructure is correctly designed and built to support

the intended C4ISR/IT requirement. This initial design and integration work is critical to developing an integrated and high performance warfighting facility.

All DOD C4ISR/IT systems going into a Navy MILCON are required to use the Shore Installation Process to plan, design, and install their individual systems into a Navy MILCON. Some MILCONs have had over 100 separate C4ISR/IT systems integrated into the new building. These separate and discrete systems usually come from many different Program Offices, PEOs, SYSCOMs, and/or other federal departments. A single Echelon II MILCON C4ISR/IT Integration Program Management Office is designated to perform the integrated design coordination and program management with multiple product producing program offices participating. Each sponsor of a C4ISR/IT system must coordinate requirements, budget and schedule of their systems with the designated MILCON C4ISR/IT Integration Program Management Office. For example, SPAWAR 4.0D acts as the overall program coordinator or MILCON C4ISR/IT Integration Program Management Office for SPAWAR HQTRs assigned projects and PMW 790 performs this function for PEO C4I assigned projects.

In the early phases of the overall MILCON C4ISR/IT Integration Process, the C4ISR/IT integration program office (Echelon II) and the designated Echelon III implementation project office will support NAVFAC with technical and programmatic expertise to define and translate the C4ISR/IT requirements into the technical details required by those constructing the building. The final phase of the process is a detailed and integrated version of the standard Shore Installation Process where the multiple systems are installed, tested, and cutover in predefined systematic order. This minimizes disruption to the warfighter, supports system dependencies, and logically develops an integrated C4ISR/IT infrastructure.

9.3.1 C4ISR/IT Requirements Identification. Prior to implementing the MILCON C4ISR/IT Integration Process, a preliminary dialog with the customer should begin to determine the customer's requirements and plans for the new building. These requirements include those that clarify standard operating procedures, facility organization, and technical aspects associated with the C4ISR/IT overall implementation that needs to be considered in order to meet mission and human interface requirements. For MILCONs, this means as soon as the local NAVFAC DD Form 1391 building requirement is started, the Mission Sponsor should initiate a project charter to identify the scope of work, who are the stakeholders, and which organizations have programmatic, engineering, installation, oversight, support and execution responsibilities. A MILCON BESEP should be started early in planning process to address C4ISR/IT facility design requirements. SPAWAR requirements identification personnel must work closely with NAVFAC personnel to insure all building and C4ISR/IT systems including network requirements are met. A more detailed discussion of the requirements identification and long range planning process is contained in the discussion of Phase I in Appendix Y.

In addition to technical and operational requirements that were previously identified/addressed by Programs of Record for each system, these major C4ISR/IT Integration Projects have additional installation-related or integrated facility capability requirements. Requirements that will not be met by the already programmed and validated C4ISR/IT systems must be validated by OPNAV as new or additional requirements.

9.3.2 C4ISR/IT Design. The C4ISR/IT Design follows and parallels the NAVFAC MILCON Process and is designed to gather and present the C4ISR/IT requirements so that their impact can be planned for during the construction design. The greatest single challenge of this phase is to develop an integrated C4ISR/IT system and network infrastructure for a NAVFAC construction project. This includes documenting the functional interfaces of all networks and systems that will be housed within the facility. As with Requirements Identification, close coordination with the NAVFAC building design team is especially important. For a more detailed discussion of the design process, see Appendix Y, under Phases II and III.

9.3.3 C4ISR/IT Installation and Full Operational Capability (FOC). Phases IV and V in Appendix Y provide more detail covering system installations, testing and turnover of large multi-system, multi-network projects. These phases should closely follow process guidance provided in Chapters 1-8 of this document. The primary difference between single and multi-system installations is the added requirement for increased system integration, dependency analysis, and coordination across a large team by multiple stakeholders. System installation planning is much more rigorous, requiring more detailed and integrated planning, design, test, and transition documentation.

9.3.4 Risk Management. Every project includes elements of risk that may impact cost, schedule, and/or performance. It is the responsibility of the MILCON C4ISR/IT Integration Program Manager (Echelon II) and the implementation Project Manager (Echelon III) to:

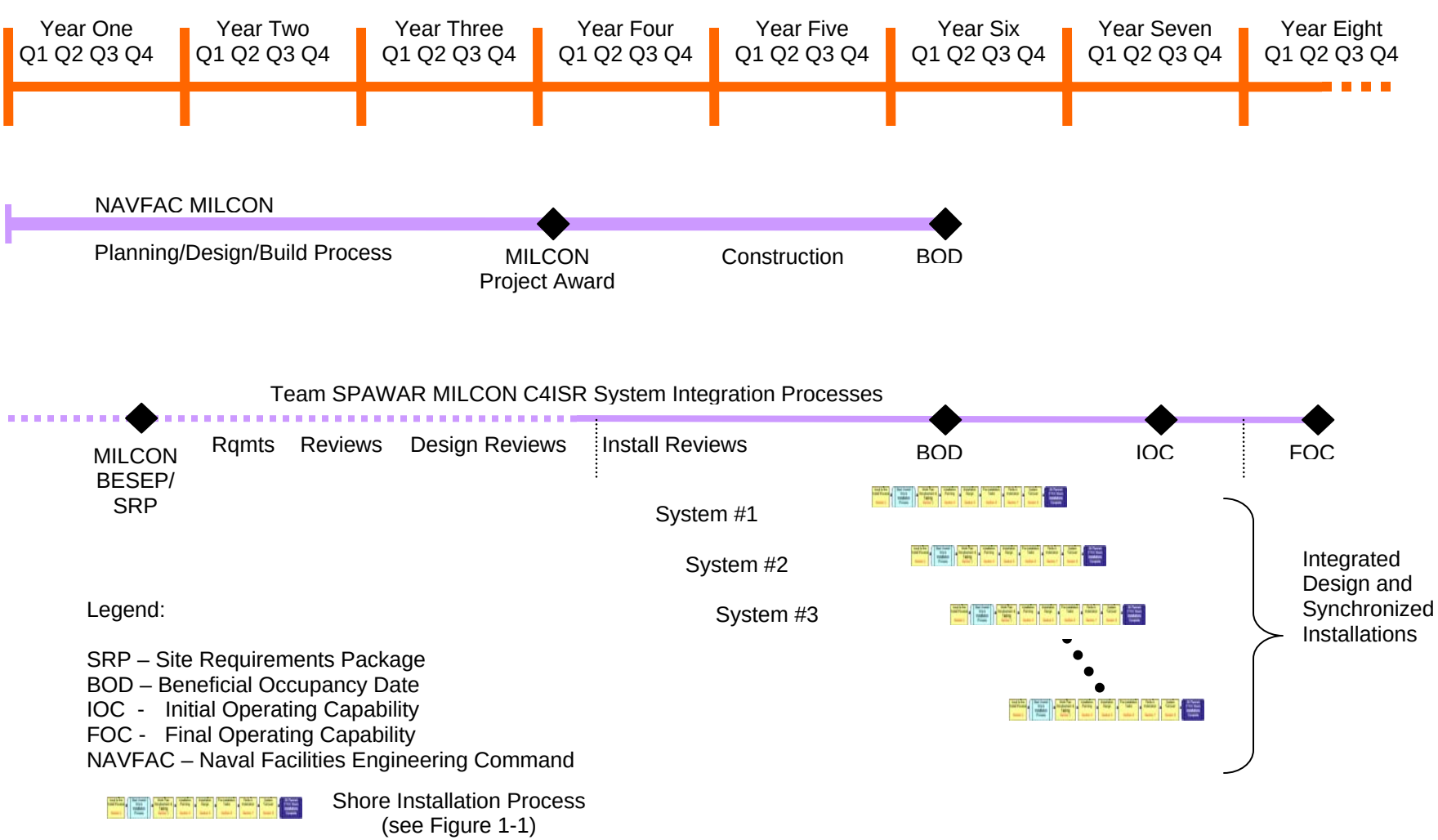

Figure 9-1. MILCON C4ISR Integration Process

- Identify the risks associated with the implementation of the Major Project.
- Establish the level of probability of occurrence and potential impact to the project.
- Develop a Risk Mitigation Plan to manage or eliminate the risk and/or impact to the project.
- Maintain the Risk Mitigation Plan that will be reviewed during each planned review of the MILCON C4ISR/IT Integration Process and during the installation phase. See Appendix E of this manual for a more detailed description of risk mitigation requirements.
- One simple method of quantifying how much risk a project is carrying is by determining how much a specific risk occurrence would cost in dollars and multiply that value by the probability of occurrence. The resulting product can then be summed with all other risks to measure how much risk a project is carrying at any given time. This value is useful when used in conjunction with the "Project Control" cost and schedule performance measurements discussed below and in Appendix Z.

9.3.5 Project Controls. There are two basic types of Project Control methods used with MILCON and Other Large Projects such as Command Centers; Earned Value Management Systems (EVMS) and Cost/Schedules Control Systems (C/SCS). All Major or Special Interest Projects require one or the other of these control systems. The Project Control system is managed by the designated MILCON C4ISR/IT Integration Program Management Office at the Echelon II level. Process implementation is performed by the Echelon III Project Office. Project Control systems are discussed in more detail in Appendix Z.

10.0 TAILORING INSTALLATION DOCUMENTATION

10.1 Purpose

The purpose of this section is to describe how installation documentation can be tailored to meet the needs of different types of installations. The purpose of tailoring is to ensure that:

- Resources expended to produce documentation for any installation are in reasonable proportion to the size and complexity of the installation.; and
- Only needed documents will be produced.

10.2 Installation Categories

This section defines the categories used to guide the tailoring of installation documentation. These categories will be compared to those previously defined within Appendix D for Work Scope preparation.

10.2.1 Shore Work Scope Form Defined Installation Categories. The Shore Work Scope Form instructions are provided as Attachment A to Appendix D1. The categories defined in this attachment are:

- SITEALT
- Field Change (FC)
- Engineering Change (EC)
- Non-Permanent Change (NPC)

10.2.2 Permanent Installations. A permanent installation is an installation that will remain in place and operational for more than one year.

10.2.3 Temporary Installations. Temporary Installations are the same as the Non-Permanent Change Installations described in Appendix D1 (Work Scope Form Instructions). This Section breaks temporary installations down further into several sub-categories which will be discussed later in this document.

10.2.4 Installation Categories for Tailoring Shore Documentation. The installation categories for tailoring shore installation documentation are defined in the following subsections. Under no circumstances shall an installation project be broken into smaller projects for the purpose of changing the category of an installation. The following installation categories are the ones used as column headings in Tables 10-1 and 10-2. Table 10-1 is a matrix that can be used to determine the documentation requirements for “permanent” installations. Table 10-2 was developed to summarize the documentation needs of temporary installations.

10.2.4.1 Software Only. Software Only installations are installations during which software, but no hardware, is installed by SPAWAR personnel or contractors. This type of installation would fit into the category of Engineering Change on the Work Scope form.

10.2.4.2 Software Mailout. Software Mailout installations are installations during which software, but no hardware, is installed by station forces personnel or their support contractors. This type of installation would fit into the category of Engineering Change on the Work Scope form.

10.2.4.3 Field Change. SPAWAR personnel or contractors may or may not be involved with the installation of Field Changes. Attachment A of Appendix D1 defines a field change as "A mechanical, electronic or electrical modification made to a single electronic equipment or system. The FC is confined to modifying an existing single nomenclature equipment or single nomenclature equipment within a system. Field Changes must meet the following conditions:

- Change cannot affect form, fit or overall function of the equipment/system.
- No additional power, heating, ventilation, or air conditioning (HVAC) is required.
- No change in external cabling or interfaces to other equipments/systems can be implemented as part of the FC.
- No software only changes

Examples include: RAM upgrades, circuit card component change, and equipment module replacement"

10.2.4.4 Technology Refresh. Technology Refresh are installations during which hardware is installed, by SPAWAR personnel or contractors, to replace existing hardware that has become, or will soon become obsolete or unsupported. This type of installation could fit into the category of Engineering Change the Work Scope form. Technology Refresh installations must meet the following conditions:

- Change cannot affect form, fit or overall function of the equipment/system.
- No additional power, heating, ventilation, or air conditioning (HVAC) is required.
- No change in external cabling or interfaces to other equipments/systems can be implemented.
- No software only changes

10.2.4.5 Hardware Removal. Hardware Removal installations will remove hardware from a site. Part of this type of project will typically require the installation of some installation materials (like new floor tiles, blank panels, etc.) to restore the condition of the affected site. A Hardware Removal installation cannot be created by breaking up a larger project.

10.2.4.6 Temporary Installation. Temporary Installations are the Non-Permanent Change (NPC) Installations defined in Attachment A to Appendix D. Because temporary installations vary widely in their scope. This category is broken down into the following subcategories.

a. Minor Impact Temporary Installations. Temporary Installations that will only install not more than three pieces of equipment requiring a total of no more than 600 watts of power and requiring only standard 120 volt electrical and standard PC or networking connections (keyboard, video, mouse, USB, RJ-45, 100Base FX) connections are Minor Impact Temporary Installations.
b. Medium Impact Temporary Installations. When a temporary installation has connection or power requirements that will not allow it to be categorized as a minor impact temporary installation, it can be classified as a medium impact temporary installation as long as the following requirements are met:
    1) Total power required is less than 16 amperes at 120 volts single-phase power.
    2) Total square feet of floor space required to hold non-desktop human interface equipment is less than eight square feet.
    3) No more than six square feet of desk space is required for human interface (keyboard, laptop, monitor, console, etc.) equipment.
    4) No outdoor building modifications are required. (e.g. antenna mounting bracket installation, holes in walls, etc.)
    5) No additional electrical circuits are required.
c. Major Impact Temporary Installations. When a temporary installation does not fall into either the Minor or Medium categories described above, the temporary installation is classified as a Major Impact Temporary installation.

10.2.4.7 Typical Installation. Typical Installations are installations that do not fit into any of the other categories described in this section. They fall into the SITEALT category defined in Appendix D1. Most of the Shore Installation Process was developed with this type of installation in mind. This installation type usually requires the installation of both hardware and software.

10.2.4.8 Major Installation. While Sections 3 through 8 of this Handbook describe the standard Shore Installation Process, Section 9 provides additional guidance and requirements for large scale installation projects frequently associated with MILCONs. Since tailoring of the Shore Installation Process is not applicable for these major installations, they will not be addressed.

10.3 Determining Which Documents Should Be Prepared.

Determining the required installation documentation for a project is accomplished by determining the Installation Category using the definitions provided above in Section 10.2 and by using the matrixes provided in Tables 10-1 and 10-2 to determine which documents are required. Once the required documents are identified, the documents may also be tailored in accordance with the guidance provided in Section 10.4.

10.3.1 Category Determination and Assignment. The first step in the tailoring process is to identify the category to which the installation belongs. In borderline cases when the category to which the project belongs is in doubt, the installation shall be considered to belong to the category requiring the most documentation. The category assignment shall be specified by the PE and forwarded to the IMO for review and approval. The IMO shall keep a record of the "Installation Category for Tailoring Shore Documentation" assigned to each project and enter the category for each project into the SYSCOM designated database once the capability is available.

10.3.2 Using Tables 10-1 and 10-2 to Determine Documentation Requirements. Table 10-1 is a matrix showing the installation documentation requirements for the different categories of permanent installations. Table 10-2 is a matrix showing the documentation requirements for the three different categories of Temporary (or Non-Permanent Change (NPC)) Installations. Once the appropriate Installation Category has been determined, one can go to the column in Table 10-1 or 10-2 headed by that category's title to find out which installation documents (listed on the left side of the table) are required. Statements in cells in Table 10-1 shall be interpreted as follows:

- A "YES" by itself in a matrix location (an individual Microsoft Excel cell) means that the document listed to the left of that location is required for all installations that belong in the installation category identified by the column heading for that location. If the word "YES" is followed by an "If" statement in parenthesis, the documentation only needs to be prepared if the condition identified by the "If" statement is true for the specific installation under consideration.

- An "IF APPLICABLE" in a matrix location means that the document listed to the left of that location shall be prepared if the document applies based on the details of the installation. For example, if no antennas are installed or affected by an installation categorized as "Typical", the Antenna Layouts and Elevations (listed under IDP Products in the Installation Process Product column) are not applicable to that installation. In the case of technology refresh installations, all types of drawings prepared for the previous installations of the system are applicable, and should be updated as required to reflect the new items installed. In most cases this only requires changing the nomenclatures from that of the old hardware to that of the new.

- A "NO" by itself in a matrix location means that the Installation Process Product listed to the left is neither required or recommended and should normally not be prepared for this type of installation identified by the column heading.

- An "IF USEFUL" and "RECCOMMENDED" in a matrix location means that the document may be useful and desired, but the Project Engineer may determine if this document is needed. For example, in the case of "Simplified Block Diagrams", they can be very useful for training and troubleshooting purposes if the system is somewhat complex. A Pre-Installation Baseline Test message is recommended, but

not a required deliverable resulting from a Pre-Installation Baseline Test (PRBT), sometimes referred to as a Pre-Installation Check Out (PICO).

"(If site survey is held)" appears in matrix locations to indicate that a document is only necessary if a site survey is to be held. In some cases, the installing activity may have good enough records or knowledge of a site to eliminate the need for a site survey. In these situations, documentation associated with conducting a site survey is not required.

10.4 Document Tailoring

Once the required documents have been identified, the following guidance can be used to tailor the documentation for installations that do not fall into the "Typical"or Major Installation categories.

10.4.1 General Tailoring Discussion For BESEPS. The main purpose of a BESEP is to document agreements between the Installation Activity that will perform an installation at a site, the organization or organizations responsible for operating and maintaining the site, the organization funding the installation, and other stakeholders. BESEPs are typically not required for Software Mailouts or Field Change installations because the installation work in these types of installations is typically performed by station forces and the actions that must be taken are spelled out in the instructions accompanying the software or field change kits. BESEPs are required for all other installation types and when on-site participation is required from a SPAWAR Installation Activity for Field Change or Software Mailout installations. Letter BESEPS with attached drawings may be used for the more complex installations. Section 5.4.2 of this handbook lists the subjects that must be addressed in every BESEP. If a subject is obviously not pertinent, the subject may be listed with the word "NONE" following it as shown below:

EVIRONMENTAL SAFETY CONCERNS: NONE

Table 10-1. Installation Documentation Requirements Matrix for Permanent Installations Sheet 1 of 2

INSTALLATION PROCESS PRODUCT		SOFTWARE ONLY INSTALLATION	SOFTWARE MAILOUT	FIELD CHANGE	TECHNOLOGY REFRESH INSTALLATION	TYPICAL INSTALLATION	HARDWARE REMOVAL
SHORE WORK SCOPE FORM		YES	YES	YES	YES	YES	YES
FRCB DOCUMENTATION		TYPICALLY YES. SEE LATEST FRCB INSTRUCTIONS FOR GUIDANCE.					
SITE SURVEY PRODUCTS							
	In-Brief	YES (If site survey is held)	NO	NO	YES (If site survey is held)	YES (If site survey is held)	YES (If site survey is held)
	Out-Brief	YES (If site survey is held)	NO	NO	YES (If site survey is held)	YES (If site survey is held)	YES (If site survey is held)
	Report	YES (If site survey is held)	NO	NO	YES (If site survey is held)	YES (If site survey is held)	YES (If site survey is held)
BESEP OR (FOR TRAINING FACILITIES) TSIP		YES	ONLY IF SPAWAR PERFORMS		YES	YES	YES
IDP PRODUCTS							
	Drawing Tree	NO	NO	NO	NO	IF APPLICABLE	IF APPLICABLE
	Functional Interface Diagram (FID)	NO	NO	NO	NO	IF APPLICABLE	IF APPLICABLE
	Site Master Index	NO	NO	NO	NO	IF APPLICABLE	IF APPLICABLE
	Installation Master Drawing	NO	NO	NO	YES	YES	YES
	Master Parts List	NO	NO	NO	YES	YES	YES
	Technical Data Summary	NO	NO	NO	YES	YES	YES
	Floor Plans and Elevations	NO	NO	NO	YES	YES	YES
	Antenna Layouts and Elevations	NO	NO	NO	IFAPPLICABLE	IFAPPLICABLE	IFAPPLICABLE
	Simplified Block Diagrams	NO	NO	NO	IF USEFUL OR PRE-EXISTING	IF USEFUL	IF USEFUL
	Cabling Block Diagrams	NO	NO	NO	YES	YES	YES
	Cable Running Sheets	NO	NO	NO	YES	YES	NO
	Cross Connect Records	NO	NO	NO	IFAPPLICABLE	IF APPLICABLE	IF APPLICABLE
	Distribution Frame Layout	NO	NO	NO	IFAPPLICABLE	IF APPLICABLE	IF APPLICABLE
	Circuit Diagrams	NO	NO	NO	IFAPPLICABLE	YES	NO
	Labeling Details	NO	NO	NO	YES	YES	NO
	Patch Panel Layouts	NO	NO	NO	IFAPPLICABLE	IF APPLICABLE	IF APPLICABLE
	Power Distribution	NO	NO	NO	IFAPPLICABLE	IF APPLICABLE	IF APPLICABLE
	Cable Routing Layouts	NO	NO	NO	NO	IF APPLICABLE	IF APPLICABLE
	Mechanical Assembly and Mounting Details	NO	NO	NO	RECOMMENDED	YES	NO
	Miscellaneous Installation Details	NO	NO	NO	YES	YES	YES
	Auxiliary Cooling Diagram	NO	NO	NO	IF APPLICABLE	IF APPLICABLE	IF APPLICABLE
	Auxiliary Dry Gas Diagram	NO	NO	NO	IF APPLICABLE	IF APPLICABLE	IF APPLICABLE
	RF Transmission Line Diagram	NO	NO	NO	IF APPLICABLE	IF APPLICABLE	IF APPLICABLE
	Synchro Data Transmission Drawing	NO	NO	NO	IF APPLICABLE	IF APPLICABLE	IF APPLICABLE
	Miscellaneous System Configuration Details	IF APPLICABLE	IF APPLICABLE	IF APPLICABLE	IF APPLICABLE	IF APPLICABLE	IF APPLICABLE

Table 10-1. Installation Documentation Requirements Matrix for Permanent Installations Sheet 2 of 2

INSTALLATION PROCESS PRODUCT		SOFTWARE ONLY INSTALLATION	SOFTWARE MAILOUT	FIELD CHANGE	TECHNOLOGY REFRESH INSTALLATION	TYPICAL INSTALLATION	HARDWARE REMOVAL
PITCO REPORT		NO	NO	NO	RECOMMENDED	RECOMMENDED	NO
SITUATION REPORTS (SITREPS)		YES	YES	YES	YES	YES	YES
PRE-INSTALLATION BASELINE TEST MESSAGE		RECOMMENDED	NO	RECOMMENDED	RECOMMENDED	RECOMMENDED	NO
INSTALLATION IN-BRIEF		YES	YES	YES	YES	YES	YES
INSTALLATION OUT BRIEF		YES	YES	YES	YES	YES	YES
SOVT		YES	YES	YES	YES	YES	NO
ILS	CDMD-OA or 4790 CK	YES	YES	YES	YES	YES	YES
AS-BUILT DRAWINGS		TYPICALLY NO, YES IF A DRAWING IS AFFECTED.	NO	TYPICALLY NO, YES IF A DRAWING IS AFFECTED.	YES	YES	DEPENDS, SEE TAILORING GUIDELINES
INSTALLATION COMPLETION REPORT		YES	YES	YES	YES	YES	YES
COMPLETION MESSAGE		YES	YES	IF APPLICABLE	YES	YES	YES

Note 1. SOVT Requirements are defined by SPAWARINST 3084.1. No provision is made in this policy for waiving the SOVT requirement.

Note 2. Requirements for MILCON and other large installation projects are not covered here, but are covered by Section 9 of the SIPH.

Note 3. See Table 10-2 for requirements for temporary installations.

Note 4. CDMD-OA is required for all changes at NETWARCOM designated sites.

Table 10-2. Installation Documentation Requirements Matrix for Temporary Installations Sheet 1 of 3

INSTALLATION PROCESS PRODUCT		SINGLE MINOR IMPACT TEMPORARY INSTALLATION	CONCURRENT MINOR IMPACT TEMPORARY INSTALLATIONS	MEDIUM IMPACT TEMPORARY INSTALLATION	MAJOR IMPACT TEMPORARY INSTALLATION
SHORE WORK SCOPE FORM		YES	YES	YES	YES
FRCB DOCUMENTATION		TYPICALLY YES. SEE FRCB INSTRUCTIONS FOR GUIDANCE.			
SITE SURVEY PRODUCTS					
	In-Brief	NO	NO	YES (If site survey is held)	YES (If site survey is held)
	Out-Brief	NO	NO	YES (If site survey is held)	YES (If site survey is held)
	Report	NO	NO	YES (If site survey is held)	YES (If site survey is held)
BESEP OR (FOR TRAINING FACILITIES) TSIP		YES	YES	YES	YES
IDP PRODUCTS					
	Drawing Tree	NO	NO	NO	IF APPLICABLE
	Functional Interface Diagram (FID)	NO	NO	NO	IF APPLICABLE
	Site Master Index	NO	NO	NO	IF APPLICABLE
	Installation Master Drawing	NO	NO	NO	YES
	Master Parts List	NO	NO	NO	YES
	Technical Data Summary	NO	EQUIVALENT INFO REQUIRED	EQUIVALENT INFO REQUIRED	EQUIVALENT INFO REQUIRED
	Floor Plans and Elevations	NO	FLOOR PLAN ONLY.	YES	YES
	Antenna Layouts and Elevations	NO	NO	IFAPPLICABLE,	IFAPPLICABLE
	Simplified Block Diagrams	NO	NO	NO	NO
	Cabling Block Diagrams	NO	NO	YES, SEE NOTE 2.	YES
	Cable Running Sheets	NO	NO	NO (If info on circuit	YES
	Cross Connect Records	NO	NO	NO	IF APPLICABLE
	Distribution Frame Layout	NO	NO	NO	NO
	Circuit Diagrams	NO	NO	IFAPPLICABLE,	YES
	Labeling Details	NO	NO	NO	YES

Table 10-2. Installation Documentation Requirements Matrix for Temporary Installations Sheet 2 of 3

INSTALLATION PROCESS		SINGLE MINOR IMPACT	CONCURRENT MINOR	MEDIUM IMPACT	MAJOR IMPACT
PRODUCT		TEMPORARY INSTALLATION	IMPACT TEMPORARY INSTALLATIONS	TEMPORARY INSTALLATION	TEMPORARY INSTALLATION
IDP PRODUCTS (CONTINUED)					
	Patch Panel Layouts	NO	NO	NO	IF APPLICABLE
	Power Distribution	NO	NO. SEE NOTE 1.	NO. SEE NOTE 1.	NO. SEE NOTE 1.
	Cable Routing Layouts	NO	NO. SEE NOTE 1.	OR EQUIVALENT	OR EQUIVALENT
	Mechanical Assembly and Mounting Details	NO	NO	NO	NO
	Miscellaneous Installation Details	NO	NO	NO	NO
	Auxiliary Cooling Diagram	NO	NO	IF APPLICABLE	IF APPLICABLE
	Auxiliary Dry Gas Diagram	NO	NO	IF APPLICABLE	IF APPLICABLE
	RF Transmission Line Diagram	NO	NO	IF APPLICABLE	IF APPLICABLE
	Synchro Data Transmission Drawing	NO	NO	IF APPLICABLE	IF APPLICABLE
	Miscellaneous System Configuration Details	NO	NO	IF APPLICABLE	IF APPLICABLE
PITCO REPORT		NO	NO	RECOMMENDED	RECOMMENDED
SITUATION REPORTS (SITREPS)		YES	YES	YES	YES
INSTALLATION IN-BRIEF		VERBAL ONLY	VERBAL ONLY	VERBAL ONLY	YES
INSTALLATION OUT BRIEF		VERBAL ONLY	VERBAL ONLY	VERBAL ONLY	YES
SOVT		YES	YES	YES	YES
ILS	CDMD-OA OR 4790CK	NO	NO	NO	NO
AS-BUILT DRAWINGS		NO	IF ANY PERMANENT CHANGE IS MADE	IFANY PERMANENT CHANGE IS MADE	IF ANY PERMANENT CHANGE IS MADE

Table 10-2. Installation Documentation Requirements Matrix for Temporary Installations Sheet 3 of 3

INSTALLATION PROCESS PRODUCT	SINGLE MINOR IMPACT TEMPORARY INSTALLATION	CONCURRENT MINOR IMPACT TEMPORARY INSTALLATIONS	MEDIUM IMPACT TEMPORARY INSTALLATION	MAJOR IMPACT TEMPORARY INSTALLATION
INSTALLATION COMPLETION REPORT	YES	YES	YES	YES
COMPLETION MESSAGE	YES	YES	YES	YES

Note 1. The installation of any long-lasting infrastructure improvements (such as new electrical power outlets and LAN drops) needed to support a temporary installation shall be fully documented in accordance with the requirements in Appendix Q the SIPH. A long lasting improvement is any improvement designed to remain after the removal of the temporarily installed equipment.

Note 2. Logistics turnover is required if site will take custody of any material or receive training in order to provided operations and maintenance support.

10.4.2 General Tailoring Discussion for Site Surveys. In-brief and out-briefs must be conducted for any site survey. A written site survey report is required for any site survey. If the site is so well documented and well known by the installing activity that no site survey is necessary, no site survey documentation is required.

10.4.3 General Tailoring Discussion for IDPs and SOVT Documents. The main purpose of the IDP is to ensure that all required material and equipment is planned for and to enable installers to efficiently and successfully install. IDPs are also used to create As-Built Drawings whose purpose is to document the existing configuration and to aid in troubleshooting and maintenance. SOVT documents are used to document the successful testing of the installed system. The tailoring of IDPs for the different installation categories is addressed in the following sections.

10.4.4 Specific Tailoring Discussions for "Software Only" Installations. The software configuration of the entire system must be documented. It should be documented in the SOVT document, but may be documented in the IDP. The documentation must include both the version level of the software and any software configuration information required to make the system work.

10.4.4.1 Software Installation Site Surveys. A site survey is normally not required for a software installation. However, when a site survey is required, the In-Brief, Out-Brief, and Site-Survey Report must be in writing and be uploaded into the SYSCOM designated installation repository.

10.4.4.2 Software Installation IDPs and As-Builts. An IDP is not required for a software installation. However, when software configuration information appears in the existing As-Built drawings for the affected system, these shall be revised as required to reflect the new software to be installed. If the Miscellaneous System Configuration Details need to be revised, the Installation Master Drawing must be revised also when the installation is complete to show the new revision level of all drawings for the system installation.

10.4.4.3 Software Installation Testing. SPAWARINST 3084.1 provides minimum software installation testing requirements. SOVT documents shall also be sent or made available for download for software mailout installations.

10.4.4.4 Software Installation Configuration Documentation. According to SPAWARINST 3084.1, the configuration of the system under test should be recorded. For a software installation the documented configuration should also show each software licenses and where it is installed. This list should clearly distinguish between operational software, management software, and diagnostic software." An inventory of the files containing the system software configuration data can be recorded. These files should include the state of installed servers, (The server system state includes the registry, the COM+ Class Registration Database, and boot files.), clients, switches, virtual private network (VPN) devices, and firewalls. The actual files containing the configuration data shall be burned

onto four identical encrypted CD-ROMs. Two CD-ROMs will be provided to the receiving activity, and two will be provided to the SOVT Manager."

10.4.4.5 Software Installation Logistics. It is important that the Installation Completion Report (ICR) record that Station Forces are supplied with backup copies of the updated software and with detailed step-by-step instructions for restoring system software to the latest configuration should the system software be lost or corrupted. Software mailouts must also include more detailed step-by-step installation instructions so that the station forces that operate and maintain the system can successfully load the software with no additional training being provided.

10.4.5 Tailoring Discussion for Technology Refresh Installations. In general, the documentation provided for a technology refresh installation should be edited versions of the documentation provided with the original equipment installation that is being refreshed. If the original installation of the system was not documented properly, some reverse-engineering will be required to create the required documents.

10.4.5.1 Technology Refresh Installation Site Surveys. In an ideal world, site surveys would not be required for technology refresh installations because most of the required information would be available in the As-Built drawings, and the remaining information could be obtained by correspondence with site representatives, RSIMs, etc. However, if a site survey is held for a Technology Refresh Installation, written formal in-briefs and out-briefs must be presented, and a written site survey report produced.

10.4.5.2 Technology Refresh Installation IDPs. The concept behind the technology refresh IDP is that key drawings (with information critical for installers during this type of installation) must be formally prepared prior to the installation while drawings that are not generally used by the installers (during this type of installation) can be redlined to show nomenclature changes and the other changes that need to be incorporated into the final as-built drawing package. New Floor Plans and Elevation drawings and Cable Block Diagrams, with before and after views, are required to clearly show what equipment is being installed and what equipment is being removed. New labeling details are required to direct the creation of new labels and to indicate what labels need to be removed. New Miscellaneous Installation Details are required to show the grounding details that apply to the new equipment being installed. On the other hand, the existing Power Distribution diagrams may not be affected at all (if new power runs are required then the installation does not fit into the Technology Refresh category) or they may only require minor changes such as changes to equipment nomenclatures and in the amount of power required that can be handled as red-lines to the original As-Builts.

10.4.6 Tailoring Discussion for Temporary Installations. The documentation requirements for Temporary Installations are less stringent than the requirements for typical installations. The following paragraphs discuss the differences. However, the installation of any long-lasting infrastructure improvements (such as new electrical power outlets and LAN drops) needed to support a temporary installation shall be fully documented in

accordance with the requirements in Appendix Q of the SIPH and the below relaxed requirements shall not apply. A long lasting improvement is any improvement designed to remain after the removal of the temporarily installed equipment.

10.4.6.1 Temporary Installation BESEPs. BESEPs for temporary installations that do not require the installation of additional permanent resources shall, after concurrence has been received from the site, document that the site has agreed to provide the required resources (space, power, security, air-conditioning, personnel (if required)) needed to accommodate the temporary installation.

10.4.6.2 Relaxed Requirements for Temporary Installation IDPs. IDPs for temporary installations do not need to meet the formatting requirements in Appendix Q of the SIPH. When required, drawings may be provided in the form of files readable with standard NMCI Microsoft Office software or NMCI Adobe Acrobat software instead of as AutoCAD drawings. Floor plans and other drawings also do not need to be scaled drawings.

10.4.6.2.1 Relaxed Requirements for Standalone Minor Impact Temporary Installations. Standalone Minor Impact Temporary Installations do not require an IDP if the site has agreed to provide the resources (space, power, security, air-conditioning) needed to accommodate it, this is documented in the BESEP, and no other temporary installations will be occurring at the same time. If the installation will take place at the same time as other temporary installations planned for the site, this rule does not apply. In these cases the temporary installations should be part of a consolidated installation.

10.4.6.2.2 IDP Requirements for Grouped Minor Impact Temporary Installations. When more than one Minor Impact Temporary Installation is to occur at a site at the same time, the IDP must include a table or listing that provides the data needed to complete a Technical Data Summary table in accordance with SIPH Appendix Q. The IDP needs to:

List all equipment provided for all of the concurrent temporary installations and provide the data needed to complete the non-ship power requirements columns, the Average Heat Dissipation column, and the Uncrated Dimensions columns of the standard Tech Data Summary Table shown in the attachments to SIPH Appendix Q1. The temperature and humidity data columns shall be completed whenever data is available from the manufacturer or the Government. The crated dimensions column shall be completed if storage or transportation of large crated equipment (over 75 pounds crated weight) or large quantities of crated equipment (Over ten items) is required at the site. The meanings of the columns in the Technical Data Summary are described in detail in the IRD standard.

Include a floor plan or table identifying each piece of equipment and software to be installed by manufacturer and part number and showing where each piece of equipment will be located.

10.4.6.2.3 IDP Requirements for Medium Impact Temporary Installations. The IDP for a Medium Impact Temporary Installation must include:

A table or listing that provides the data needed to complete a Technical Data Summary Table in accordance with SIPH Appendix Q1.

A Cabling Block Diagram that provides all of the technical information required in Cabling Block Diagrams according to SIPH Appendix Q1.

Wiring information for all cables other than standard PC cables (keyboard, video, mouse, USB, RJ-45).

An elevation drawing showing the dimensions of all temporary racks (includes stacked equipment transit cases).

A floor plan drawing (does not need to be to scale) or a document explaining how signal and power cables will be routed so that cable and power runs will not present a safety hazard. For example, if a temporary rack of stacked transit cases will be installed next to an existing row of equipment bays and beneath existing cable trays that will be used to route cables between the temporary and existing equipment, then a statement to this effect would be sufficient. The statement should provide enough information to specify the exact location of the temporary rack.

10.4.6.2.4 IDP Requirements for Major Impact Temporary Installations. The IDP for a Major Impact Temporary Installation must include all of the information required for Medium Impact Temporary installation and:

Drawings that meet all of the requirements of SIPH Appendix Q1 to cover all temporary electrical power wiring and any cable pathways (conduits, ducts, cable trays, J-hooks, etc.) to be installed to support the installation. (Drawings are always required for new permanent electrical power run installations.)

A floor plan drawing (does not need to be to scale) showing where all equipment is to be temporarily installed. This drawing does not need to be an AutoCAD drawing.

10.4.6.3 Relaxed Requirements for Temporary Installation SOVT Documents. SPAWARINST 3084.1 does not make provision for waiving SOVT requirements for temporary installations. However, if the temporary system is standalone (does not impact or interface with any operational system) and it will be operated and maintained by SPAWAR employees for the entire temporary period, a formally approved SOVT document is not necessary. However, a document containing test procedures is still a best industry practice that should be observed. In cases where the temporary installation poses a risk to existing operations, a formal SOVT is required to ensure that existing networks/circuits are not being adversely affected. While the system is temporarily installed, additional testing should occur as required to collect data needed to judge the utility/effectiveness of the installed system. If the custody of any material is to be turned

over to station forces, even temporarily, Installation Completion Report should provide a complete inventory of the material turned over. A completion message is only required if the site is required to accept responsibility for the operation or maintenance of the system during the temporary period.

10.4.7 Tailoring Discussion for Removal "Installations". The documentation requirements for Removal Installations depend largely upon whether – and for how long – the site will remain in operational use. IDPs for sites that will remain in use can be quite extensive to ensure that the removal of equipment is performed properly (only the right equipment and cabling is removed) and to ensure that the configuration of the site is accurately depicted in the final As-Built drawings. IDPs are not required if the site does not need to remain operational after the equipment removal. If the site will only remain operational for less than a year after the equipment removal occurs, redlined As-Built drawings can be substituted for final as-built drawings.

10.4.7.1 Site Surveys. Formal written In-Briefs and Out-Briefs are required for Site Surveys when site surveys are performed for Removal installations.

10.4.7.2 Removal IDPs for Sites Remaining in Operational Use. The concept behind the Removal IDP for sites that will remain operational is that key drawings (with information critical for installers during this removal process) must be formally prepared prior to the installation while drawings that are not generally used by the installers (during this type of installation) can be redlined (to show nomenclature changes and the other changes that need to be incorporated into the final as-built drawing package). New Floor Plans and Elevation drawings and Cable Block Diagrams are always required to clearly show what equipment, cable pathways, and cabling are being removed and what is being added. Both "Before" and "After" views are required. These drawings should include any blank panels required to cover holes left by removed equipment and any new floor tiles needed to cover holes in the floor resulting from the removal of racks or cabinets. If duct and conduit are being removed, Cable Routing Layouts with before and after views are also required. The Cable routing Layout Parts List in this case shall include any hardware needed to plug holes left in the remaining cable pathways or holes left in walls or floors due to conduit or duct removal. This includes any firestopping material needed to meet building or electrical code requirements. If power circuits are to be removed (only by qualified personnel using the proper safety equipment), the power distribution drawings should indicate all required changes with a final view showing the final configurations including all changes needed to balance the remaining power load. Drawings like FIDs, Circuit Diagrams, Cable Running Sheets, and Simplified block diagrams do not need to be part of the IDP provided to installers, but affected drawings for any part of the system that remains need to be corrected as part of the as-built development process.

10.4.7.3 Removal IDPs for Sites NOT Remaining in Operational Use. The concept behind the Removal IDP for sites that will not remain operational is that enough information must be provided to ensure that all concerned can know exactly what is and what is not to be removed. This can be accomplished through the use of drawings, marked-up

photographs, text descriptions, or any combination of these. AutoCAD drawings that meet SIPH requirements are not required in this case. In all cases, the information provided shall state that abandoned cables and electrical wiring shall be removed as required by the National Electrical Code.

10.4.7.4 Removal Installation As-Built Drawings. Removal As-built drawings are not required for sites that will not remain in operational use after the equipment is removed. If the site will remain operational for less than one year after the removal takes place, red-lined As-Builts are required, but final As-Builts (with all changes incorporated in AutoCAD) are not. If the site will remain in operational use for more than a year after the equipment removal takes place, "Final" finished As-Builts – with all changes incorporated – are required.

10.4.7.5 Removal Installation SOVT Documents. A formal SOVT is not required for removal installations unless existing operational interfaces could be affected by the removal and therefore need to be checked after removal to verify that existing operations have not been harmed. SPAWARINST 3084.1 shall be followed if SOVT is required. A draft completion message should be provided to the site.

10.4.8 Tailoring Discussion for Relocation of Equipment Installations. Relocation of Equipment Installations can be looked at as a Hardware Removal Installation at one site combined with a Typical Installation at another site. Only one BESEP is required. The number of Site Surveys and IDPs depends on whether the relocation keeps the equipment in the same building under the same organization or if the equipment must cross organizational or geographic boundaries. Relocation projects that require equipment to change buildings should have separate SPIDER tracking numbers for each site. If for any reason only one tracking number is assigned, SPAWAR 4.2 will assign a special drawing set number for the removal IDP (The Drawing Set Number is a seven digit number starting with the number 2 followed by the six-digit installation Tracking Number (TN) for that specific installation. If another number is needed for a removal IDP, the drawing set number for the removal will typically be an "R" followed by the tracking number, and the one SPIDER tracking number shall be used for creating the installation IDP drawing number. For example, if a relocation installation was only assigned Tracking Number 10-9990, then the drawing number for the Installation Master Drawing covering the installation part of the project would be 020-000-2109990, while the removal part of the project would have an Installation Master Drawing with the drawing number 020-000-R109990.

10.4.9 Tailoring Discussion for Engineering Change and Field Change Installations. The Engineering change category is covered by the Technology Refresh and Software Only Installation Categories previously discussed within this document. Field changes are not typically performed by Installation Activity personnel. When they are, a BESEP must be prepared (as shown in Table 10-1) to document the responsibilities of all participants in the installation. IDPs are not needed for field change installations**.**

APPENDIX A – CHECKLISTS

Criteria for Input Into The Installation Process Checklist A-2
Work Plan Development And Tasking Checklist A-4
Installation Planning Checklist A-6
Installation Design Checklist A-8
Pre-Installation Checklist A-9
Installation Performance Checklist A-11
System Turnover Checklist A-13

CRITERIA FOR INPUT INTO THE INSTALLATION PROCESS CHECKLIST

Element	Complete Y/N	Notes
FUNDING		
Funds are currently available to complete this installation		
DESIGN		
System design completed and documented with complete IRD drawing package		
TESTING		
All lab testing is complete		
Acceptance testing is complete		
JITC testing is complete		
Standard System SOVT is developed and approved		
The software is accredited, validated, or approved, as appropriate, for installation by all cognizant parties (Program Office, JITC, DISA, etc)		
FIELDING PLAN DEVELOPMENT		
The installation is in the FY fielding plan validated by the Program Office		
Detailed Work Scope Form (Appendix D) is complete		
System power, space, and Heating, Ventilation, and Air Conditioning (HVAC) is documented		
Technical Training Equipment is identified		
Cut-Over Strategy is developed		
Risk Management Plan is developed		
The equipment delivery dates are validated and are consistent with proposed installation dates		
CERTIFICATION/ACCREDITATION		
SIP and SSAA are prepared and sent to CA and ODAA		
Approved Accreditation (IATO/ATO) is valid beyond installation period?		
Are copies of approved Accreditation Documents ready to be sent to the site?		
The crypto validation form is submitted		
Crypto user training is budgeted (if applicable)		
The system was evaluated against existing (or proposed) Fleet Firewall policies		
Spectrum Certification is obtained		
The Keymat Plan is developed and keymat material is pre-positioned with NSA		
ELECTROMAGNETIC ENVIRONMENTAL EFFECTS (E3)		
E3 compatibility in the intended operational environment is achieved		
SITE APPROVAL		
Check for “Site Approval” requirements; e.g. airfield safety, explosives safety, electromagnetic illumination, historic or pre-historic resources, protected species, etc. See NAVFACINST 11010.45 and Appendix AC. Note in Work Scope Form that Site Approval is required deliverable.		

CRITERIA FOR INPUT INTO THE INSTALLATION PROCESS CHECKLIST (Continued)

Element	Complete Y/N	Notes
SUSTAINMENT LOGISTICS		
ILSP and ULSS are complete and approved for this program.		
A Configuration Management Plan is approved, nomenclature assigned, system drawings developed and approved, and a CDMD-OA Work File submitted (4790CK for sites not in CDMD-OA).		
Supply Support/Support & Test Equipment planning activities are complete		
System Technical Manuals are complete and available		
System maintenance planning activities are complete		
Navy Training System Plan (NTSP) is complete and interim training preparation activities are complete		
IMPLEMENTATION SUPPORT		
New System/Crypto training for IA (if applicable) was provided		
A Standard System Training Guide designed for customer OJT is developed		
FLEET READINESS CERTIFICATION BOARD		
Preparations for Fleet Readiness Certification Board (FRCB) approval are in progress including the submission of an FRCB case form.		

WORK PLAN DEVELOPMENT AND TASKING CHECKLIST

Element	Complete Y/N	Notes
FINALIZE REQUIREMENTS		
Identify all installation requirements for the fiscal year plus one (FY+1)		
For each requirement, fully define the installation project by completing a detailed Work Scope (Appendix D). Provide the following data elements: Identify and Assign status of Work Plan Requirement: - Unique project tracking number, e.g. 07-6050 - New requirement (add) - Update requirement (change) - Cancel requirement (suspend) Identify Location: - Area, e.g. Pacific - Region, e.g. Pacific Far East - Navy Base City, e.g. Yokosuka - Command Name, e.g. NAVCOMMSTA Yokosuka - Command UIC, e.g. 70278 Identify Project Requirement Information: - System name, e.g. EHF SATCOM - System nomenclature, e.g. AN/USC-38 - Installation description, e.g. Engineering Change 01 R1 updates legacy and MDR Appliqué NESP terminals to TCPP Rev J70 to utilize UFO 11 and Polar 3 satellites. - Tasking description, e.g. Complete Work Scope Form available (See Appendix D) Identify Key Points of Contact: - Program Office, e.g. PMW 170 - Performing Activity, e.g. SSC San Diego IMO Identify Financial Information: - Fiscal year, e.g. FY07 - Subhead, e.g. 52NR - Program Office estimate, e.g. $8,000 Identify Schedule Planning Information: - Equipment/system availability, e.g. 08/01/06 - Mission Critical Date for operations or for training (if applicable), e.g. 03/16/07 - Program Office desired installation start and end, e.g. 02/01/07 – 02/15/07		
VALIDATE FEASIBILITY		
For each requirement, validate that All applicable data elements requested in Finalize Requirements are provided		
Determine if a completed Work Scope was provided		
Validate that Installation Requirements Drawings are complete and available to support cost estimating		
Review installation dependencies and special deliverable/service requirements. Is request feasible?		
Validate that an FRCB case form was submitted		

Determine if potential opportunities for integration or consolidation exist and so note		
COST ESTIMATING AND SCHEDULING		
For each requirement provide the following information: Identify Key Points of Contact: - Performing Activity code, e.g. 4251 - Subject Matter Expert, e.g. 5321 - Project Engineer, e.g. Joe Brown Identify Financial Information: - Performing Activity Initial Estimate, e.g. $17,916 Identify Schedule Planning Information: - Building availability, i.e. Building Occupancy Date (BOD), e.g. 02/10/07 - Performing Activity (PA) funding required date, e.g. 10/13/06 - PA Site Survey planned start and end, e.g. 10/24/06 – 10/27/06 - PA IDP planned start and end, e.g. 10/31/06 – 01/19/07 - PA BESEP planned start and end, e.g. 01/08/07 – 01/12/07 - PA Production planned start and end, e.g. 02/12/07 – 02/26/07 - PA SOVT planned start and end, e.g. 02/26/07 – 03/10/07 - PA As-built planned start and end, e.g. 03/13/07 – 03/30/07 - PA Installation project planned completion, e.g. 04/20/07		
Regardless of sponsor, SPAWAR PEs must validate with IMO that estimates correctly reflect entire Work Scope and all expected SIPH deliverables prior to forwarding.		
UPDATE AND REVIEW WORK PLAN REQUIREMENT		
IMA and IA review initial Cost Estimate and planned schedule. Does Performing Activity/Code estimate and schedule indicate that both Program Office, i.e. Sponsoring Activity, and Performing Activity have the same understanding of the requirement?		
Does Program Office need to clarify and/or reduce Work Scope?		
Can Performing Activity/Code revise estimate and/or schedule?		
Is Program Office, i.e. Sponsoring Activity, going to cancel requirement?		
Does Program Office, i.e. Sponsoring Activity, approve the initial or revised estimate and schedule?		
CUSTOMER COORDINATION		
Initiate customer coordination. Does intended site have any blackout dates? Is there any non-SPAWAR installation that could interfere during planned installation schedule?		
WORK PLAN APPROVAL		
Record “Approved Estimate” amount, e.g. $17,916		

INSTALLATION PLANNING CHECKLIST

Element	Complete Y/N	Notes
FUND TASK		
Develop Funding Document		
Issue Funding Document		
Amend Funding Document (as required)		
DEVELOP POA&M		
Identify required operational dates		
Identify required funding date		
Identify required IRD date		
Identify required standard system SOVT availability date		
Identify required equipment delivery dates (EDD)		
Identify long-lead time materials		
Identify required ILS availability date		
Identify required FRCB approval date		
Synchronize shore install schedule with BG/ARG		
Develop detailed installation schedule that includes Installation Planning, Install Design, Pre-Installation Tasks, Perform Install, and System Turnover (include EDT of long-lead materials)		
Submit a revised schedule if necessary to IA and IMA		
Develop Time Line Summary		
SYSTEM REQUIREMENTS		
Review Work Scope		
Obtain and review IRDs		
Identify system space, power, HVAC, communications, COMSEC, Timing and Sync, system testing and cutover requirements, and other special requirements.		
Identify any required support system equipment		
SITE RESOURCES AND CONSTRAINTS		
Obtain and review site Master As-built Drawings		
Identify space, power, HVAC, communications, COMSEC, Timing and Sync, and other required resources.		
Review possible constraints such as environmental, station grounding system, antenna platform, access ways, TEMPEST facility zoning, etc.		
SITE SURVEY		
Coordinate Site Survey with site and RSIM		
Conduct In-Brief with site personnel. Obtain a site personnel Point of Contact list.		

INSTALLATION PLANNING CHECKLIST (Continued)

Element	Complete Y/N	Notes
Conduct detailed site survey. Review space, power, HVAC, communications, COMSEC, other special requirements including antenna coverage survey and E3 study as applicable. Complete Appendix J checklist.		
Establish agreements with site/others to accomplish requirements identified during the site survey.		
Establish agreement for a system testing and cutover plan		
Identify need and plan to provide Type Accreditation Package (including SSAA) for use by site		
Identify all NIPRNET / SIPRNET connection requirements and responsibility for completing Connection Approval Process (CAP) for new requirements.		
Conduct Out-Brief with site personnel		
Distribute Site Survey Report		
REVISED ESTIMATE AT COMPLETION (EAC)		
Review cost estimates previously provided against site survey data. Coordinate revised estimate with IA and IMA if necessary.		
Review Installation Activity new EAC (if applicable)		
Review Site Survey Report against work tasked (ie. Work Scope). Remove any ambiguities and negotiate estimate cost if applicable.		
Review available funding		
UPDATE POA&M AND TLS		
Review previously produced POA&M & TLS and update as required. Any change to installation completion date must be approved by IMA.		

INSTALLATION DESIGN CHECKLIST

Element	Complete Y/N	Notes
REVIEW INSTALLATION DESIGN STANDARDS		
Review Appendix AC for design and installation standards and requirements that are applicable to this project's installation design.		
SPECTRUM ASSIGNMENT & E3		
When new RF emitters are installed, a frequency assignment must be obtained.		
If an RF emitter is involved with this installation review the Electromagnetic Environmental Effects (E3) requirements found in OPNAVINST 5100.23E and NAVFACINST 11010.45.		
DEVELOP BESEP		
Review Site Survey Report, system requirements, and site resources and constraints.		
Prepare draft BESEP including detailing all agreements/responsibilities with other organizations.		
Distribute draft BESEP to activities with assigned responsibilities		
Incorporate valid comments. PEs should work with the RSIMs to successfully resolve all BESEP issues before transmitting the final version.		
Individual with Command release authority sends final BESEP no later than 30 days prior to installation		
DEVELOP IDP		
Starting with IRD as basis, develop IDP in accordance with Appendix Q.		
Ensure special requirements such as Environmental Protection and Personnel Safety requirements are addressed as notes in the IDP.		
IA conducts rigorous review.		
Authorized approval officials approve drawings certifying that the drawings are technically correct and drawings format and content conform to standards specified in Appendixes Q and AC.		
PE uploads approved IDP documents to approved SYSCOM document repository		
DEVELOP SOVT		
Starting with system SOVT as basis, develop site specific SOVT in accordance with SPAWARINST 3084.1.		
Detail procedures for any special utility or communication outage and obtain site personnel concurrence in advance.		
Detail cutover requirements and procedures and obtain site personnel concurrence in advance.		
IA conducts rigorous review.		
Authorized approval officials approve SOVT certifying that the test plan is technically sufficient and document		

INSTALLATION DESIGN CHECKLIST (Continued)

format and content conform to standards specified in SPAWARINST 3084.1.		
PE uploads approved SOVT documents to approved SYSCOM document repository		
DEVELOP TRAINING MATERIALS		
Prepare On-the-Job Training materials. If available use the standard System OJT Training Guide as basis.		
DEVELOP ILS CHECKLIST		
Develop an ILS Checklist in format shown in Appendix W using information obtained from the associated program office and/or task requirements.		
DEVELOP PITCO PROCEDURES		
If applicable prepare Pre-Installation Test and Check Out procedures for testing system/equipment.		
ORDER INSTALLATION MATERIALS		
Order and track receipt of all installation materials as indicated on the IDPs Master Parts List		
VERIFY SCHEDULING AND FINANCIAL REQUIREMENTS		
Review POA&M for schedule changes		
Coordinate schedule changes with all affected parties especially the site. All changes to the final installation completion date must be approved by the IMA.		
Review EAC for changes		
Coordinate any EAC changes with IA		
IA obtains approval from IMA for forecasted cost increases		

PRE-INSTALLATION CHECKLIST

Element	Complete Y/N	Notes
PREPARE INSTALLATION TEAM		
Determine number of installers required		
Task contractor		
Identify contractor Lead Installer		
Coordinate installation team responsibilities		
Identify SOVT team members		
Identify training team members		
Ensure all Government and Contractor personnel have received current installation safety training. Ensure all members are aware of project specific safety issues. Arrange for safety training if necessary.		
Coordinate communication and facility services required for SOVT and training		
Coordinate with outside commands for site support as required		
Ensure clearances for all team members are sent		
Verify transportation into host nation		
Make travel and lodging arrangements		
PREFABRICATION AND PITCO		
Complete equipment prefabrication		
Perform cable prefabrication		
Prefabricate foundation		
Conduct PITCO		
Prepare software		
Integrate equipment and software		
Conduct system level checks as required		
Provide PITCO report, including system level test reports and configuration data as required		
DEVELOP INSTALLATION IN-BRIEF AND OUT-BRIEF		
Prepare an installation In-Brief and Out-Brief IAW Appendix V and X		
VERIFY EQUIPMENT, MATERIALS, AND SITE PREPARATIONS		
Prepare 3 copies of the approved IDP		
Inventory and stage all equipment, installation materials, and ILS materials for shipment.		
Verify all site preparation completion status.		
Verify availability of communication connectivity and cryptographic materials (including SIPRNET/NIPRNET connectivity)		
Verify MILCON or Minor Construction status		

PRE-INSTALLATION CHECKLIST (Continued)

Element	Complete Y/N	Notes
preclude proceeding to the Installation performance phase		
Identify packing, handling, shipping, transportation, and any other special requirements for shipment of install materials		
Identify and coordinate with shipping receiving officer at site		
Prepare DD-1149's and ship all installation materials		
FINAL INSTALLATION PREPARATIONS		
Verify HNA approval		
Verify frequency approval		
Verify site approval		
Verify PM/ISEA has prepared a CDMD-OA work file or a 4790CK form.		
Verify FRCB approval received. No on-site production is allowed without NETWARCOM's FRCB approval. Furthermore, RSIMs have been empowered to cease any production work that is found to not have FRCB approval. Do not expend travel resources without first verifying that FRCB approval has been received.		
Notify RSIM of install status		
Coordinate availability of trainees		
Verify schedule. All schedule changes impacting Mission Critical Dates require immediate notification and approval by IMA. Update POA&M and TLS.		
Verify EAC. Forecasted cost increases requirement IMA approval.		
Provide copy of installation readiness checklist to IMA		

INSTALLATION PERFORMANCE CHECKLIST

Element	Complete Y/N	Notes
INSTALLATION SAFETY		
Insure all Government and Contractor personnel have current installation safety training and adhere to safe installation practices		
CONDUCT IN BRIEF		
Is the In Brief scheduled?		
Are there security impacts?		
Are there facilities impacts?		
Are key personnel identified?		
COORDINATION AND LIAISON		
Coordinate visit with RSIM		
Coordinate with regional frequency coordinator		
Liaison with Navy command and Joint command		
Schedule Cut-Over and outage time		
Coordinate crane and rigging services		
Coordinate public works and scaffolding services		
Verify status of all interfaces (special communication)		
Coordinate ship and shore site support		
ADMINISTRATION		
Locate the install material and equipment		
Confirm building accessibility		
Deliver equipment and material		
Verify Telecommunications Service Order is in place		
Coordinate with BCO (host nation communications)		
Complete badging and clearance for all workers CRYPTO: Verify availability of COMSEC/ TRANSEC key. Verify labeling/marking for classification. Ensure required on-site personnel are available to support. Coordinate with CMS custodian for delivery of KeyMat.		
Coordinate administrative actions for SOVT team		
INSTALLATION REPORTING		
Establish PE Installation SITREPs: • 6 months to 1 month prior to the installation: Monthly • 1 month prior to the installation until the installation is completed: Weekly		
CONDUCT INSTALLATION		
Conduct daily meetings		
Perform a baseline test on existing equipment		
Remove old equipment and recycle or dispose of as required		
Prepare foundations		

INSTALLATION PERFORMANCE CHECKLIST (Continued)

Element	Complete Y/N	Notes
Complete cabinet and equipment mounting		
Complete all power and equipment cabling		
Perform software loads		
Complete cosmetic actions		
Update redline drawings daily		
Document configuration revisions as required		
Provide weekly progress reports		
SYSTEM QA AND CHECKOUT		
Testing and QA performed?		
Ensure that all existing systems are tested		
Verify software builds		
Conduct a cold check of system before SOVT		
Conduct post installation troubleshooting		

SYSTEM TURNOVER CHECKLIST

Element	Complete Y/N	Notes
CONDUCT SECURITY/SAFETY WALKTHROUGH		
Inspect for security discrepancies		
Inspect for safety discrepancies		
COMMENCE SOVT		
Perform SOVT testing		
Conduct end-to-end demonstration of equipment and subsystems		
ARRANGE AND CONDUCT TRAINING		
Arrange for training		
Conduct training		
Sign and distribute OJT certificates		
TYPE ACCREDITATION/CERTIFICATION		
Type Accreditation Package (including SSA) provided to the site DAA		
LOGISTICS SUPPORT AND CONFIGURATION MANAGEMENT		
Deliver spares		
Provide applicable Allowance Parts Lists to the supply officer and Electronic Maintenance Officer (EMO)		
Provide copies of approved ILS documents, such as ILSP, SP/ULSS, PMS, MRC, technical manuals, warranties, training guides, software licenses		
Provide any special test equipment		
Provide Technical Support Agent (TSA) POCs and help desk information		
Provide redline drawings, draft of SOVT, and major equipment list		
Provide completed 4790 CK and/or CDMD-OA Work File.		
Provide signed copy of ILS checklist		
CUT-OVER		
Execute Cut-Over Plan (as applicable)		
Sign SOVT		
OUT BRIEF		
Conduct security and safety brief		
Conduct Out-Brief		
Sign Installation Completion Report (ICR)		
Obtain Completion Message		
POST-INSTALLATION ADMINISTRATION		
Resolve and report all outstanding deficiencies from installation. Enter deficiencies to tracking database.		
Conduct the negotiated on-line observation period		

SYSTEM TURNOVER CHECKLIST (Continued)

Element	Complete Y/N	Notes
Update Master As-Built drawings within 60 days after the completion of the installation and distribute to the site, IA, IMA and post to the designated SYSCOM installation document repository		
Collect actual cost data		
Obtain final acceptance letter or message		
Ensure all installation deliverables are uploaded to the designated shore repository		
INSTALLATION TASK CLOSE OUT		
Send an Installation Completion Message if the Site has not sent one within 30 days after the Out-Brief		
Return excess installation materials		
Update configuration database (CDMD-OA) and/or 4790 CK as required		
Update Work Plan and Time Line Summary		
INSTALLATION COMPLETION		
PE has copy of signed DD-1149 or letter of transmittal of the customer acknowledging receipt of all logistics related material, spares, equipment, drawings and supporting installation documentation (e.g. technical and operations manuals)		
The customer completion message has been received or the PE has sent the completion message to the customer		
All outstanding installation issues, including SOVT issues, have been resolved		
All Out Brief and Installation Task Close Out items are complete		

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APPENDIX B1 - WEEKLY SHORE SITUATION REPORT (SITREP)

Subject: *Color of Overall Project Status* **Weekly Shore SITREP For** *Installation Activity Name,* **TN:** *## - ####***,** *Installation Name*

Report Date: *(today's date)*
Installation Location: *(site location)*
Project Engineer: *(name of assigned PE)*

Project Status: (Color Coded Green, Yellow, or Red)

Item/Area	Status
Overall Task Assessment	
Schedule	
Funding	
Planning/Engineering	
System Documentation from ISEA (i.e. BESEP, System drawings, SOVT, etc)	
Contracts	
Hardware Materials	
Software Load	
ILS Package (including training)	
As-built Drawings	
Customer Satisfaction	

Color Coded Ratings:
Green: High level of confidence, no major issues
Yellow: Some concerns, or reservations, that the installation is in danger/delays may occur.
Red: No confidence in the installation being completed on time without exceptional action.

FRCB Status: REQ Y/N, SUB (Date), 04 (Date), 05 (Date), PEO (Date), Approved/Disapproved (Date)
Task Description: Brief overall description of the overall scope of work.
Operational Capability Provided: Should be a brief Description of what capabilities the command or site will receive as a result of this installation.
Status: Should be a quick snapshot of what is currently going on with the project. Briefly explain any current Red or Yellow issues or any other issue of consequence along with planned or recommended action.
Key Issues: Detail description of significant issues or problems that were briefly mentioned above in "Status". Maintain a historical log of all issues and their current status/resolution. At completion of installation, transfer any incomplete work items/ discrepancies identified in the SOVT to this log. Continue to report progress through to completion. When installation is complete, incomplete work items are finished, and all deliverables are uploaded in the Shore Repository, submit a final SITREP reporting project as complete/closed.

Schedule Summary:

Planned Event	**Planned Start**	**Planned End**	**Revised Start**	**Revised End**	**Actual Start**	**Actual End**
Funding Required						
Funding Received						
Site Survey						
Develop BESEP						
Develop IDP						
Equipment/Material Required						
Procure Material						
Planning & Design Documentation Uploaded into Shore Repository						
On-Site Production						
SOVT						
Training						
Cutover Date						
ILS Delivered						
Completion message						
As-Built drawings delivered to site						
Signed SOVT & As-Builts Uploaded into Shore Repository						
Installation Project Complete						

Site POC & Phone #: (name and phone number of principle site POC)
PE Email & Phone #: (contact information)

APPENDIX B2 - SPAWAR REGIONAL SHORE INSTALLATION MANAGER (RSIM) WEEKLY ACTIVITY REPORT (WAR)

Region: *(identify region)*
Shore Weekly Activity Report
RSIM: *(name of RSIM)*

Report For Week Ending: *(dated for end of reported week, i.e. Saturday)*

A. Installation Issues:

1. (*Identify project Tracking Number (TN) and project title)*

a. Issue *(brief statement of the problem)*
b. Discussion *(more detailed as required to include any impact to customers, installation, or operational status)*
c. Recommendation or Corrective Action *(possible solutions)*
d. Site POC's *(title, phone, and email address of principle site POCs)*

B. RSIM Issues:

1. *(Identify RSIM concerns and issues that are not associated with a specific installation, but impacts overall RSIM region or several installations. Example "PE's in region XYZ require SIPH training")*

a. Issue
b. Discussion
c. Recommendation or Corrective Action

C. Installations: *(A listing of all jobs in region in the RSIM WAR report is optional.)*

Region					
Install Tracking Number	**Command Name**	**System/Install Group**	**Planned Start Date**	**Planned End Date**	**Comments**
	NONE				

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APPENDIX C1 – REGIONAL SHORE INSTALLATION MANAGER (RSIM) DESIRED QUALIFICATION STANDARDS

1 Introduction

This document describes the qualification standards for personnel acting as a Regional Shore Installation Manager (RSIM). SPAWAR uses RSIMs as the single point of customer contact for installations within specific regions. The Shore Installation Process is designed so that other "non-SPAWAR" activities can also use it to execute and manage their shore installations. It is advantageous for the Navy in general and for user Commands specifically, to have consistency in process, deliverables and in how shore facilities receive new and upgraded C4ISR systems. Other installation activities may find it advantageous to assign RSIMs from their own organizations to oversee specific geographical regions and to represent their entire claimancy during performance of any and all shore installations under their cognizance. SPAWAR employees can only become RSIMs through appointment by the SPAWAR System Center Atlantic and Pacific Installation Management Offices (IMO). The intent behind this document is to describe the desired knowledge and experience that a RSIM should possess in order to perform the responsibilities assigned by the Shore Installation Process Handbook. RSIMs are tasked to be authoritative on the Shore Installation Process Handbook, installation standards and experiences leading to successful installations, and sound project management methodology. Since RSIMs are also ambassadors for the entire SPAWAR organization and are seen as key SPAWAR contacts by our Navy user customers, RSIMs should demonstrate skill and finesse in their dealings with others. The following should be considered desired qualifications and used to aid in the RSIM selection process as well as used by the newly appointed RSIM in setting individual training objectives. The qualification elements are separated into three separate categories in the following sections.

2 Regional Knowledge

RSIMs should have in depth knowledge of the region where they will serve and of the regional points of contact, rules, and regulations. This knowledge is needed for RSIM coordination and management to properly consider local conditions and rules that will maximize the efficiency and the degree of customer satisfaction with which installations are conducted while operating within the guidelines of the Shore Installation Process and Navy policies. This includes knowledge needed (at all key sites and activities within the region) to ensure full coordination with key individuals throughout the installation process. It is also useful for helping to avoid potential conflicts between new and existing installations and for making optimum use of existing assets. Discerning factors:

a. Years spent working as an installation designer, project engineer, supervisor, or installer in the region.

b. Years spent monitoring installations in the region accomplished by a contractor (e.g. as a BLII OCONUS monitor)

c. Number of different organizations or different facilities within the same organization (e.g. NCTS, DISA, SUBGRU, and METOC) for which the candidate planned or directly supervised or monitored successfully completed installations.
d. Individual's reputation with key customers within the region.

3 General Knowledge of the Shore Installation Process and Installation Standards

The Shore Installation Process Handbook defines the RSIM as an authoritative source for the Shore Installation Process and installation standards and experiences that lead to successful performance of shore installations. In order to be this authoritative source, RSIMs need to have had practical experiences applying the shore installation process in performing and managing shore installations. RSIMs should continually seek to expand and update knowledge of the installation processes and standards through formal training and practical experience opportunities. A RSIM should possess knowledge and experience for the majority of the following processes and standards:

a. Shore Installation Process Handbook
b. Fleet Readiness Certification Board
c. SPAWAR installation databases and document repositories (SPIDER)
d. Installation Management Office (IMO) processes and tools
e. Installation standards with emphasis on National Electrical Code, fire code, accessibility and human engineering, TEMPEST RED/BLACK separation, site approval requirements and procedures, grounding, bonding, and shielding
f. Navy safety requirements (Asbestos, electrical safety, protective gear, construction sites)
g. Defense contract management (e.g. Contracting Officer Technical Representative (COTR) or Navy Technical Representative (NTR) training and experience)

Discerning factors:

a. Individual is Installation Competency qualified to "Advanced Stage - Technical" per SPAWAR Competency Development Model standard. This includes having acquired the Knowledge, Skills, and Abilities (KSAs) of the Entry Stage, Intermediate Stage, and the Advanced Stage.
b. Individual is qualified as a SPAWAR PE for Inside Plant (ISP) installations.
c. Individual is qualified as a SPAWAR PE for Outside Plant (OSP) antenna installations.
d. Individual is qualified as a SPAWAR PE for (OSP) cable installations.
e. Individual is a licensed professional engineer in any state or territory of the United States.
f. Individual is a BiCSi Registered Communications Distribution Designer (RCDD)

4 Knowledge of Project Management Processes

The Shore Installation Process Handbook requires that RSIMs be an authoritative source on the "application of sound program or project management processes such as defining

and controlling requirements, developing a Work Breakdown Structure (WBS), estimating task durations, allocating and managing resources, defining dependencies, preparing network diagrams, determining critical path, assessing and managing risk, cost accounting, managing project quality, building teams, developing Project Management Plans and implementing management early warning and control processes such as an Earned Value Management System (EVMS). Discerning factors:

a. Individual's "Leadership Core" competencies under the Competency Development Module is at the "Advanced Stage".

b. Formal project management training

c. Years of experience successfully managing installation projects that included requirements definition, WBS development, scheduling, resourcing, and executing.

d. Experience managing large ($6M or greater) complex projects including the implementation of a Project Management Plan, EVMS, and Risk Management Plans with all applicable elements shown in the SIPH Appendix E.

e. Project Management Institute (PMI) certification as a Project Management Professional (PMP) or Defense Acquisition Workforce Improvement Act (DAWIA) Program Management level III certification.

f. Formal training in process improvement and developing process maturity such as Lean Six Sigma (LSS) or Capability Maturity Model Integrated (CMMI).

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APPENDIX C2 - SPAWAR SHORE INSTALLATION PROJECT ENGINEER (PE) QUALIFICATION STANDARDS

1 Introduction

This document describes the qualification requirements for personnel acting as Project Engineers (PEs) on indoor and outdoor equipment and infrastructure installations for SPAWAR. The Shore Installation Process is designed so that other "non-SPAWAR" activities can also use it to execute and manage their shore installations. It is advantageous for the Navy in general and for user Commands specifically, to have consistency in process and deliverables in how shore facilities receive new and upgraded C4ISR systems. Non-SPAWAR installation activities may also find it advantageous to use the qualification requirements defined herein. This document includes three sections of different qualification requirements; Inside Plant (ISP), Outside Plant (OSP) antenna installations, and OSP cable installations. PEs working either type of OSP installations must also be qualified for ISP work since OSP installations almost always also involve some ISP equipment installation.

2 Detailed Qualification Requirements for PEs Responsible for ISP Projects

This section describes the qualification requirements for PEs assigned to ISP projects. As a prerequisite for becoming ISP PEs, personnel shall have acquired the Knowledge, Skills and Abilities (KSAs) and meet the minimum technical background and education requirements described in the SPAWAR 4.2 Competency Development Model (CDM) for entry and intermediate stages.

Note: These requirements shall not be used as a justification to increase costs. Most SPAWAR journeyman PEs are senior personnel whose labor rates are significantly higher than those of eligible Assistant PEs. Assistant PEs can offset the journeyman PEs higher salaried costs by performing some of the routine tasks while over time taking on more complex tasks under the tutelage and mentoring of a qualified PE. The purpose of this qualification process is to avoid the additional cost of correcting "rookie mistakes" and to insure new engineers learn correct standards and processes at the outset of their careers at SPAWAR.

2.1 *Minimum Technical Background and Education Requirements for Assistant Project Engineers*

Assistant Project Engineers should have a broad technical background that will allow them to absorb the technical knowledge that PEs need to acquire quickly. This can only be achieved through years of technical training or experience. The ideal assistant project engineers will have had both formal training and experience. The following technical background qualification requirements are designed to allow personnel with a wide

diversity of technical backgrounds to qualify while still ensuring that all of these personnel have enough technical background to be successful. All assistant project engineers shall meet at least one of the following four technical background requirements.

a. A bachelors of science or engineering degree (from an accredited university in the field of electrical or computer engineering or computer science).

b. Four years of experience working as a qualified enlisted U.S. military serviceman with one of the following technical ratings -- Electronics Technician with Advanced Training, Interior Communication (IC) man with Advanced Training, Information System Technician (IT), Radioman (RM) (legacy rating), or Data System Technician (DS) (legacy rating).

c. Accredited Electronics Technician certificate and four years of experience performing a wide variety of electrical and electronic installation work for the US Department of Defense, a telephone equipment company, or a communications equipment provider (e.g. Nortel Networks, Lucent, Alcatel, AT&T) as a qualified technician or installer. At least two years of this experience shall have been conducting shore (not shipboard) installation work, and at least one year of this experience shall have been in installing US Navy systems.

2.2 *Minimum Project Engineering Experience Requirements*

In order to qualify to work as a PE, personnel shall have had at least two years of experience as a SPAWAR Assistant PE working under the supervision or guidance of a fully qualified journeyman PE. (Journeyman PEs are those with at least four years of SPAWAR project engineering experience and a thorough knowledge of the standards that apply to installations.) During that time, the assistant project engineer shall develop the skills and obtain the knowledge required to be a fully qualified PE.

2.3 *Assistant Project Engineers and Project Engineers Required Knowledge*

2.3.1 Installation Knowledge

Assistant PEs and PEs are required to obtain and demonstrate knowledge of the following installation requirements through independent research or formal training:

a. Shore Installation Process Handbook (SIPH) process and deliverable requirements

b. Commercial and military standards that govern inside plant (ISP) communications and electrical installations. Appendix AC of the SIPH discusses all of the major shore installation guidance documents pertaining to SPAWAR shore installations. All shore assistant PEs shall be expected to study the entire Appendix AC, including its attachments, and to further research the standards as required for the installation projects that they are assigned to. The new appendix is entitled “Policy and Guidance for the Application of Fundamental Shore Installation Standards and References”. The appendix covers the following documents that all PEs need to be familiar with including:

   1) National Electrical Code (NEC) requirements as they apply to the installation of electronic equipment and cabling.

2) Commercial grounding, bonding, and shielding requirements as spelled out in ANSI-J-STD-607-A-2002 and the NEC.
3) Military grounding, bonding, and shielding requirements as spelled out in MIL-STD-188-124B and MIL-HDBK-419A.
4) Commercial standards for the installation of Telecommunications Pathways, especially TIA-569-B.
5) Commercial Building Telecommunications Cabling Standard, TIA/EIA-568.B.1.
6) TEMPEST RED/BLACK separation criteria contained in NSTISSAM TEMPEST/2-95.
7) PDS guidance from Navy Staff Office Publication (NAVSO Pub) 5239-22, PDS Guidebook and CNO WASHINGTON DC message R 091948Z JAN 03.

c. Design and drawing standards as defined by Appendix Q of the Shore Installation Process Handbook.
d. Administering CPR.
e. Navy safety requirements - All PEs shall receive electrical safety training. When installation projects encounter hazardous materials such as asbestos, lead paint, transformer fluids, etc, PEs are responsible for knowing and insuring that correct procedures are followed. Important documents governing safety issues encountered during installations are discussed in Appendix AC of the Shore Installation Process Handbook. Installing Activities shall develop and maintain an electrical safety program using the references and information discussed in Appendix AC.
f. Installation databases - SPAWAR PEs must be knowledgeable of the "Team SPAWAR" installation databases and repository tools, currently SPIDER at the time of this revision.
g. Managing Department of Defense contracts (e.g. Contracting Officer Technical Representative (COTR) training)
h. Site approval requirements and procedures as described in NAVFACINST 11010.45. Note: Projects requiring "Site Approval" should be assigned to journeyman PEs with at least four years of experience.

2.3.2 System Knowledge

Assistant PEs and PEs should ideally receive or demonstrate prior completion of systems operations and maintenance training and acquire expertise for at least one major system. The purpose of this is to reduce the overall cost of installation to the Navy by reducing the need for PEs to call in outside expertise. Examples of "major systems" include the Global Command and Control System, the Extra High Frequency (EHF) System, and the Link-16 System.

2.3.3 Project Management Knowledge

Assistant PEs and PEs shall acquire "Core Leadership" proficiencies of the Competency Development Module for entry and intermediate stages. Assistant PEs and PEs shall be required to receive or demonstrate prior completion of formal project management

training. As a minimum, all project engineers should be able to demonstrate proficiency in MS Project, requirements definition, the Work Breakdown Structure (WBS), estimating task durations, allocating resources, defining dependencies, network diagrams, critical path analysis, risk analysis and management, cost accounting, project quality management, and team building. PEs assigned to large complex projects should also be proficient at writing integrated Project Management Plans and implementing an Earned Value Management System (EVMS).

2.3.4 Test Equipment Operation Knowledge

PEs should be capable of operating test equipment commonly used during testing of C4ISR systems. The test equipment that should be possessed by or available to the installing activity (in order for all of its PEs to be fully capable of conducting ISP installations) is listed below. PEs should be capable of operating at least 75% of the following:

a. Bit-error rate test set or combination of test sets capable of operating on the types of circuits scheduled to be installed under the projects to which the PE could be assigned. Typical circuit types include serial circuits (e.g. EIA RS-232 circuits), DS-1 circuits, DS-3 circuits, and OC-3/ATM links.
b. Optical Time Domain Reflectometer (OTDR) with single mode and multimode modules.
c. AC power analyzer (one phase required, 3-phase preferred).
d. Multimeter or separate voltmeter, ammeter, and resistance meter
e. Clamp-on ammeter
f. VSWR meter capable of covering the frequency band of any systems scheduled for installation that year.
g. Fall of Potential Ground Tester
h. Storage oscilloscope
i. Optical Loss Test Set
j. LAN Cable Certification Test Set (e.g. Cat 6 Cable Certification Test Set)
k. Network Analyzer for Ethernet networks
l. Humidity meter

2.4 *Project Engineering Proof of Capability*

To qualify as a PE, assistant PEs shall work under the tutelage of journeyman PEs during which time, it is expected that the assistant PE will demonstrate ability to:

a. Use Microsoft Project to prepare POA&Ms that include an adequate WBS, resource estimating and allocation, and dependencies. The assistant PE shall demonstrate the ability to use a critical path analysis to prioritize activities.
b. Conduct site surveys to gather installation design details, to develop detailed site survey reports, and to prepare Base Electronic System Engineering Plans (BESEPs).
c. Develop and/or manage Computer Aided Design (CAD) development of Installation Design Plans (IDPs) including the correct application of applicable design standards and methods as described in Appendix Q of the Shore Installation Process Handbook. IDPs shall have been reviewed and approved by a

qualified Drawing Approval Authority that is nominated and certified by SPAWAR for this purpose.
d. Read and conduct installations using Installation Design Plans (IDPs) and to properly capture all changes (redlines) to installation designs.
e. Submit weekly installation situation reports (SITREPs).
f. Prepare and conduct SOVTs.
g. Load installation deliverables including site survey reports, in/out briefs, BESEPs, IDPs, As-Builts, completed SOVTs, completion messages into the SPAWAR approved installation document repository.
h. Conduct cost accounting and other job close out activities.

3 Detailed Qualification Requirements for PEs Responsible for Outside Plant (OSP) Antenna Installation Projects

All OSP antenna installation PEs shall meet all of the requirements for PEs responsible for ISP projects, as described above, plus meet the additional requirements described in the following paragraphs of this section.

3.1 *Additional Knowledge Requirements*

PEs responsible for antenna installations shall have knowledge of:

a. Antenna related grounding requirements and approved methods (MIL-HDBK-419A, MIL-STD-188-124B Notice 3 and NFPA 780).
b. Frequency approval requirements and procedures.
c. Site approval requirements and procedures.
d. FAA and FCC antenna tower lighting requirements.
e. Requirements for ladders and platforms.
f. Antenna and antenna tower foundation and platform requirements.
g. Obtaining satellite coverage data and mapping antenna angles to horizon (developing horizon masks using a theodolite).
h. Structural Standards for Steel Antenna Towers and Antenna Supporting Structures (TIA-222-G or most recent revision) if a new antenna structure is being designed.
i. Local procedures and requirements for coordinating the work through the local SPAWAR Facilities Engineering Personnel and NAVFAC personnel. These procedures will vary depending upon the location of the installing activity. The types of work that should be coordinated in this way include:
    1. Obtaining building structural analyses for potential antenna platform sites on roofs.
    2. Obtaining soil analyses for potential antenna platform sites on open land.
j. Microwave path analysis (for microwave antenna installations only).
k. Safety requirements in the NESC, and U.S. Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1 dtd 3 Nov 03). (governs safety on

construction sites) and in the Navy Safety and Occupational Health Program Manual, OPNAVINST 5100.23G (dtd 30 Dec 05).

l. Antenna cable /waveguide building penetration requirements of the National Electrical Code and MIL-STD-188-124B.

3.2 *Additional Tools and Test Equipment Experience Requirements*

To be qualified as an antenna installation PE, personnel must have experience using:

a. One of the following:

1. A theodolite to create a horizon mask.
2. Excel or similar software to prepare a microwave path analysis with charts and path cross-sections for different conditions.
3. Three dimensional maps and GPS locators to prepare coverage area maps for two shore line-of-site antennas.

b. A VSWR test set on an ongoing or completed installation.

c. An RF Field Strength Meter.

d. A spectrum analyzer capable of covering the frequency band of the system being installed.

e. A GPS location and direction finding system.

3.3 *Additional Project Engineering Requirements*

To qualify as an Antenna Installation PE, assistant PEs shall have prepared IDPs containing the additional drawing types and drawing content that would be required by antenna installations. Specifically, antenna layouts (Drawing Category Code 50), antenna mechanical assembly and mounting details (Drawing Category Code 170), antenna grounding details (miscellaneous detail drawings, Drawing Category Code 180), and cable block diagram sheets for all antenna cabling (Drawing Category Code 070) shall be prepared. The assistant PE shall be able to show several IDPs including at least one major antenna installation IDP, which he or she developed or directly managed the CAD development including the correct application of applicable design standards and methods. IDPs shall have been reviewed and approved by a qualified SPAWAR Drawing Approval Authority.

4 Detailed Qualification Requirements for PEs Responsible for Outside Plant (OSP) Cable Infrastructure Installation Projects

All OSP Cable installation PEs shall meet all of the requirements for PEs responsible for ISP projects, as described above, plus meet the additional requirements described in the following paragraphs of this section. OSP Cable Installation projects are projects that require the use or installation of outdoor cable pathways (e.g. ducts, conduits, cable

ladders, messenger wires, etc.) above (e.g. on utility poles) or below ground (in trenches or tunnels). This includes PEs for projects that:

a. install cables between buildings.

b. install cables between buildings and external remote devices (antennas, antenna farms, concentrators, distribution frames, sensors, etc.).

c. extend or replace existing underground (normally conduit) infrastructure or aerial (normally utility pole) infrastructure.

4.1 *Additional Knowledge Requirements*

PEs responsible for OSP cable installations shall have a thorough knowledge of:

a. Outside plant related grounding requirements and approved methods (MIL-HDBK-419A, MIL-STD-188-124B Notice 3 and the National Electrical Safety Code.)

b. Protector block installation and grounding requirements of the National Electrical Code and J-STD-607-A.

c. Industry standards governing outside plant cable installations including:
   1) TIA-758-A, *Customer-owned Outside Plant Telecommunications Infrastructure* and the BiCSi *Customer-Owned Outside Plant Design Manual* (3rd Edition is latest at the time of this revision)
   2) TIA-590-A, "Standard for Physical Location and Protection of Below-Ground Fiber Optic Cable Plant, dated January 1997
   3) National Electrical Manufacturer's Association Bulletin No. TCB 2-2000, "NEMA Guidelines for the Selection and Installation of Underground Nonmetallic Duct"

d. Government standards governing outside plant cable installations including:
   1) Unified Facilities Guide Specifications, UFGS-33 71 02.00 20 (July 2006), Underground Electrical Distribution.
   2) Unified Facilities Guide Specifications, Section 33 82 00 (April 2006), Telecommunications Outside Plant (OSP).
   3) USDA RUS Bulletin 1751F-644, Underground Plant Construction, Effective Date: August 28, 2002.
   4) USDA RUS Bulletin 1753F-201 (PC-4), RUS Standard for Acceptance Tests and Measurements, Effective Date: June 2, 1997.

e. Safety requirements of:
   1) National Electrical Safety Code (especially physical clearance and grounding requirements).
   2) U.S. Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1 dtd 3 Nov 03) (governs safety on construction sites).
   3) Navy Safety and Occupational Health Program Manual, OPNAVINST 5100.23G (dtd 30 Dec 05) (especially Chapter 27, Confined Space Entry).
   4) OSHA (Standards -29 CFR), Part 1926, Subpart P (Excavations).
   5) OSHA (Standards -29 CFR), Part 1910, Subpart R (Telecommunications).

f. Specific labeling requirements and techniques for OSP cable. This is actually covered by standards listed above, but is specifically called out to emphasize

its importance. For example, the PE must have the knowledge needed to ensure that:

1) Labels resistant to the environmental conditions at the point of installation (such as moisture, heat, or ultraviolet light), and that they have a design life equal to or greater than the labeled component. (Required by TIA/EIA-606-A Section 10.1.1).
2) Cables are permanently identified by tags or otherwise at each manhole or other access opening of the conduit system. (Required by NESC Rule 341.b.3.a.(1) and TIA-606-A).
3) Two fiber connection positions (or polarities) are labeled using the letters "A" and "B". (Required by TIA/EIA-758-A Section 5.3.5).

4.2 *Additional Tools and Test Equipment Experience Requirements*

To be qualified as an OSP cable installation PE, personnel must have personally conducted at least five of the following:

a. OTDR testing on single-mode and multimode fiber optic cable.
b. Optical Loss testing on single-mode and multimode fiber optic cable.
c. Bit error rate testing on circuits (T1, DSL, etc) over copper cable.
d. Audio frequency signal loss testing and signal quality testing.
e. Gas detector testing for confined space entry (e.g. Bascom-Turner Instruments CGA-401).
f. Distance measurements using a Measuring Wheel.
g. Microscopic examination of fiber optic cable terminations.

4.3 *Additional Project Engineering Requirements*

PEs assigned to projects where a SPAWAR contractor is responsible for OSP cable projects involving construction activities (e.g. ONENET, Pier Connectivity), must have additional general basic (See note 2.) knowledge of:

a. Soil compaction testing.
b. Concrete construction and testing techniques.
c. Road surface repair techniques.
d. Manhole and handhole installation techniques.

Notes:
1. Training to acquire this knowledge and/or professional assistance should ideally be provided by a registered Civil Engineer specializing in the construction of underground cabling infrastructure.
2. General basic knowledge is required to intelligently seek professional assistance as required from professionals (with an in-depth knowledge of the subject matter) and to ensure that requirements documents (e.g. Statements of Work) specify the use of best practices and the completion of appropriate tests. The purpose of this requirement is not to require PEs to become Civil Engineers.

5 Requirements for PE Support

Installation Activities are responsible for ensuring that their PEs are provided with reasonable support that they need to qualify and function as PEs. This includes access to test equipment, computer resources, and training.

5.1 *Minimum Computer Resource Support*

All SPAWAR PEs shall have convenient access to a Personal Computer either loaded with a copy of the following software or with convenient access to the software.

a. Access to SPIDER.
b. Microsoft Project.
c. Microsoft Office Suite.
d. Adobe Acrobat Reader or Professional.
f. Access to SPAWAR Document Repository (currently Documentum).
g. A recent version of AutoCAD or an AutoCAD viewer.

5.2 *Minimum Standards Accessibility*

PEs shall have possession of or convenient access to core installation standards documentation. PEs must be able to obtain a copy of the following core documents within a reasonable time and without impacting project schedule.

a. A copy of the National Electrical Code (NFPA 70) that is less than four months out of date.
b. A copy of TIA-568-B.1 that is less than six months out of date.
c. A copy of TIA-569-B that is less than six months out of date.
d. A copy of the National Electrical Safety Code that is less than four months out of date for any PEs involved in outside plant installations.
e. A copy of TIA-758-A that is less than four months out of date for any PEs involved in outside plant installations.
f. A personal copy of the Shore Installation Process Handbook. (Soft copy is permitted)
g. A personal copy of all DoD publications (standards, handbooks, instructions, Notices, etc.) called out in the Shore Installation Process Handbook. (Soft copies are permitted.)

5.3 *Minimum Test Equipment Support*

The goal is that PEs have timely access to test equipment required for completion of all routine site-survey, SOVT and pre-SOVT testing without depending upon borrowed test equipment (from customers or other installing activities). Installation hand tools along with the required test equipment are the tools of the trade that SPAWAR Installation Activities and their PEs are expected to either have on-hand or make available via

contractual services. PEs should not depend on customers to provide installation tools or test equipment. Installing Activities shall have procedures in place to ensure that equipment is recalibrated as required.

APPENDIX C3 – SPAWAR QUALIFICATION STANDARD FOR IDP AND AS-BUILT DRAWING APPROVAL

1 Introduction

SYSCOMs are responsible for establishing and managing core processes essential to the success of their organizations. Availability of correct and usable engineering drawings, and associated data is essential to acquisition, deployment, and life cycle maintenance, technical refresh, operations, repair, and modernization.

This document describes the qualification standards for those selected and certified to approve shore C4I Installation Design Plans (IDPs), and As-built drawings. IDPs and As-built drawings shall be in accordance with required design, drawing, and installation standards detailed in Section 5.0 and Appendixes Q and AC of the Shore Installation Process Handbook (SIPH) as well as the referenced commercial and military standards and instructions. Only personnel with a thorough knowledge of these requirements should be selected and certified to approve these document types. The intent of this appendix is to define qualification standards for those who are entrusted to approve these critical document types.

2 Minimum Requirements

IAs shall utilize a rigorous review and approval process that results in final approval by a qualified and certified approval authority. These approval authorities will have acquired the Knowledge, Skills, and Abilities (KSAs) and education and experience qualifications at the “Advanced” level in the 4.2 Competency Development Model. These certified approvers will have enough CAD background, ability, and access to software to determine compliance with CAD requirements in Appendix Q of the SIPH. They must have a thorough knowledge of the design and drafting requirements found in Appendix Q of the SIPH. They must have in-depth knowledge and understanding of installation standards discussed in Appendix AC of the SIPH. They will need to have a scientific/engineering background and be able to identify C4ISR installation design issues that violate the laws of physics or that are otherwise suspect. Their technical writing and communication skills must be excellent in order to clearly describe drawing discrepancies. They will need access to the Installation Requirements Drawing and Installation As-Built repositories to check suspect installation issues against approved system standards and prior successful installations. Those approving drawings for each of three types of projects Inside Plant (ISP), Outside Plant (OSP) Antenna, OSP Cable Infrastructure must have prior relevant experience with those types of projects. See SIPH Appendix C2.

3 Desirable Additional Credentials

It is highly desirable, but not required that those who approve IDPs and As-built drawings also be certified as a:

a. Licensed Professional Electrical Engineer in any of the fifty states or US territories.

b. Registered Communications Distribution Designer (RCDD) from Building Industry Consulting Service International (BICSI).

c. Cisco Certified Network Associate (CCNA)

APPENDIX C4 – QUALITY ASSURANCE EVALUATOR (QAE) QUALIFICATION STANDARDS

1 Introduction

This document describes the qualification standards for personnel acting as a Quality Assurance Evaluator (QAE). The QAE professional has specialized training in quality surveillance (quality assurance and control). The individual will possess the Knowledge Skills and Abilities (KSAs) and will have acquired the education and experience of those at the "Adanced" stage of the 4.2 Competency Development Model (CDM) Technical Level. The individual must also have the technical knowledge and experience that comes from completing work at the Entry and Intermediate stages of the Installation Competency. This knowledge and experience is essential to identifying quality issues in planning, design, production, testing, and project management.

The Shore Installation Process is designed so that other "non-SPAWAR" activities can also use it to execute and manage their shore installations. It is advantageous for the Navy in general and for user Commands specifically, to have consistency in process, deliverables and in how shore facilities receive new and upgraded C4ISR systems. However, the SPAWAR Installation Competency QAE is a SPAWAR government employee that is selected by either the SPAWAR System Center Atlantic or Pacific Installation Management Offices (IMOs). The intent behind this document is to describe the knowledge, experience, and certifications that an Installation Competency QAE should possess.

2 Specialized Knowledge

QAEs must have acquired knowledge and experience with Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) systems. The SPAWAR QAE possesses a broad background of technical proficiency in the many C4ISR product areas that SPAWAR deploys. Discerning factors:

a. Years spent working as a technician or engineer in designing, fabricating, installing, and providing in-service support for C4ISR systems.
b. Diversity of C4ISR systems supported and/or qualified to maintain/operate.
c. Specialized training in different technology areas; SATCOM, telecommunications, networks, computers, etc.

3 General Knowledge of the Shore Installation Process and Installation Standards

The Shore Installation Process Handbook defines the QAE as an authoritative resource on the Shore Installation Process and installation standards and experiences that lead to successful performance of shore installations. In order to be an authoritative resource, QAEs need to have had practical experiences applying the shore installation process in performing and managing shore installations. QAEs should continually seek to expand and update knowledge of the installation processes and standards through formal training

and practical experience opportunities. A QAE should possess knowledge and experience for the majority of the following processes and standards:

a. Shore Installation Process Handbook.
b. SPAWAR installation databases and document repositories (SPIDER).
c. Installation Management Office (IMO) processes and tools.
d. Installation standards with emphasis on National Electrical Code, fire code, accessibility and human engineering, TEMPEST RED/BLACK separation, site approval requirements and procedures, grounding, bonding, and shielding.
e. Navy safety requirements (Asbestos, electrical safety, protective gear, construction sites).
f. Defense contract management (e.g. Contracting Officer Technical Representative (COTR) or Navy Technical Representative (NTR) training and experience).

Discerning factors:

a. Individual is Installation Competency qualified to "Advanced Stage - Technical" per SPAWAR Competency Development Model standard. This includes having acquired the Knowledge, Skills, and Abilities (KSAs) of the Entry Stage, Intermediate Stage, and the Advanced Stage.
b. Individual is qualified as a SPAWAR PE for Inside Plant (ISP) installations.
c. Individual is qualified as a SPAWAR PE for Outside Plant (OSP) antenna installations.
d. Individual is qualified as a SPAWAR PE for (OSP) cable installations.
e. Individual is a licensed professional engineer in any state or territory of the United States.
f. Individual is a BiCSi Registered Communications Distribution Designer (RCDD).
g. Individual is Cisco Certified Network Associate (CCNA) qualified.

4 Quality Professional Certification

Quality had early beginnings with craftsman, but like many disciplines has evolved and become more sophisticated. We have learned that it is simply not enough to check for quality, but quality has to be built-in to our processes to produce quality products at competitive cost. For example, while the American auto industry was originally the world's leader in producing automobiles for consumers, today it has lost much of the competitive advantage it used to enjoy to foreign competitors. Lower cost is not the only form of competition. Far superior quality without increased cost has shown to be a very effective competition strategy. While SPAWAR is not in the business of making a profit producing products for the commercial consumer, we are in the business of providing quality C4ISR systems to the warfighter at an affordable cost.

Quality doesn't cost more. It is poor quality products and services that increase overall cost and decrease customer confidence. Therefore, it is not enough for a QAE to be very knowledgeable and experienced in C4ISR Systems and installation processes. The QAE must also obtain formal training in quality management and seek out appropriate certifications.

Discerning factors:

a. Individual's "Leadership Core" competencies under the Competency Development Module is at the "Advanced Stage".

b. Formal quality management training

c. PQM Certification (DAWIA)

d. Quality Improvement Associate Certification (ASQ)

e. Certified Quality Engineer offered by American Society for Quality (ASQ)

f. Certified Manager of Quality/Organizational Excellence (CMQ/OE) (ASQ)

g. Formal training in process improvement and developing process maturity such as Lean Six Sigma (LSS) or Capability Maturity Model Integrated (CMMI)

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APPENDIX D1 – SHORE WORK SCOPE FORM INSTRUCTIONS

1.0 Purpose and Background:

The Shore Work Scope Form shall be used to supply detailed work scope information for all installation projects for cost estimation, project execution, and FRCB purposes. This requirement is also applicable to Other Command Funded (OCF) projects that are not funded by a PEO Program Office. Some of the required entries on the form will not be applicable to installations not funded by a PEO office. The following instructions are designed to enable all users to correctly complete the Shore Work Scope Form.

2.0 Form Completion Instructions:

The Shore Work Scope Form is a generated document that describes the work to be performed by an Installation Activity (IA). For program office installations, once the Work Scope is completed and approved by the designated program office authority, it is entered into SPIDER by the Installation Support Representative. (The entire document is uploaded into the database and specific fields are updated as required.)

When the installation is to be performed by a SPAWAR Installation Activity, but externally funded by Other Customer Funds (OCF), then the SPAWAR Code accepting the funds are ultimately responsible for completing the Work Scope Form. The Installation Activity's Installation Management Office (IMO) is responsible for uploading the Work Scope Form into the SPIDER database and updating the appropriate fields. If the installation is externally funded and also performed by a non-SPAWAR installation activity, then this form is required by SPAWAR and NETWARCOM for FRCB purposes only and the sponsoring organization is responsible for providing a completed work scope form to SPAWAR Code 4.2. SPAWAR Code 4.2 will upload the form into the SPIDER database, update the appropriate database fields, and assign a shore installation Tracking Number (TN).

The originator of the form is required to enter the date finalized and version number at the top of the form. The first Shore Work Scope Form submitted shall be version 1, the second Version 2, the third version 3, etc. A new version shall be submitted whenever work scope changes that could impact cost or schedule occur. When the form is finalized and uploaded into the SPIDER database, the person uploading the form will modify the date to match the date that the form was finalized.

2.1 Section I, Program/Project Information:

The Program/Project Information Section is used to enter administrative and tracking information.

Subsection A. In the "Program/Project Office" field, enter the organization and code of the PEO Program Office funding the project (e.g. PMW 790) or of the other organization funding the project (e.g. NCTSFE Code N2). In most cases it will be the PEO Program Office/APM responsible for completing the form. In the "Submitted by:" field, enter the full name of the

individual responsible for answering questions about the contents of the form. In the "Telephone:" field, enter that individual's main telephone number.

Subsection B. In the "System Name/Nomenclature:" field, enter the name that identifies the system being installed (or altered or removed) (e.g. AN/USC-38(V)7 EHF LDR/MDR). This shall be the same text entered in the "System" field in the SPIDER database.

Subsection C. In the "Alteration (Alt) Brief:" field, enter the brief description of the alteration (includes installations, equipment removals, software upgrades, etc.) covered by the form. For PEO funded projects, this is the description given by the program office describing the alteration. This same description will appear in the SPIDER data base in the *Alt Brief* field. Check the appropriate box for the installation type. The Shore Categories and Definitions (Attachment A to this instruction) contain the information needed to determine the alt type.
Note: To check a box, double click the box you would like to checkmark and select checked under default value, then click OK.

Subsection D. In the "Funded FY:" field, enter fiscal year that the installation is funded (e.g. 2007). In the "Subhead:" field, enter the subhead that appears on the funding document (e.g. 52JG).

Subsection E. This subsection has an *Installation Schedule* table with five columns. In most cases, only one row of this table will be used. If the Scope of Work Form information for installations at different sites is identical, except for the *Installation Schedule* table information, then one Work Scope Form can be used to cover installations at more than one site. That single scope form, however, must be uploaded into SPIDER for each tracking number listed in the *Installation Schedule* table.

- Enter the SPIDER database "Job" Tracking Number in the "**Tracking #"** column. If the SPIDER tracking number is not known by the person originating the form, this column will be completed by the person who uploads the form into the SPIDER database.
- Enter the name of the Command/Site where the installation will occur in the **"Command"** column.
- The next column is entitled **"PMW Start".** If the scope of the work includes actual physical installation work, enter the date that the originator plans to have the physical installation work started in the "**PMW Start**" column. If the scope of the work is design only, enter the date the originator plans the design work to start.
- If the scope of the work includes actual physical installation work, enter the date that the originator plans to have the physical installation work completed in the "**PMW End**" column. If the scope of the work is design only, enter the date the originator plans the final design product (e.g. IDP, BESEP, Site Survey Report, etc.) to be delivered.
- The last column is entitled **"Mission Critical Date"**. This column is only used if it is critical that the installation be completed by a certain date to meet operational requirements. This column should not be used arbitrarily.

Subsection F. This subsection has a table for entering Point of Contact (POC) information about key government personnel involved with the project. It is divided into six blocks. Each block has

a space for entering the Point of Contact's "Name", "Activity" (name of the organization/command that the person works for), "Code" (Organizational Code used to indicate which part of the organization/command the individual works for), "Phone" (best telephone number to use to contact the individual), and "E-mail" (best e-mail address to use to contact the individual). Ensure blocks 3 and 4 are completed as a minimum.

Block 1. Assistant Program Manager. Most SYSCOM and PEO funded installation projects will have an Assistant Program Manager (APM). If the project does not have association with an APM, then this part of the form does not need to be filled out. If the project does have an APM, their POC information should be entered.

Block 2. Configuration Manager/ILS Manager. Most SYSCOM and PEO funded installation projects will have a Configuration Manager or Integrated Logistic Support (ILS) Manager. If the project does not, then this part of the form does not need to be filled out. If the project does, their POC information should be entered.

Block 3. Installation Representative. This block must be completely filled out for the form to be accepted if Work Scope is from a program office. Most SYSCOM and PEO installation projects will have an Installation Representative who is responsible for ensuring the completeness and uploading of the Shore Work Scope Form. This part of the form is used to identify the key working level individual (most knowledgeable about project installation requirements) at the organization funding the project. In many cases, this is the originator of the form.

Block 4. Subject Matter Expert/Technical Expert. This block must also be completely filled out for the form to be accepted. This part of the form is used to identify the government representative who is the best source of technical knowledge about the system to be installed, removed, or altered. The person may reside in a program office or at a field activity.

Block 5. In-Service Engineering Activity (ISEA). If an In-Service Engineering Activity exists for the system to be installed, removed, or altered, enter POC information.

Block 6. Other. Enter in this block, other important POC not identified in parts 1 through 5. When the project is externally funded (i.e. OCF) by an organization other than Team SPAWAR, use this block to identify the key individual responsible for executing the installation (i.e. the Project Engineer).

2.2 Section II, Information and Description of Work to be Performed:

This section contains all the necessary information to understand, assess, and estimate the scope of work. This section contains a description of the work and lists the hardware and software being provided by the program office and any other critical items.

Subsection A. In the "System Description:" field, enter a description of the system being installed and its capabilities. This entry is used to populate a SPIDER database field and is typically a two line statement identifying the system by name and briefly describing its function.

Subsection B. In the "Job Scope:" field, enter a detailed description of what the job entails. If this installation work will be part of a consolidated task statement, clearly describe each portion of the work being consolidated. If necessary, this part of the form may be used to reference other documents submitted with the form.

Subsection C. (Hardware Upgrade Description). This subsection consists of a single data entry field followed by three tables of data items, followed by two data entry fields. This subsection is concerned with all equipment and major hardware items that will not be purchased or supplied by the Installation Activity. It does not apply to hardware that will be supplied by the Installation Activity. The technical data provided shall be based on manufacturer provided data, formal test data, or another trustworthy source. Accurate data must be provided in the second and third tables, because these tables are critical to calculating the change in current and air-conditioning requirements and for developing cost estimates for possible infrastructure improvements. When the technical data required to complete the tables in this subsection is not available or is suspect, accurate data may be obtained through manufacturer specifications or measurement. If the Work Scope form originator is not a PEO program office, the originator may task the SPAWAR installation activity to conduct the research and/or testing needed to complete the table.

- At the top of this subsection, after "Equipment Delivery Date (EDD):" enter the date by which the delivery of all supplied equipment will be completed.
- In the first column of the first table, list all existing major hardware components that are part of the system or systems being installed, are already installed at the site, and will remain installed when the installation is finished. This does not include items such as large switches that the systems or systems may interface with, but which are not part of the system. (The data collected in the first table is not used to calculate the change in current or heat load. It is used to calculate the overall impact of the system or systems on the site's infrastructure.
- In the first column of the second table list all new (new to this site — the equipment can be reconditioned or equipment removed from another site or warehouse) hardware components that will be supplied to the Installation Activity for installation.
- In the first column of the third table list all equipment that is to be de-installed. If disposal of the removed items will be the responsibility of the Installation Activity, this needs to be made clear in this column. Otherwise disposing of the de-installed equipment will be assumed to be a site responsibility.
- In the second column of each table, list the amps (maximum steady-state) that the unit in the first column requires and the corresponding voltage (e.g., 12 @ 120 VAC, 10 @ 48 VDC). If any equipment requires 3-phase power, this fact shall be noted (with an asterisk or note identifier) and a full description of the three phase requirement (e.g. Requires three phase delta power at 115 VAC with a peak requirement of 24 amps and an average operational requirement of 17 amps per phase.) shall be stated in a note below the table.
- In the third column of each table, enter the amounts of heat generated (in BTUs per hour) by the units in the first column.
- In the fourth column of each table, enter the quantities (of the units identified in the first column) that fit into the category covered by the table.
- Make the calculation for the net gain/loss of Amps and BTUs/Hr and enter the net gain or loss in both Amps and BTUs per hour at the bottom of this subsection. If current will be

delivered at different voltage levels, enter the net current gain or loss at each voltage. If three phase current is required, state the quantity of current required for each phase in the notes.

Subsection D. (Software Upgrade Description). This subsection consists of a single data entry field followed by one table of data items. This subsection is only concerned with software that will not be purchased or supplied by the Installation Activity. In the "Equipment Delivery Date (EDD):" field, enter the date by which the delivery of supplied software will be completed. In the provided single-column table, list the software to be provided by name and version/release if a specific version/release will be supplied or with ("latest rev") next to the title if the latest revision to the software will be supplied.

Subsection E. (Scope Criteria Checklist). This subsection provides a listing of items that could be required to support the installation(s) covered by the form. All of the potential issues that could be entered might not be apparent at the time that the form is prepared. Some issues might not become apparent until after a site survey is conducted. However, known issues should be addressed on the form to increase the accuracy of any cost estimates. The originator should clearly indicate who is responsible when completing the form. If the originator knows that an item does not apply, he or she should clearly state, in the first space under the item, that *"This item does not apply"*. If the originator of the form is not certain if the item applies, the originator should state *"To be determined"* in the first space under the item. If a site survey is planned, the originator may state *"To be determined during site survey."* The items listed in this subsection are discussed below.

- **Item 1** – "System Drawings (IRD) provided?". In this subsection asks if system drawings are provided. System drawings are Installation Requirements Drawings (IRD). After asking this question, the form provides three check boxes. Check "Yes" or "No" as applicable. Provide Point of Contact for obtaining the drawings if not provided. If drawings are not required, check "Not required".
  Note: To check a box, double click the box you would like to checkmark and select checked under default value, then click OK.
- **Item 2 -** "List any special power, or any other requirements (e.g., Host Nation Agreement, E3)." A special power requirement, for example "UPS power equipment shall be provided and installed by the Installation Activity to enable all equipment to run for at least two hours without base power and to provide continuous power conditioning and surge suppression." should be listed. If Site Approval or Host Nation Approval is required the form should so state and indicate who is responsible for completing and submitting the Site Approval forms.
- **Item 3 -** "List INFOSEC (crypto) requirements for this installation:". Crypto hardware requirements should have been identified in section II, subsection C. This item is used to address other INFOSEC issues such as:

  a. " Installation Activity to install Protected Distribution System for new classified LAN drop in Hanger 5. Site will provide room hardening at LAN drop location."
  b." Installation Activity to procure and install two KIV-7HS cryptos. NCTS Blank to obtain and load required KEYMAT."

c. "No security escorts are available. The installing activity must provide appropriately cleared personnel."

- **Item 4 -**"List any long lead items for this installation". This item is used to notify the Installation Activity when the originator is aware that certain required items (e.g. 12-pin connectors for pierside connectivity or Host Nation Approval or Site Approval) should be ordered/requested as soon as possible to minimize installation delays because they take many months to obtain after they are ordered. The estimated time to obtain the long-lead items should be stated.
- **Item 5 -**"List any special cable and connector requirements for this installation". For example, if every SIPRNET drop on your base uses red MTRJ connectors, and you want to be sure that you get red MTRJ connectors installed on ten new SIPRNET LAN drops, then one entry under this item should state something like "*Install red MTRJ connectors on all new SIPRNET LAN drops and patch panel appearances."* If your base has an extreme rodent problem, and you need to install cable between two buildings, you could state something like, *"All outside plant cable shall be double-armored cable designed to resist rodent attack."*
- **Item 6 -**"Describe interface requirements for this installation (scope interfaces/shared boundaries). The information (if known) will help the IMO identify where combined and integrated shore installation efforts can occur". If, for example, the installation will require a 100BaseT connection to the existing NIPRNET inner router in Bldg 1 via an existing single mode fiber optic cable between buildings 1 and 2, then that should be explained in this part of the form along with who will provide what to accomplish the connection. For example, the site could be tasked to obtain permission to use the fiber strands, patch panels and router port while SPAWAR's Installation Activity would provide converters, patchcords, and other hardware and installation services needed to establish a link. If the installation requires a T1 connection to a remote site, the site could be required to submit a TSR to provide a T1 appearance at a local patch panel at each end of the link. Sometimes if these tasks are not identified and assigned early in the project, significant delays could result. In these cases, the task should also be identified as a "Dependency for Installation" in item 7
- **Item 7** -"Dependencies for this installation**".** Use this part of the form to list events (installation projects completed, permissions granted, funding provided, etc.) that must occur before the project can be started or completed when there is a significant risk that the events could delay or prevent the installation. The purpose of this is to allow the SPAWAR IMO to develop a risk management strategy for handling the risks associated with these dependencies.
- **Item 8 -** "Facility modification or site prep work required to support this installation". This part of the form is typically used to lists tasks such as:

  a. Raised Floor Installation
  b. Power Panel Installation
  d. Building Construction
  e. Pouring concrete pads for antenna foundations
  f. Making large holes in reinforced concrete floors and ceilings

  However, it can also be used to list tasks that the installing activity may normally do (e.g. install cable trays), but that the originator plans to have accomplished by another organization. In many cases, the Program Office or other funding activity may assign all

or part of these tasks to a Publics Works Department or a contractor specializing in the required work. If any Site Preparation Work is divided between the SPAWAR Installation Activity and other activities, this part of the form must clearly state who will be responsible for what. For example, the statement "New power panel required" is incomplete. It should provide details such as *"New 100 amp 3-phase 208/120 VAC power panel (already contracted for) is to be installed in Room 102 by PWC by July with one 100 amp main breaker and 30 (each) 20-amp single pole breakers. Installing activity shall remove six 20-amp breakers and install two three-pole 30-amp breakers to support new server cabinets. Four single pole 20 amp breakers will be marked as reserved for new receiver racks and used for this installation. Power panel data (used to determine required breaker type/AIC rating) to be supplied to installation activity by June."*

- **Item 9 -**"Caveats, concerns, risks, and/or special requirements for installation work" Use this part of the form to express any concerns that are not covered by Items 1 through 8. For example, if certain dates are off-limits because of holidays, festivals, or scheduled exercises, that should be noted here.
- **Item 10 -**"Submission date of FRCB package". Enter the date that the FRCB package submission is scheduled to be completed. This should be no closer than 90 days prior to the start of installation unless the installation requirement is emergent and NETWARCOM agrees to prioritize the FRCB submission.
- **Item 11** - "Information Assurance Certification & Accreditation". Enter the name of the Designated Approving Authority (DAA) certifier for the installation and the date of expiration of the current certification. If the Information Assurance (IA) certification is in progress, provide the POA&M in the table provided and the expected date of approval.

2.3 Section III, Installation Deliverables:

This section is used to list deliverable requirements that are not covered by the SIPH.

Subsection A states that "Deliverables/services shall be in accordance with the Shore Installation Process Handbook (SIPH)" to emphasize that all Team SPAWAR installation activities are required to produce the deliverables required by the (SIPH). This subsection is used to list deliverables that are not covered by the SIPH. These items could be documentation (e.g. documentation related to Italian Mixed Commission Approval or documentation not normally provided by the Installation Activity (SSAA or ULSS)), equipment (e.g. switches and routers) not listed in subsection II.C, software not listed in subsection II.D, disposal services, OPEVAL testing support, etc..

Any document deliverables that the funding activity (normally a PEO program office) is expecting from the Installation Activity (normally a SPAWAR Systems Center IMO) must be addressed in the SIPH or listed here. Attachment B provides additional guidance and addresses the deliverables that are most likely to be required by the SIPH.

Subsection B - "Any deliverable generated by this task shall be uploaded by the installation activity to the currently designated Team SPAWAR repositories". A repository has been assigned to each type of deliverable. The specific repositories are not identified here. However, SPAWAR IMOs are aware of the repository requirements and are obligated to comply with

them. The SIPH also provides specific requirements for the delivery of other deliverables (e.g. Installation Design Plans, SOVT documents, and As-built drawings).

Attachment A

Shore Categories and Definitions

Use the following categories and definitions for Shore Work Scope Form Question I3, Alt Type.

SITEALT - An approved permanent change that affects the form, fit, and/or function of the configuration of a shore facility or command and that is documented in an Installation Design Plan (IDP) and implemented through the Shore Installation Process. SITEALTs are classified by command name title/type and comprise any change in C4ISR equipment or fittings that involves changes in design, material, quantity, location, or relationship of the component parts of an assembly or C4ISR system. SITEALTs can be split into design and production phases. The "Design" phase includes the Site Survey, the development and coordination Base Electronic System Engineering Plan (BESEP), and development of the IDP. The "Production" phase includes the physical onsite installation efforts.

Field Change (FC) - A mechanical, electronic or electrical modification made to a single electronic equipment or system. The FC is confined to modifying an existing single nomenclature equipment or single nomenclature equipment within a system. Field Changes must meet the following conditions:
1. Change cannot affect form, fit or overall function of the equipment/system.
2. No additional power, heating, ventilation, or air conditioning (HVAC) is required.
3. No change in external cabling or interfaces to other equipments/systems can be implemented as part of the FC.
4. No software changes
Examples include: RAM upgrades, circuit card component change, equipment module replacement, firmware, mailout.

Engineering Change (EC) - A mechanical, electronic, electrical or software change made to a system. The EC can be utilized to modify multiple existing equipments within a system. The EC is used to replace components within a system (i.e. COTS replacement) or add COTS components to a system (i.e. Printer). The EC is also used for software changes to a system. Engineering Changes must meet the following conditions:
1. Change cannot affect form, fit or overall function of the equipment/system.
2. No additional power, heating, ventilation, or air conditioning (HVAC) is required.
3. No change in external cabling or interfaces to other systems can be implemented as part of the EC.
Examples include: Software loads/upgrades, workstation refresh, software mailout, COTS replacements.

Non-Permanent Change (NPC) - Commonly referred to as a "Temporary Installation", is defined as a Non-Program of Record (NPR) experimental change that will be installed for Test & Evaluation (T&E) and Research & Development (R&D) purposes and to demonstrate a new or improved capability for the fleet/site. A NPC may be installed on a specific shore site or group of sites. The testing criteria is normally carried out during an at-sea exercise or during an acquisition program's technology demonstration for further development in pursuit of a

Permanent Change/Program of Record (POR) fielding if the NPC reaches maturity. In some cases, for NPC's that were installed and demonstrated during a previous exercise, the systems/equipment may need to be installed and additional testing conducted during another exercise to meet the overall criteria for a new capability. Additionally, NPC's can be used to provide an interim capability to support operational and training requirements for Platform TYCOM's, NETWARCOM, Operational Commanders, Intermediate Superiors in Command (ISIC's), or Commander Fleet Forces Command (CFFC) when formal justification and approval is provided. NPCs are required to be removed within one year or completion of one operational deployment cycle (whichever is shortest) of the time the alteration is installed. The Life Cycle Manager (LCM) will ensure the NPC sponsor removes (if required) the NPC and the site is re-configured to its original condition (condition prior to the change being installed).
Examples: Trident Warrior 06 support, pre-deployment workups, Joint Tactical Fleet Exercise (JTFX), Fleet Exercises.

Attachment B
Installation Deliverables Covered by the SIPH

Installation Schedule — Plan of Action and Milestones. See SIPH Section 4 and Appendix H for detailed information on format and contents.
Site Survey In-Brief. When a Site Survey is required, Appendix K of the SIPH provides a Site-Survey In-Brief Outline.
Site Survey Out-Brief. Appendix L of the SIPH provides a Site-Survey Out-Brief Outline.
Site Survey Report. A site survey report contains site survey findings in greater depth than the information provided at the Out-Brief. It allows plans to be adapted to the conditions at the site, and provide more in-depth information than is typically available from site documentation. Site surveys provide the opportunity to have installation issues addressed and answered in advance of the installation with full site participation. See SIPH Section 4 and Appendix M for detailed information on format and contents.
BESEP or TSIP (training sites only). A BESEP is a Naval Message or Naval letter that serves as the agreement between the installing activity (normally a SPAWAR Systems Center), the site receiving the installation, and all other parties that are affected or have responsibilities during the installation. The BESEP defines the installation plan as well as the physical, mechanical, electrical, safety, testing, training support, and operational transition requirements of the installation. An TSIP performs the same basic functions as a BESEP. It is only used for training sites. See SIPH Section 5 and Appendix O1 for detailed information on BESEP format and contents.
Installation Design Plan (IDP). The IDP is a drawing package that contains all of the information needed to allow installers to successfully complete and troubleshoot an installation. The developer of the IDP is responsible for specifying methods and materials in enough detail to enable trained installers to complete an installation that meets all applicable requirements. The IDP should also contain circuit diagrams and other drawings like block diagrams designed to aid in troubleshooting and maintenance. See SIPH Section 5 and Appendix Q for detailed information on format and contents.
Site Approval. NAVFACINST 11010.45 Contains a Section that describes the Site Approval Process. While the SPAWAR installing Activity cannot guarantee delivery of Site Approval, Site Approval request forms (NAVFAC 11010/31 (Rev. 5-20010 and supporting documentation can be prepared, submitted, and tracked by SPAWAR Installation Activities. Projects having explosives safety, airfield safety, or electromagnetic safety implications require a safety certification by specific commands. See the NAVFAC instruction for more information.
Training Materials. SPAWAR Installation Activities are required to provide "On-the-Job" (OJT) training during the installation. If this is the only training required, the Work Scope form originator does not need to call this out. However, standard OJT training might not be adequate to enable customers to operate and maintain the installed equipment. Program Managers may decide that the installing activity shall provide or contract with a vendor for formal background training to ensure that on-site personnel will be capable of operating and maintaining the system or systems being installed. If this is known to be the case, this shall be stated on the Work Scope form. The originator may state something like, *"Installation Activity to supply two (each) one-week courses of local factory-equivalent ATM switch training. Each course will train up to twelve students. Local training equipment storage and classroom facilities to be provided by the*

installing activity (local SPAWAR facility 20 miles from the site). Training materials shall be provided in three-ring binders and in CD-ROM format."

FRCB Documentation Support. For Team SPAWAR internally funded (e.g. PEO funded) installations, FRCB documentation would normally be provided by the program office. Exceptions to this assumption shall be stated on the Work Scope form. For externally funded (i.e. Other Command Funded), the Installing Activity shall be required to prepare the FRCB case form and any other required documentation. A typical statement would be something like *"Installing activity shall prepare and submit the FRCB case form with the supporting IDP, Site-Specific SOVT, and E3 Study to be prepared by the installing activity and the remaining supporting documentation (ULSS, SSAA, ATO/IATO) to be provided by the SPAWAR Program Office."* The documentation required to obtain FRCB approval is listed in NAVNETWARCOMINST 12271.1 dated 17 Oct 2006.

PITCO Report. This item is not required for all equipment installations and when required, it is usually provided by the program office In-Service Engineering Agent (ISEA). Exceptions to this assumption shall be stated on the Work Scope form. For externally funded installations, the installing activity is responsible to make the determination if Pre-Installation Test and Checkout (PITCO) is warranted and subsequently provide PITCO reports. The PITCO process is described in Section 6 of the SIPH. Appendix S of the SIPH is a sample PITCO report.

Installation In-Brief. The SIPH requires that Project Engineers prepare an Installation In-Brief for each installation. See Section 6 and Appendix V (Sample In-Brief) of the SIPH.

Site-Specific SOVT. The Site-Specific SOVT is a standard SIPH deliverable. It is the formal document used to test the installed system/equipment to show that it is fully operational. It is also used to document the exact configuration of what was tested. The SOVT Team will conduct system-level testing for all interfaces and impacted systems, ensuring system operational capabilities are demonstrated to site personnel who will witness successful SOVT completion by signing the SOVT document. Section 8 of the SIPH and SPAWARINST 3084.1 provide guidance for SOVT Documentation and completion.

Installation Out-Brief. The installation out-brief is a standard deliverable prepared and presented at the end of installations. It should explain the systems and capabilities that have been installed and summarize the results of the installation. A signed Installation Completion Report (ICR) should be a product of the Installation Out-Brief. Appendix X of the SIPH is a template for completing the Out-Brief.

Installation Completion Report. The Installation Completion Report (ICR) is explained in Section 8. It records the completion status including discrepancies and required actions for all installation aspects including what training (and training materials) and logistic support (spares, technical manuals, User Logistic Support Summary) has been provided.

As-Built Drawings. As-Built drawings is a standard deliverable for all hardware installations. The IDP (discussed above) is revised to show any differences between the planned installation and the actual completed physical installation.

Configuration Data Managers Database - Open Architecture (CDMD-OA) Documentation. The CDMD-OA database tracks the status and maintenance of naval equipment and their related logistics items (drawings, manuals, etc.) on ships and naval activities around the world. There is a new requirement to update the CDMD-OA database when alterations/installations are completed at shore sites. Typically on ships, as part of the ILS installation package, the ISEA is responsible for providing CDMD-OA Validation Aid pages (VALAIDS) to the NTR. The NTR will then conduct a physical configuration validation at the completion of system installation.

The marked-up VALAIDS will then be turned over to the ISEA for final update of the CDMD-OA concurrently with the Alteration Completion Report. (See SPAWAR Technical Manual 708 Rev 2.) NETWARCOM is requiring shore installations to complete the same CDMD-OA requirement. For internally Team SPAWAR funded, the program office provides the VALAIDS through their ISEA. Redlines to the VALAIDS would be the standard shore installation process deliverable in this case. For externally funded, Team SPAWAR executed installations, the installing activity accepts responsibility for entering the CDMD-OA work file and producing the VALAIDS before and after the installation.

Completion Message/Letter. This message or letter is required for all completed installations and is discussed in Section 8 of the SIPH.

Actual Costs. There is a requirement for the installing activity to provide actual cost data to their sponsoring activity. In the case of SPAWAR executed installations the installation activity shall upload the actual cost of the installation into the SPIDER Database.

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DATE - _____ VERSION - _____

Note: See SIPH Appendix D1 for instructions for completing this form.

I. PROGRAM/PROJECT INFORMATION: ☐ PEO ☐ OCF ☐ 3rd Party

A. Program/Project Office: _____ Submitted by: _____ Telephone: _____ E-mail: _____

B. System Name/Nomenclature: _____

C. Alteration (Alt) Brief: _____

Installation Type: ☐SITEALT ☐Shore FC ☐ Shore EC ☐ Shore Non-Permanent

D. Funded FY: _____ Subhead:_____ Funds Exp Date:_____

E. Installation Schedule and Location (add rows as needed):

Tracking #	Command, Base, Building	UIC	Install Start	Install End	Mission Critical Date

F. Government POCs:

1. Assistant Program Manager (APM) (if PMO System)	2. Configuration Manager / ILS
Name: Activity: Code: Phone: Email:	Name: Activity: Code: Phone: Email:
3. Installation Representative (if PMO System)	**4. Subject Matter Expert / Technical Expert**
Name: Activity: Code: Phone: Email:	Name: Activity: Code: Phone: Email:
5. In-Service Engineering Activity (ISEA)	**6. Other (specify): (OCF & 3rd party enter. Project Engineer)**
Name: Activity: Code: Phone: Email:	Name: Activity: Code: Phone: Email:

II. INFORMATION AND DESCRIPTION OF WORK TO BE PERFORMED:

A. System Description: _____

B. Job Scope (Detailed Description of work) : _____

(Note: If this installation work will be part of a consolidated project, clearly describe each portion of the work being consolidated in this scope statement).

C. Hardware Upgrade Description:

Equipment Delivery Date (EDD): _____

List hardware components for this installation (add rows as needed).

Existing HW components that will be re-used:	Amps/unit	BTU/hr/unit	Qty
1.			
2.			
3.			

New HW components:	Amps/unit	BTU/hr/unit	Qty
1.			
2.			
3.			

De-Installed HW components and disposition:	Amps/unit	BTU/hr/unit	Qty
1.			
2.			
3.			

	Amps (+/-)	BTU/hr (+/-)
Net Sum Gain/Loss for complete installation:	_____	_____

D. Software Upgrade Description:

Software Delivery Date: _____

List software components for this installation (software media shall include the indicated release of the following, add rows as needed):

1.
2.
3.
4.

E. Scope Criteria Checklist:

1. System Drawings available?
   ☐ IRD ☐ IDP ☐ Not required

   POC:_____

2. List any special power, or any other requirements (e.g., Host Nation Agreement, E3):
   a. _____
   b. _____
   c. _____

3. List INFOSEC (crypto) requirements for this installation:
   a. _____
   b. _____
   c. _____

4. List any long lead items for this installation: ☐ N/A for OCF
   a. _____
   b. _____
   c. _____

5. List any special cable and connector requirements for this installation: ☐ N/A for OCF
   a. _____
   b. _____
   c. _____

6. Describe interface requirements for this installation (scope interfaces/shared boundaries). (The information (if known) may help the IMO identify where combined and integrated shore installation efforts can occur.):
   a. _____
   b. _____
   c. _____

7. Dependencies for this installation:
   a. _____
   b. _____
   c. _____

8. Facility modification or site prep work required to support this installation:
   a. _____
   b. _____
   c. _____

9. Caveats, concerns, risks, and/or special requirements for installation work:
   a. _____
   b. _____
   c. _____

10. Submission date of FRCB package: _____

11. Information Assurance (IA) Certification & Accreditation (C&A) (if applicable):
    a. Designated Approving Authority (DAA):_____
    b. Date of C&A (ATO/IATO) expiration:_____
    c. If C&A has expired, provide a Plan of Action and Milestones (POA&M). POA&M should include as a minimum the following information:

Action or Milestone:	Date:
1. Submission of Certification & Accreditation package	
2. Navy Certification Authority (SPAWAR 05) forwards endorsement	
3. Navy DAA (NNWC) decisions C&A package	

III. INSTALLATION ACTIVITY DELIVERABLES:

A. Deliverable Requirements. Deliverables/services shall be in accordance with the Shore Installation Process Handbook (SIPH). List any additional deliverables or services not covered by the SIPH.

a. _____
b. _____
c. _____

B. Repository Requirements. Any deliverable generated by this task shall be uploaded by the Installation Activity to the currently designated Team SPAWAR document repositories. List any additional repository requirements below:

a. _____
b. _____
c. _____

APPENDIX E – RISK MANAGEMENT PLAN

1. During the development of the Fielding Plan, the Program Manager will be required to develop a Risk Management Plan. It lists all of the potential installation and operational risks that have been identified as part of a formal system risk evaluation. The Risk Management Plan will detail the actions or procedures that the Program Manager will employ to manage or mitigate the identified risks. Figure E-1 provides an example of a Risk Management Plan.

2. **Elements of a Risk Management Plan**
   A Risk Management Plan should contain the following elements in order to clearly define the risks, impact, and mitigation plan:

   a) **RISK/DEFICIENCY -** This element is a reasonably detailed explanation of the risk that has been identified. The key to this element is to define the risk to a level that provides appropriate insight into the true nature of the risk.
   b) **IMPACT -** This element is the expected functional impact to the project if the risk is left unmanaged. This is not expressed in dollars, but is rather a verbal description of the impact.
   c) **MITIGATION PLAN -** This element describes the steps that the project team will take to manage or minimize the risk. It is important to describe the plan to a level of detail that will allow a solid plan to be executed.
   d) **ESTIMATED VALUE -** This element provides an estimated value of the cost to the project (in dollars) if the identified risk was left unmitigated. This value is generally derived via an engineering estimate.
   e) **PROBABILITY -** This element documents the estimate of the probability (in percentage) that the identified risk will occur. This is also based on engineering judgment.
   f) **ESTIMATED IMPACT -** The estimated impact is determined by multiplying the estimated value by the probability of occurrence. For example, a risk with an estimated value of $500,000 and a 75 percent probability of occurrence would have an estimated impact of $375,000. As a general rule, the sum of all estimated impacts for a project equals the amount of Management Reserve a project should hold.

Risk Mitigation Plan

The purpose of this Risk Mitigation Plan is threefold:

1) Identify the risks associated with installation and testing of <*enter system name*> at <*enter location*>.
2) Describe the impact to system capabilities while operating with the identified deficiencies
3) Describe the measures necessary to mitigate the impact of the identified risks .

	RISK/DEFICIENCY	IMPACT	MITIGATION PLAN	EST VALUE	PROB	EST IMPACT
1	Unable to establish communication with Sub from the TS shore enclaves. This includes Organization e-mail and ISDS.	No impact to current operational capability.	Complete SCI Networks Shore SOVT with the completion of the installation/SOVT of the first submarine.	10K	10%	1K
2	Unable to establish communication with Sub from the SI shore enclaves. This includes Organization e-mail and ISDS.	No impact to current operational capability.	Complete SCI Networks Shore SOVT with the completion of the installation/SOVT of the first submarine.	12K	10%	1.2K
3	Installation of new 6-port Ethernet module into existing Cisco 4700 policy router.	Current ADNS operational capabilities could be lost.	1. Make a backup of the configuration prior to making changes. 2. Print a copy of the configuration prior to making changes. 3. Reconfigure router.	30K	40%	12K
4	Modifications to existing Proteon CNX-600 ADNS router. Risk of losing existing configuration data when adding routes to support new enclaves.	Current ADNS operational capabilities could be lost.	1. Make a backup of the configuration prior to making changes. 2. Print a copy of the configuration prior to making changes. 3. Initialize CNX-600 #2 (backup to CNX-600 #1). 4. Reconfigure CNX-600 #1.	30K	80%	24K
5	Modifications to existing Proteon CNX-500 OTAM router. Risk of losing existing configuration data when adding routes to support new enclaves.	Current ADNS OTAM operational capabilities will be lost.	1. Make a backup of the configuration prior to making changes. 2. Print a copy of the configuration prior to making changes. 3. Reconfigure CNX-500 router.	40K	80%	32K

Figure E-1 Sample of a Risk Management Plan.

"NOTIONAL" SHORE WORK PLAN BY TRACKING NUMBER

Install No	PMW	IMO	Subhead	Fund Status	Area	Region	Command	Base City	System	Equip Delivery Date	PMW Prod Sched Start	PMW Prod Sched End
07-0001	PMW 780	J	52JG	NOFUND	P	PSW	RMOCC PT. MUGU	PT. MUGU	TAC MOBILE/NETWORK UPGRADE (INC 1)	8/6/2007	4/2/2007	6/22/2007
07-0002	PMW 780	J	52JG	NOFUND	P	PSW	RMOCC PT. MUGU	PT. MUGU	TAC MOBILE/COMMAND AND CONTROL UPGRADE (INC 1)	8/6/2007	4/2/2007	6/22/2007
07-1000	PMW 790	J	5T6M	FUNDED	L	LMA	NCTAMS LANT	NORFOLK	AN/FSQ-207 JMINI CONTROL SYSTEM	1/20/2006	4/2/2007	6/30/2007
07-1001	PMW 790	D	5T6M	FUNDED	P	PMP	NCTAMS PAC	WAHIAWA	AN/FSQ-207 JMINI CONTROL SYSTEM	1/20/2006	2/20/2006	6/30/2006
07-1002	PMW 790	J	5T6M	FUNDED	E	EMD	NCTAMS EURCENT	NAPLES	AN/FSQ-207 JMINI CONTROL SYSTEM	1/20/2006	2/20/2006	6/30/2006
07-1003	PMW 790	D	5T6M	FUNDED	P	PWP	NAVCOMTELSTA GUAM	FINEGAYAN	AN/FSQ-207 JMINI CONTROL SYSTEM	1/20/2006	2/20/2006	6/30/2006
07-1005	PMW 790	J	52PQ	FUNDED	E	EMD	NAVCOMTELSTA NAPLES	NAPLES	TSW/ST1000 NODE 175		10/1/2007	10/20/2007
07-1006	PMW 790	D	5T6M	CLSD	P	PSW	NAVCOMTELSTA SAN DIEGO CA	NAS NORTH ISLAND	TSW/HSGR GOV OVERSIGHT		10/23/2006	10/27/2006
07-1007	PMW 790	D	5T6M	CLSD	P	PMP	NCTAMS PAC	WAHIAWA	TSW/HSGR GOV OVERSIGHT		10/23/2006	10/27/2006
07-1008	PMW 790	D	52PQ	FUNDED	P	PMP	NCTAMS PAC	WAHIAWA	TSW/ADMS/PSAX 2300	6/15/2007	6/15/2007	8/13/2007
07-1009	PMW 790	J	52PQ	FUNDED	L	LMA	NCTAMS LANT	NORFOLK	TSW/ADMS/PSAX 2300	5/15/2007	7/7/2007	8/13/2007
07-1010	PMW 790	J	52PQ	FUNDED	L	LMA	NCTAMS LANT	NORFOLK	TSW/ADMS/ST-1000		11/9/2007	12/7/2007
07-1011	PMW 790	J	57HX	FUNDED	L	LMA	NAVSATCOMMFAC NORTHWEST VA	CHESAPEAKE	TSW/BLACK CORE ROUTING (TEMPALT TW07)	2/5/2007	2/9/2007	3/9/2007
07-1012	PMW 790	D	57HX	CLSD	P	PMP	NCTAMS PAC	WAHIAWA	TSW/BLACK CORE ROUTING (TEMPALT TW07)	2/5/2007	2/9/2007	3/9/2007
07-1013	PMW 790	J	57HX	FUNDED	L	LMA	NCTAMS LANT	NORFOLK	TSW/BLACK CORE ROUTING (TEMPALT TW07)	2/5/2007	2/9/2007	3/9/2007
07-1014	PMW 790	J	57HX	FUNDED	L	LMA	NCTAMS LANT DET HAMPTON ROADS	NORFOLK	TSW/NETWORK MANAGEMENT SYSTEM (NMS) (TW07)	11/30/2006	11/26/2006	1/31/2007
07-1017	PMW 790	J	57HX	FUNDED	L	LMA	COMSECONDFLT	Norfolk	TSW/NETWORK MANAGEMENT SYSTEM (NMS) (TW07)	11/30/2006	11/27/2006	1/31/2007

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APPENDIX G - COST ESTIMATE

								LOCATION						DATE:		
SYSTEM:								TRACKING #						FUNDING DOC #		
COST PLAN					FY XX SPEND PLAN											
					QTR 1			QTR 2			QTR 3				QTR 4	
WBS	TASK NAME	AGENT	CATEGORY	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	
1.6.1	TASK	GOVT	man/hrs	0												
	MANAGEMENT		LABOR	$0												
P	CODE:		travel	$0												
L	SITE SURVEY	GOVT	man/hrs	0												
A			LABOR	$0												
N	CODE:		travel	$0												
N		CNTR	man/hrs	0												
I	CNTR:		LABOR	$0												
N			travel	$0												
G	GOVT COST		TOTAL	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
	CNTR COST		TOTAL	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
1.6.2	BESEP	GOVT	man/hrs	0												
	COORDINATION		LABOR	$0												
	CODE:		travel	$0												
D		CNTR	man/hrs	0												
E	CNTR:		LABOR	$0												
S			travel	$0												
I	IDP & SOVT	GOVT	man/hrs	0												
G	DEVELOPMENT		LABOR	$0												
N	CODE:		travel	$0												
		CNTR	man/hrs	0												
	CNTR:		LABOR	$0												
			travel	$0												
	GOVT COST		TOTAL	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
	CNTR COST		TOTAL	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
1.6.3	HARDWARE	GOVT	man/hrs	0												
	Pre-Fab		LABOR	$0												
P	Pre-Installation		travel	$0												
R	Installation	CNTR	man/hrs	0												
O	CODE:		LABOR	$0												
D	CNTR:		travel	$0												
U	SOFTWARE LD	GOVT	man/hrs	0												
C	CODE:		LABOR	$0												
T			travel	$0												
I	CNTR:	CNTR	man/hrs	0												
O			LABOR	$0												
N			travel	$0												
	MATERIAL	GOVT	man/hrs	0												
			LABOR	$0												
	CODE:		material	$0												
			shipment	$0												
	CNTR:	CNTR	man/hrs	0												
			LABOR	$0												
			material	$0												
			shipment	$0												
	GOVT COST		TOTAL	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
	CNTR COST		TOTAL	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
1.6.4	SOVT & ASBUILTS	GOVT	man/hrs	0												
S	CODE:		LABOR	$0												
Y			travel	$0												
S	CNTR:	CNTR	man/hrs	0												
			LABOR	$0												
T			travel	$0												
U	ILS (TRAINING)	GOVT	man/hrs	0												
R	CODE:		LABOR	$0												
N			travel	$0												
O	CNTR NAME:	CNTR	man/hrs	0												
V			LABOR	$0												
E			travel	$0												
R	GOVT COST		TOTAL	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
	CNTR COST		TOTAL	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
	GOVT TASK COST		TOTAL	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
E	CNTR TASK COST		TOTAL	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
V	BUD COST FOR WORK SKD (BCWS)			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
M	BUD COST FOR WORK PERF (BCWP)			$0												
	ACT COST FOR WORK PERF (ACWP)			$0												

TOTAL TASK MAN/HRS	0	GOVT MAN/HRS	0	CNTR MAN/HRS	0
TOTAL TASK LABOR	$0	GOVT LABOR	$0	CNTR LABOR	$0
TOTAL TASK TRAVEL	$0	GOVT TRAVEL	$0	CNTR TRAVEL	$0
TOTAL TASK MATERIAL	$0	GOVT MATERIAL	$0	CNTR MATERIAL	$0
TOTAL TASK COST	$0	TOTAL GOVT TASK COST	$0	TOTAL CNTR TASK COST	$0

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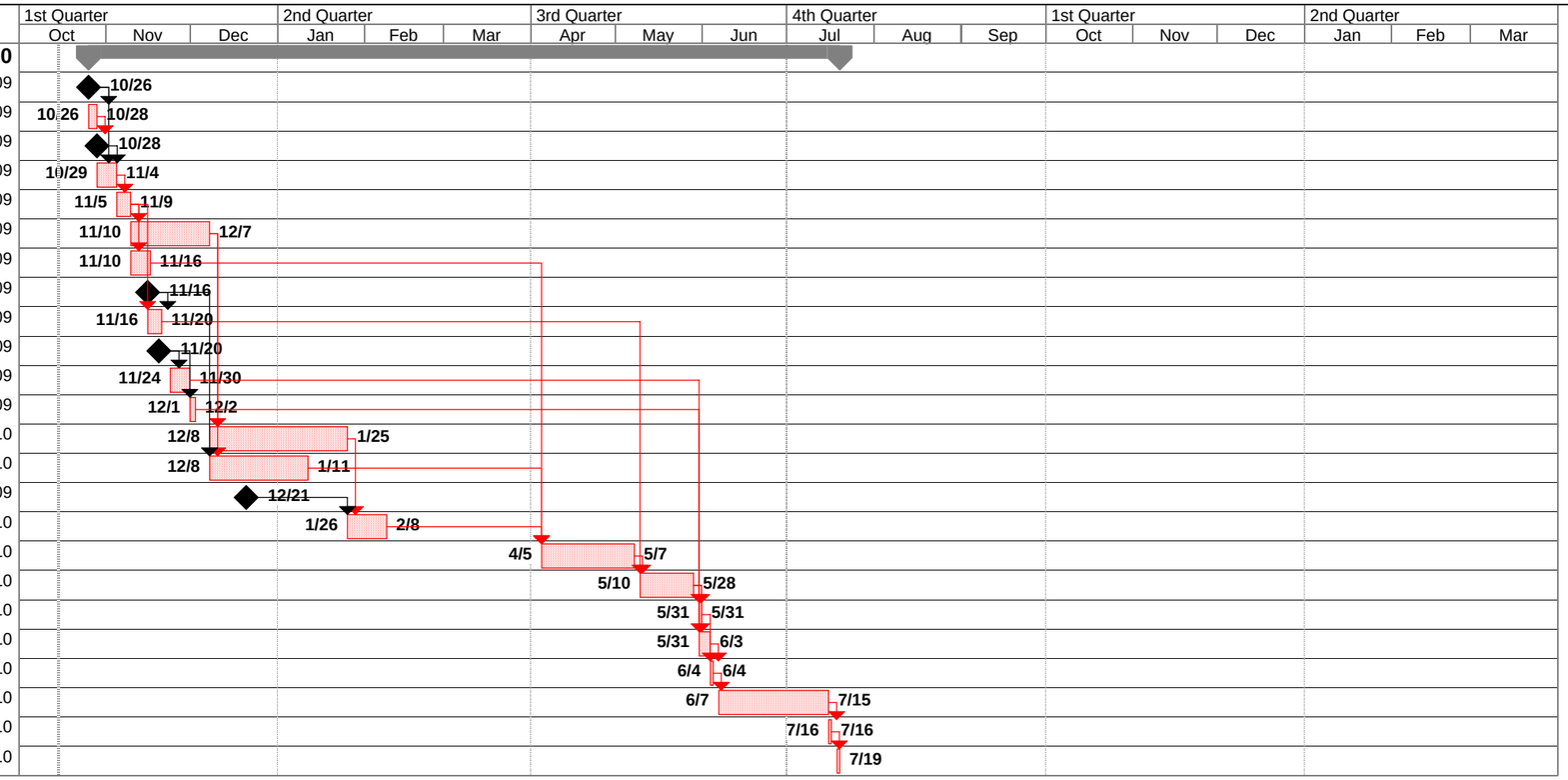
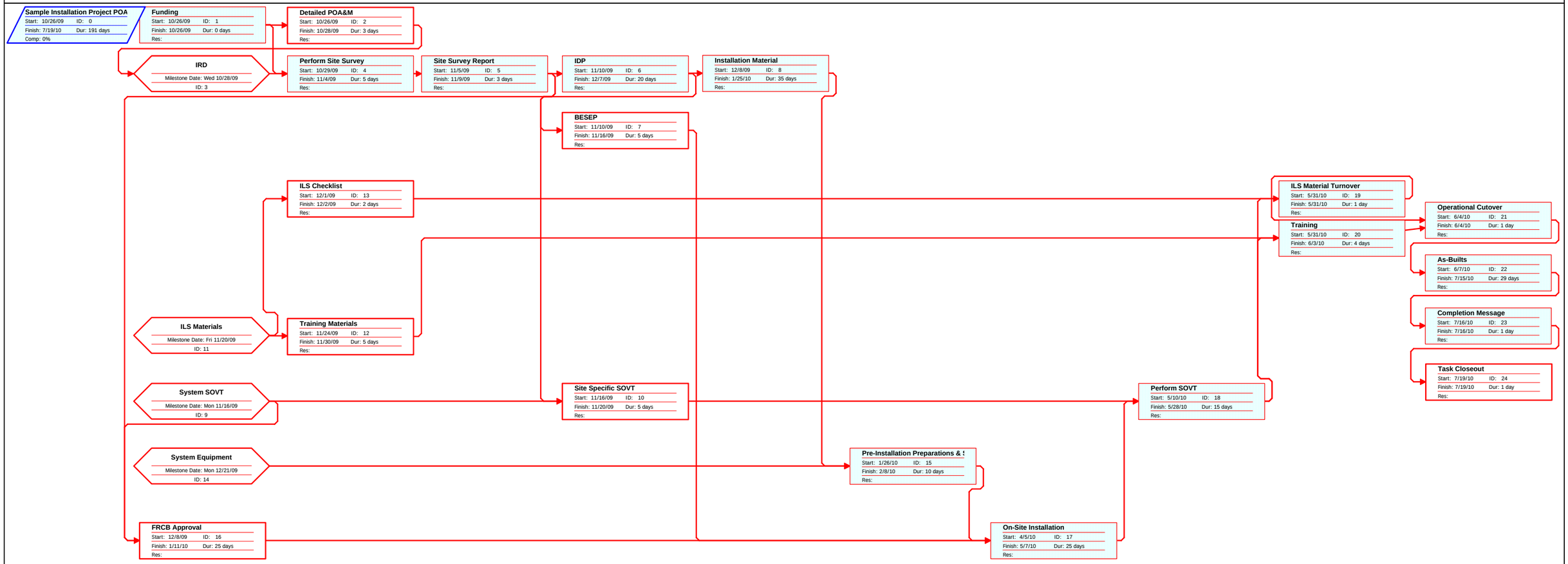
ID	Task Name	Duration	Start	Finish
0	**Sample Installation Project POA&M**	**191 days**	**Mon 10/26/09**	**Mon 7/19/10**
1	Funding	0 days	Mon 10/26/09	Mon 10/26/09
2	Detailed POA&M	3 days	Mon 10/26/09	Wed 10/28/09
3	IRD	0 days	Wed 10/28/09	Wed 10/28/09
4	Perform Site Survey	5 days	Thu 10/29/09	Wed 11/4/09
5	Site Survey Report	3 days	Thu 11/5/09	Mon 11/9/09
6	IDP	20 days	Tue 11/10/09	Mon 12/7/09
7	BESEP	5 days	Tue 11/10/09	Mon 11/16/09
9	System SOVT	0 days	Mon 11/16/09	Mon 11/16/09
10	Site Specific SOVT	5 days	Mon 11/16/09	Fri 11/20/09
11	ILS Materials	0 days	Fri 11/20/09	Fri 11/20/09
12	Training Materials	5 days	Tue 11/24/09	Mon 11/30/09
13	ILS Checklist	2 days	Tue 12/1/09	Wed 12/2/09
8	Installation Material	35 days	Tue 12/8/09	Mon 1/25/10
16	FRCB Approval	25 days	Tue 12/8/09	Mon 1/11/10
14	System Equipment	0 days	Mon 12/21/09	Mon 12/21/09
15	Pre-Installation Preparations & Shipping	10 days	Tue 1/26/10	Mon 2/8/10
17	On-Site Installation	25 days	Mon 4/5/10	Fri 5/7/10
18	Perform SOVT	15 days	Mon 5/10/10	Fri 5/28/10
19	ILS Material Turnover	1 day	Mon 5/31/10	Mon 5/31/10
20	Training	4 days	Mon 5/31/10	Thu 6/3/10
21	Operational Cutover	1 day	Fri 6/4/10	Fri 6/4/10
22	As-Builts	29 days	Mon 6/7/10	Thu 7/15/10
23	Completion Message	1 day	Fri 7/16/10	Fri 7/16/10
24	Task Closeout	1 day	Mon 7/19/10	Mon 7/19/10



Project: Sample Installation Project POA&M
Date: Thu 10/15/09

Task		Milestone		Rolled Up Critical Task		Split		Group By Summary	
Critical Task		Summary		Rolled Up Milestone		External Tasks		Deadline	
Progress		Rolled Up Task		Rolled Up Progress		Project Summary			

Appendix H2 - NETWORK DIAGRAM



Project: Sample Installation Project POA&M
Date: Thu 10/15/09

Critical		Critical Milestone		Critical Summary		Critical Inserted		Critical Marked		Critical External		Project Summary		Highlighted Noncritical	
Noncritical		Milestone		Summary		Inserted		Marked		External		Highlighted Critical			

NOTIONAL SHORE TIMELINE SUMMARY REPORT

Install No	Area	Region	Command	Base City	St Ctry Code	System	PMW	Subhead	IMO	SSC Code /Industry Name	Equip Sched	Mission Critical Date	Fund Request	Fund Received	IDP Comp	PA Plan Prod Start	PA Plan Prod End	PA Revised Prod Start	PA Revised Prod End	PA Actual Prod Start	PA Actual Prod End	Plan SOVT Start	Plan SOVT End	Revised SOVT Start	Revised SOVT End	Actual SOVT Start	Actual SOVT End	AS-Builts	Planned Install Completion Date	Revised Install Completion Date	Install Completion Date	MSG Letter Date Group
07-0001	P	PSW	RMOCC PT. MUGU	PT. MUGU	CA	TAC MOBILE/NETWORK UPGRADE (INC 1)	PMW 780	52JG	J	261010	8/6/2007		2/26/2007			4/2/2007	6/22/2007	5/1/2007	6/15/2007	5/1/2007		5/28/2007	6/22/2007	8/27/2007	10/5/2007			N	6/22/2007	10/26/2007		
07-0002	P	PSW	RMOCC PT. MUGU	PT. MUGU	CA	TAC MOBILE/COMMAND AND CONTROL UPGRADE (INC 1)	PMW 780	52JG	J	261010	8/6/2007		2/26/2007			4/2/2007	6/22/2007	5/1/2007	6/15/2007	5/1/2007		5/28/2007	6/22/2007	8/27/2007	10/5/2007			N	6/22/2007	10/26/2007		
07-1000	L	LMA	NCTAMS LANT	NORFOLK	VA	AN/FSQ-207 JMINI CONTROL SYSTEM	PMW 790	5T6M	J		1/20/2006	6/30/2006				4/11/2006	4/11/2006	5/7/2007	5/7/2007					5/7/2007	5/7/2007							
07-1001	P	PMP	NCTAMS PAC	WAHIAWA	HI	AN/FSQ-207 JMINI CONTROL SYSTEM	PMW 790	5T6M	D	2532	1/20/2006	6/30/2006	5/15/2006			8/5/2006	8/9/2006	4/30/2007	5/11/2007	4/30/2007	5/11/2007	8/10/2006	8/12/2006	4/30/2007	5/11/2007	4/30/2007	5/11/2007	N	8/17/2006	5/31/2007	5/31/2007	
07-1002	E	EMD	NCTAMS EURCENT	NAPLES	IT	AN/FSQ-207 JMINI CONTROL SYSTEM	PMW 790	5T6M	J		1/20/2006	6/30/2006				4/11/2006	4/11/2006	5/7/2007	5/7/2007					5/7/2007	5/7/2007							
07-1003	P	PWP	NAVCOMTELSTA GUAM	FINEGAYAN	GU	AN/FSQ-207 JMINI CONTROL SYSTEM	PMW 790	5T6M	D	2932	1/20/2006	6/30/2006	3/26/2007	3/22/2007		9/3/2006	9/29/2006	9/3/2007	9/14/2007	5/3/2007	5/7/2007			5/7/2007	5/9/2007	5/9/2007	5/10/2007	Y	9/29/2006	5/31/2007		
07-1005	E	EMD	NAVCOMTELSTA NAPLES	NAPLES	IT	TSW/ST1000 NODE 175	PMW 790	52PQ	J			12/30/2007				10/1/2007	10/20/2007	10/1/2007	10/20/2007													
07-1006	P	PSW	NAVCOMTELSTA SAN DIEGO CA	NAS NORTH ISLAND	CA	TSW/HSGR GOV OVERSIGHT	PMW 790	5T6M	D	263200						2/5/2007	2/16/2007			2/5/2007	2/8/2007	2/20/2007	2/22/2007			2/8/2007	2/14/2007	Y	3/9/2007		3/8/2007	
07-1007	P	PMP	NCTAMS PAC	WAHIAWA	HI	TSW/HSGR GOV OVERSIGHT	PMW 790	5T6M	D	2532			11/1/2006	1/18/2007								11/1/2006	11/30/2006	2/14/2007	2/16/2007	2/14/2007	2/16/2007	Y	12/29/2006	4/6/2007	4/6/2007	
07-1008	P	PMP	NCTAMS PAC	WAHIAWA	HI	TSW/ADMS/PSAX 2300	PMW 790	52PQ	D	2532	6/15/2007	12/30/2007	2/1/2007	3/7/2007		6/18/2007	6/29/2007	11/5/2007	11/16/2007			7/2/2007	7/13/2007	11/19/2007	11/30/2007			N	8/13/2007	12/31/2007		
07-1009	L	LMA	NCTAMS LANT	NORFOLK	VA	TSW/ADMS/PSAX 2300	PMW 790	52PQ	J		5/15/2007	9/30/2007			4/18/2007	7/7/2007	8/3/2007	9/5/2007	9/23/2007					9/24/2007	9/28/2007							
07-1010	L	LMA	NCTAMS LANT	NORFOLK	VA	TSW/ADMS/ST-1000	PMW 790	52PQ	J			12/30/2007				11/9/2007	11/30/2007	11/9/2007	11/30/2007					12/3/2007	12/7/2007							
07-1011	L	LMA	NAVSATCOMMFAC NORTHWEST VA	CHESAPEAKE	VA	TSW/BLACK CORE ROUTING (TEMPALT TW07)	PMW 790	57HX	J		2/5/2007	3/12/2007			2/2/2007	2/12/2007	2/16/2007	2/27/2007	3/2/2007	2/27/2007	3/2/2007			3/19/2007	3/30/2007	3/19/2007	3/26/2007				4/4/2007	
07-1012	P	PMP	NCTAMS PAC	WAHIAWA	HI	TSW/BLACK CORE ROUTING (TEMPALT TW07)	PMW 790	57HX	D	2532	2/5/2007	3/12/2007	11/17/2006	12/20/2006	2/9/2007	2/12/2007	3/2/2007	2/15/2007	3/2/2007	2/15/2007	2/27/2007	3/12/2007	3/16/2007	3/19/2007	3/23/2007	3/19/2007	3/23/2007		4/30/2007		4/13/2007	
07-1013	L	LMA	NCTAMS LANT	NORFOLK	VA	TSW/BLACK CORE ROUTING (TEMPALT TW07)	PMW 790	57HX	J		2/5/2007	3/12/2007			2/2/2007	2/12/2007	2/16/2007	2/27/2007	3/2/2007	2/27/2007	3/2/2007			3/19/2007	3/30/2007	3/19/2007	3/26/2007				4/4/2007	
07-1014	L	LMA	NCTAMS LANT DET HAMPTON ROADS	NORFOLK	VA	TSW/NETWORK MANAGEMENT SYSTEM (NMS) (TW07)	PMW 790	57HX	J		11/30/2006	1/31/2007			3/2/2007	2/19/2007	3/9/2007	3/12/2007	3/13/2007	3/12/2007	3/16/2007			6/11/2007	6/29/2007							
07-1017	L	LMA	COMSECONDFLT	Norfolk	VA	TSW/NETWORK MANAGEMENT SYSTEM (NMS) (TW07)	PMW 790	57HX	J		11/30/2006	1/31/2007			3/2/2007	2/19/2007	3/9/2007	3/12/2007	3/13/2007	3/12/2007	3/16/2007			6/11/2007	6/29/2007							
07-1018	L	LMA	NAB LITTLE CREEK	NORFOLK	VA	TSW/NETWORK MANAGEMENT SYSTEM (NMS) (TW07)	PMW 790	57HX	J		11/30/2006	1/31/2007			3/2/2007	2/19/2007	3/9/2007	3/12/2007	3/13/2007	3/12/2007	3/16/2007			6/11/2007	6/29/2007							
07-1019	L	LMA	NCTAMS LANT	NORFOLK	VA	DMR 6.4.1.1 TEST SOFTWARE	PMW 790	5T6M	J		1/17/2007					1/17/2007	1/31/2007	1/17/2007	3/31/2007	1/17/2007	3/31/2007											
07-1020	L	LMA	NCTAMS LANT	NORFOLK	VA	ST1000 5.1.1D S/W UPGRADE	PMW 790	5T6M	O			3/7/2007																				
07-1021	L	LMA	NCTAMS LANT DET HAMPTON ROADS	NORFOLK	VA	ST1000 5.1.1D S/W UPGRADE	PMW 790	5T6M	O			3/7/2007																				
07-1022	E	CEN	NAVCOMTELSTA BAHRAIN	MANAMA	BH	ST1000 5.1.1D S/W UPGRADE	PMW 790	5T6M	O			3/11/2007																				
07-1023	P	PMP	NCTAMS PAC	WAHIAWA	HI	ST1000 5.1.1D S/W UPGRADE	PMW 790	5T6M	O			3/14/2007																				
07-1024	P	PSW	NAVCOMTELSTA SAN DIEGO CA	NAS NORTH ISLAND	CA	ST1000 5.1.1D S/W UPGRADE	PMW 790	5T6M	O			3/15/2007																				
07-1025	P	PMP	SATCOMFAC - WAHIAWA	WAHIAWA	HI	ST1000 5.1.1D S/W UPGRADE	PMW 790	5T6M	O			3/14/2007																				
07-1026	P	PFE	SATCOMFAC - FT BUCKNER	OKINAWA	JA	ST1000 5.1.1D S/W UPGRADE	PMW 790	5T6M	O			3/14/2007																				
07-1027	L	LMA	NAVSATCOMMFAC NORTHWEST VA	CHESAPEAKE	VA	ST1000 5.1.1D S/W UPGRADE	PMW 790	5T6M	O			3/7/2007																				
07-1028	E	EMD	LAGO DE PATRIA	NAPLES	IT	ST1000 5.1.1D S/W UPGRADE	PMW 790	5T6M	O			3/9/2007																				

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APPENDIX J

Site Survey Requirements
(With Checklist)

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A − Shore Site Survey Checklist Example ……A-1

1.0 Site Survey Purpose

Site surveys are visits to potential shore C4ISR Installation locations by qualified installation professionals made to accomplish the following objectives:

a. Finish gathering the information needed to complete the installation design;
b. Compare the information on hand with actual site conditions;
c. Make the measurements needed to verify old data;
d. Obtain new data;
e. Identify roles and responsibilities for actions necessary to enable the installation to proceed;
f. Determine the optimum location and configuration for planned C4ISR installations;
g. Determine any site preparation requirements and responsibilities;
h. Finalize the installation schedule with the customer; and
i. Begin formulation of the BESEP as defined in Section 5 and Appendix O of the Shore Installation Process Handbook (SIPH).

2.0 Pre-Site Survey Requirements

Prior to scheduling or conducting a Site Survey, whether the installation is a small single system or a large multi-system consolidated installation, each Project Engineer (PE) shall liaison with the site's POCs and the RSIM associated with the installation. The RSIM will be able to supply important information regarding travel into the region and special requirements related to visiting the installation site. The PE shall also collect any available site drawings that might be useful during the site survey. For all installations, the PE shall determine requirements for installation production and operational cutover. The PE shall contact Base Security Office and any other personnel needed to obtain permission to take photographs of the site during the site survey. The PE shall also coordinate with the appropriate Public Works Officer (PWO) (who typically reports to the Base/Facility Commanding Officer) or the Base Facilities Manager for all installations that are expected to require any of the following:

a. Known required changes to power distribution for the building;
b. Building modifications such as new walls, doors, locks, floors, roof strengthening, window guards, or wall penetrations;
c. Air-conditioning upgrades;
d. Trenching or construction work;
e. Heavy Equipment (e.g., cranes and backhoes) usage;
f. Special studies related to public works (e.g., core sample study); and
g. Site Approval.

For installations outside the continental United States, the IA shall verify that Host Nation Approval requirements will be completed in time to support the installation schedule. This means that the paperwork to obtain the approvals has been submitted and the necessary approvals have been granted or are expected in time for the installation to start.

3.0 Site Survey Checklist

Organizations tasked to conduct site surveys shall adapt the Site Survey Checklist, provided as Attachment A to this appendix, to meet the needs of the installations that the Site Survey is being conducted for. Items may be added to or removed from the provided checklist as needed to adapt the checklist to the type of installation and expected site conditions.

4.0 Multimedia Documentation

Multimedia documentation can be very effective in capturing existing site conditions. No photographs, video, or audio recordings shall be taken without the permission of site security. Whenever feasible, photographs shall be taken during the site survey to document existing conditions.

4.1 Multimedia Requirements

All photographs shall be taken using a digital camera (5 mega pixel or better) and provided in Joint Photographic Experts Group (JPEG) format. When motion video recordings are made, the recordings shall be provided in an industry standard format readable by at least 90% of commercial DVD players sold in the United States. To ensure that photographs are properly mapped, all file names of photographs shall be recorded with the camera orientation on the appropriate floor plans and/or maps provided as an enclosure (usually a CD-ROM) to the site survey report.

5.0 Information Gathering

During the Site Survey, the organization conducting the site survey (normally the Installing Activity (IA)) shall gather all pertinent environmental, engineering, configuration, and design information relevant to site conditions and the system/equipment/software to be installed. Any available relevant on-site drawings not already held by the IA (e.g., drawings that show existing floor plans, underground conduit layouts, Intermediate Distribution Frames, etc.) shall be collected and reviewed. Any information not readily available shall be obtained through measurement and analysis. The conducting organization shall analyze the collected data, perform any calculations needed to make technical recommendations, and prepare a Site Survey Report for each site survey.

5.1 Electrical Data

5.1.1 Electrical Power Panels

When appropriate for the installation and access is available, the conducting organization shall – while following the applicable OHSA and Navy safety regulations – determine and document existing power panel capacity, configuration, and usage for each power panel whose configuration will be affected by the installation. The data to be collected shall include:

a. Current and voltage measurements for each phase and neutral conductor at each power panel or circuit breaker directly affected by the installation. Record American Wire Gauge (AWG) or metric equivalent of power wires. The current on the equipment/safety ground should also be recorded. The conducting

organization shall ensure that their personnel recording these measurements and in the area near the work have received appropriate training, utilize protective gear and proper tools, and possess proper authorization as required by OSHA standards and Unified Facilities Criteria (UFC) 3-560-01.

b. Main breaker ampere and Ampere Interrupting Capacity (AIC) ratings.
c. Manufacturer and part number information needed to order any additional circuit breakers.
d. Size (amps) and AIC ratings of spare circuit breakers that could be utilized by the installation.
e. Power panel manufacturer and part number (if shown), dimensions, distance above floor, floor plan location, and any other information required to complete an installation design plan (IDP) that meets the requirements of Appendix Q of the SPAWAR SIPH.
f. Details on any surge suppression devices installed at the power panel.
g. When permission is obtainable, photographs of the power panel with and without the cover removed.
h. Any violations of the national electrical code existing within the power panel.

5.1.2 Electrical Power Analysis

A power analysis shall be performed whenever specified in the task order or equivalent document. The organization conducting the power analysis shall measure and record simultaneous three phase power consumption (load balancing), voltage levels, current, power factor, frequency, and harmonic distortion for a representative time interval that that includes peak usage. The time interval for a power analysis shall be for a twenty four hour period and shall utilize a commercial three-phase power analyzer capable of providing and storing the aforementioned data in a format readable by either Adobe Acrobat or Microsoft Office. Power analysis results shall be provided with the site survey report.

5.1.3 Other Electrical Data

Personnel assigned to conduct site surveys for large projects that could require new electrical infrastructure such as new power panels, new transformers, feeder wiring upgrades, etc. shall have sufficient background and qualifications to determine what data needs to be collected to determine and plan for the impact of planned installations on existing electrical infrastructure. Examples of the types of data that could be needed are:

a. Wire gauge of feeder wires.
b. Size of building transformer.
c. Capacity of building UPSs.
d. Capacity of emergency generator power.

5.2 Ground System Data

The type or types of electrical grounding systems available at the installation site shall be documented. Ground system connection points and required hardware to make any new ground connections required by the installation shall be identified on existing drawings or documented during the survey. When a ground electrode (or system) resistance

measurement is specified in the task or job scope, the conductor of the survey shall also measure and record ground resistance utilizing the fall-of-potential method and commercial test equipment designed for this purpose. All data taken to determine the resistance to earth ground shall be provided as an enclosure to the Site Survey Report.

5.3 Heating, Ventilation, and Air Conditioning (HVAC) Data

For hardware installations, the PE shall – while following the applicable OHSA and Navy safety regulations – determine and document the existing HVAC condition and capacity. Whenever an installation will add heat load to an interior space, the Authority Having Jurisdiction (AHJ) e.g., PWO, over the installation site shall be notified. If the installation will utilize additional HVAC capacity, the PE shall do one of the following:

a. Obtain a signed e-mail from the AHJ confirming that the existing HVAC capacity is adequate to handle the equipment to be installed and that no modifications are required.
b. Coordinate an engineering analysis of the existing HVAC capacity to determine who will conduct the analysis and how it will be funded.

5.3.1 Engineering Analysis

The preferred activity to conduct an HVAC analysis is the local PWC or agency equivalent. However, when the IA is required to perform an HVAC analysis, a computer analysis of the site's air conditioning system can be completed. The IA shall gather all of the data needed to conduct the analysis during the site survey. These inputs shall include information regarding local sun exposure/building orientation, local weather extremes, building wall construction, existing equipment capacity (in BTU/hr), duct placement, air flow readings, window placement/construction, traffic (through doorways), and personnel loading. Commercially available software tested in compliance with ANSI/ASHRAE Standard 140 - Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs shall be used. The ANSI/ASHRAE standard specifies test procedures for evaluating the technical capabilities and ranges of applicability of computer programs that calculate the thermal performance of buildings and their HVAC systems. All data input into the model and computer simulation results shall be provided to the AHJ for concurrence of adequacy. When appropriate, such as any time rooms are uncomfortable during the survey, temperature and humidity readings shall be taken and included in the site survey report.

5.3.2 Hot and Cold Aisles

When an installation is located at an existing Data Center, Transmitter Site and other sites where large quantities of heat are generated the existing hot and cold aisle locations shall be identified within the floor plans of the Site Survey Report.

5.4 Interior Space Data

When appropriate for the installation, the conducting organization shall determine and document the configuration of interior building spaces that could be affected by the planned installation. When no accurate drawings are available, the dimensions for all rooms that could be affected by the installations shall be recorded on a sketch or sketches. The distances shown on the sketches shall be accurate within the tolerances shown in

Table 1, unless otherwise noted, and shall be recorded for the following items for all rooms affected by the installation.

a. The length of each wall.
b. Ceiling heights. (If the ceiling heights are inconsistent, this should be explained in the notes and a range provided (e.g., 116-122 inches).
c. Raised floor clearance heights (from true floor to bottom of floor panels) are accurate to within 1/8" with measurement locations identified. If the heights are inconsistent, this should be explained in the notes and a range provided (e.g., 16-18 inches). The survey should provide additional details if needed (for example, to map out a path for any required new cableway.)
d. Drop/false ceiling clearances. If the heights are inconsistent, this should be explained in the notes and a range provided (e.g., 16-18 inches).
e. Raised floor panel grid locations in relation to walls, permanently mounted cabinets/racks/furniture, doors, power panels, stanchions, air-conditioning units, and other key features of rooms where the installations are anticipated to take place. The use of the raised floor panel grid as a reference is encouraged.
f. The positions, in relation to walls or − even better − to the raised floor panel grid, of permanently mounted cabinets, racks, furniture, doors, power panels, stanchions, air-conditioning units, windows, emergency equipment panels, and other key features of rooms where the installation is anticipated to take place.
g. The positions of floor spaces reserved for equipment and other items to be installed by future projects, including the one that the survey is for, in relation to the floor tile grid or walls.
h. The vertical positions of rack or cabinet spaces reserved for equipment to be installed by future projects, including the one that the survey is for, shall be accurately identified by the exact rack unit positions.
i. The positions of existing or proposed new cable pathway infrastructure (e.g., conduits, ducts, and cable trays) having the potential to be used by the planned installation. Pathways for RED Signal Cable, BLACK Signal Cable, and Electrical Power shall be clearly identified.
j. The positions of items relevant to maintaining RED/BLACK separation in accordance with NSTISSAM/TEMPEST 2-95 (such as RF Transmitters within 3 meters of the installation site) shall be accurately identified with enough accuracy and precision to ensure that the future installation will meet RED/BLACK separation requirements. (For example, if the separation requirement is 5 cm, and the separation is approximately 4.9 cm, a measurement that is accurate to within plus or minus 1/8 inch is not adequate. However if the separation is 2 feet, a measurement accurate to within plus or minus 1/8" would be sufficient.)
k. The positions of items relevant to maintaining separation in accordance with National Electrical Code (NEC) requirements (such as maintenance work space clearances for power panels) shall be accurately identified with enough accuracy and precision to ensure that the future installation will meet NEC requirements.
l. All locations where a wall penetration will be required shall be clearly identified on a drawing provided with the site survey report. The type of wall construction at each wall penetration location and wall thickness shall also be identified on the

drawing. This is needed to ensure the purchase of the correct firestopping material.

m.

Table 1. Linear Dimension Accuracy Requirements[1]	
Distance	Accuracy
Up to 10 ft	±1/8 in.
10 to 100 ft	±1/4 in.
Over 100 ft	Pro rata (e.g., for a 200 foot measurement, the required accuracy would be ½”)

5.5 Linear Distance Measurement Methods

This document does not mandate the use of any specific type of measuring equipment for measuring linear distances. However, for surveys that require a large quantity of linear measurements, surveyors may find that achieving the required accuracy can be achieved more efficiently and economically by using a calibrated laser measuring device for most site survey measurements. Practical difficulties with the use of tape measures can make it difficult to achieve the accuracies shown in Table 1 even when the tape measures themselves meet the requirements of Table 2. Laser measuring devices with accuracies of 1/16 of an inch over 100 feet (and better) are in common use in today’s construction industry.

Table 2. Maintenance and Acceptance Tolerances, in Excess and in Deficiency, for Metal Tapes[2]	
Nominal interval from zero	Tolerance
feet	inch
6 or less	1/32
7 to 30, inclusive	1/16
31 to 55, inclusive	1/8
56 to 80, inclusive	3/16
81 to 100, inclusive	1/4

[1] Originally from Canadian Building Digests (Latta) CBD-171 and used in Handbook of Construction Tolerances 2nd Edition (Ballast)

[2] NIST Handbook 44 - 2003 Edition - Specifications, Tolerances, And Other Technical Requirements for Weighing and Measuring Devices as adopted by the 87th National Conference on Weights and Measures 2002, Section 5.52 (See http://ts.nist.gov/WeightsAndMeasures/h44-03.cfm)

5.6 Structural Data

When appropriate for the installation, the conducting organization shall determine and document site survey information needed to determine if existing support structures (e.g. raised floors, antenna platforms, building roofs) can support the additional equipment to be installed. If collecting the information needed is not possible during the site survey, the site survey report shall identify when a separate structural analysis is required.

5.7 Lighting Measurements

Interior lighting measurements shall be taken and recorded in all areas to be affected by the installation unless this requirement has been waived. If lighting levels are not in accordance with the latest revision of the Illuminating Engineers Society (IES) Lighting Handbook, and MIL-HDBK-1190 as required by MIL-HDBK-1012/1 this shall be noted in the report. If the installation of new equipment cabinets could result in inadequate lighting for maintenance, this shall be noted so that utility lights will be provided with the new cabinets. In these cases, the positions of overhead and other light sources shall be noted on sketched made during the survey if existing drawings showing light positions are not available.

5.8 Communications Equipment and Services Infrastructure

The conductor of the site survey shall record the availability of ports on communications equipment that have been or could be reserved for use by the installations planned for the site. The conductor shall also determine what, if any, additional circuits/communications services need to be provided to support the installation and identify the potential service providers and their contact information. When network resources such as blocks of IP addresses, ATM addresses, server resources, and Information Assurance resources are required, the site survey conductor shall contact the appropriate personnel (network administrators and/or the local) to determine the steps needed to obtain the necessary information.

5.8.1 IP Connectivity Requirements

All Non-secure Internet Protocol Router Network (NIPRNET)/Secure Internet Protocol Router Network (SIPRNET) connection requirements shall be identified. It is normally the site's responsibility to obtain additional NIPRNET/SIPRNET connectivity if sufficient connectivity is not available. However, the responsibility for obtaining the required additional connectivity must be determined during the Site Survey and noted in the BESEP. NIPRNET and SIPRNET Connection Approval must be obtained through the Connection Approval Process (CAP) as described at:
https://iase.disa.mil/documentlib.html - CAPDOCS.

5.9 Outside Plant (OSP) Cable and Cable Pathway Infrastructure.

When outside plant cable infrastructure will be or could be needed to support an installation, the organization conducting the site survey shall determine the capacity of the existing OSP infrastructure to accommodate the planned installations. As part of the site survey process, the conductor shall contact the Authority Having Jurisdiction (normally PWO) to reserve any OSP resources required for the site survey and the installation as soon as possible. This shall be done so that when the site survey team

arrives, access to manholes and other hard (or dangerous) spaces to gain access to can be arranged.

5.9.1 Outside Plant (OSP) Cable and Cable Pathway Infrastructure Items

Outside Plant (OSP) Cable and Cable Pathway Infrastructure includes underground and above ground cable and pathways not inside of buildings. It includes fiber cable strands, copper cable pairs, innerduct pathways, conduit pathways, aerial pathways (e.g., telephone poles), and antenna platform space.

5.9.2 Requirement for OSP Photographs

The following items shall be photographed whenever it is possible to obtain permission to do so:

a. Each manhole or handhole face of every manhole and handhole opened during the site survey.
b. Each building entry point where conduits that could be used by the installation enter a building.
c. Each damaged infrastructure element (ground connection, ladder, utility pole, conduit riser, conduit seal, cable, etc.) found during the survey.

5.10 Antenna Sites

Whenever the installations could require the installation of an antenna, the organization conducting the site survey shall arrive at the site with any test equipment or other equipment (e.g., theodolites, compasses, GPS locator) needed to determine the suitability of potential antenna locations. The conductor of the survey shall also record any information that could affect the antenna placement or site approval. Examples of this information include the presence of flight paths and the proximity to areas for loading or storing ordnance.

5.11 Safety and Environmental Hazards

The Site Survey Team shall contact the responsible safety organization to gather all available information on known safety hazards such as building asbestos and lead paint. The local RSIM should be able to provide points of contact for most sites under his or her cognizance.

Note: According to Section 0303.a of OPNAVINST 5100.23G:

"(1) Each shore activity not receiving Base Operating (BOS) safety services from their cognizant Naval Region shall have a safety organization, staffed and organized commensurate with the mission and functions of the command. A safety professional shall head the safety organization and shall have the authority, responsibility, and visibility to manage and represent effectively the activity's safety program. Implementation of the safety program is considered a command staff level function. Accordingly, the head of the safety organization shall report directly to the commanding officer of the shore activity.

(2) Shore activities receiving Base Operating Support (BOS) safety services from their cognizant Naval Region shall establish an organizational chart that includes safety as a staff function, reporting to the Commanding Officer. The description of this function shall state that the regional host Safety Department provides this service."

6.0 Site Accreditation and IA

The Site Survey Team shall discuss any requirements for Site Accreditation. If the system/equipment being installed does have a valid Type (system) accreditation, the Site Survey Team should provide it to the Information Assurance Manager (IAM) at the site as evidence of Interim Authority to Operate (IATO) pending approval by the NAVNETWARCOM Operational Designated Approval Authority (ODAA) of an updated Site Accreditation package. If the system/equipment being installed does not have an approved Type Accreditation, the site IAM will need to obtain Site Accreditation that includes the system/equipment to be installed prior to the installation commencing. The Site Survey Team should ensure that the site personnel understand the IA related actions that are necessary for them to obtain for Accreditation.

6.1 Physical Security and TEMPEST Separation

At least one member of the Site Survey Team for an installation that could affect physical or TEMPEST security at a site shall have a thorough knowledge of the requirements in the most recent versions of:

a. OPNAVINST 5530.14D, *Navy Physical Security*
b. OPNAV C5510.93F *Navy/Marine Corps Implementation of National Policy on Control of Compromising Emanations*
c. NSTISSAM TEMPEST /2-95 with Amendments,
d. IA PUB-5239-22/ October 2003, *Protected Distribution System (PDS) Publication*

6.1.1 Requirement to Document Security Issues

Any security issue (e.g., TEMPEST issues, physical security, etc.) that could affect the planned installation shall be discussed with the site for resolution. Sensitive issues should not be detailed in the site survey report, but the Site Survey report should document the need to resolve security issues if such a need exists.

7.0 Resource Reservation

When possible, site facility resources that will be used by the installation shall be labeled as reserved for the installation. For example, rack space, power panel breakers, floor space, etc. If the site agrees to reserve these resources, this should prevent the site or other agencies from inadvertently using these resources during the time between the Site Survey and commencement of the installation. Reserved resources shall also be documented in the Site Survey Report and BESEP for the installation.

8.0 Shore Site Survey In-Brief and Out-Brief Documentation

Provided presentations shall be designed to be easily updated by the SPAWAR project engineer and shall not be password protected. Site Survey In-Brief and Out-Brief presentations shall be readable using Power Point software. In-Briefs and Out-Briefs shall use the SPAWAR SIPH as guidance. In-Brief Guidance includes the guidance in SIPH section 4, the Site Survey Out-Brief Outline (SIPH Appendix K1), and the Site Survey In-Brief Example (SIPH Appendix K2). Out-Brief Guidance includes the guidance in SIPH section 4, the Site Survey Out-Brief Outline (SIPH Appendix L1), and the Site Survey Out-Brief Example (SIPH Appendix L2).

8.1 In-Brief and Out-Brief Scheduling

Site surveys In-Brief and Out-Brief should be scheduled for a time when key personal are available. Example of key personal that should be considered include: the RSIM, Facilities Manager, Electronics Maintenance Officer, Base Communications Officer, Command Communications Officer, Supply Officer, Plans Officer, Classified Material Storage (CMS) Custodian, local DISA representative, Regional Information Technology coordinator, and representatives of the local Public Works Center.

8.2 In-Brief Purpose

The purpose of the site survey In-Brief is to accomplish the following objectives:

a. Introduce the Site Survey Team;
b. Identify local points of contact;
c. Review what equipment or systems the IA intends to install at the site;
d. Review the schedule and address issues as necessary;
e. Discuss potential impacts the installation may have on the facility;
f. Discuss impacts that site activities or outside issues may have on the installation; and
g. Request whatever assistance is needed to successfully complete the survey.

8.3 Out-Brief Purpose

The purpose of the site survey Out-Brief is to:

a. Report the results of the Site Survey, with special emphasis on facility requirements, and any associated issues or problems that were discovered.
b. Discuss what actions the site needs to take in order to prepare for the actual installation.

8.4 Site Survey Reports

A Site Survey Report (SSR) shall be prepared and distributed upon completion of a Site Survey. The body of the report shall summarize the information obtained and agreements made during the survey. Detailed information collected during the site survey shall be provided as enclosures with the exceptions of the large paper documents discussed in Section 8.4.3 of this appendix.

8.4.1 Site Survey Report (SSR) Content

The SSR shall:

a. Identify in the introduction, the installation tasks for which the survey was performed, the dates of the survey, and the organization performing the survey.
b. Document required information that could not be obtained during the Site Survey and a plan for obtaining the missing information.
c. Include, if the installation involves a large integrated effort, an initial plan on how the integration will proceed.
d. Provide a description of the information obtained and agreements made during the survey. This shall include any agreements to reserve space, circuit breakers, or other resources for use by the installations covered by the site survey.
Information that is summarized in the body of the report shall be provided in full

as an attachment or its location shall be clearly identified so that the information can be readily obtained.

e. Provide plans and information, when appropriate, showing how the facility can best be modified to meet the needs of the project. For example, if new terrestrial connectivity is required it is normally ordered via a Feeder Telecommunication Service Request (FTSR). Since the acquiring of new terrestrial connectivity can take time, the SSR should include sufficient technical circuit data to enable the FTSR originator to prepare the request. Normally, the site is responsible for submitting the FTSR. FTSR information can be found at DISA's Web site at http://www.ditco.disa.mil/corporatelibrary.
f. Provide, for installations with significant structural or facilities work, points of contact (e.g., facilities manager, local Public Works Officer, and/or regional commander representatives) who can identify local requirements and policies affecting this type of work.
g. Include a listing of any documents obtained during the site survey including drawings and requirements documents.
h. Address the adequacy of existing space and specifically identify each space reserved for use by the installation.
i. Address the adequacy of the existing Heating, Ventilation, and Air-Conditioning (HVAC) system. Any conclusion about the adequacy or inadequacy of the existing system shall be accompanied by the facts and analysis used to make the determination. Examples of relevant facts include the existing power load, the capacity of the air-conditioning units servicing the installation area, and the increase or decrease in planned heat loads.
j. Address the adequacy of the existing Electrical Power by presenting the facts needed to determine the adequacy. Typically, this includes providing the existing power load on each phase of the power panels, main breaker size, size and number of spare breakers, number of blank breaker positions, and the specific breakers and positions reserved for the installation. Site surveys reports shall identify any need for additional circuit breakers, power panels, transformers, surge suppressors, and uninterruptable power supplies (UPSs), and generator hardware (includes generator and transfer switches).
k. Address the adequacy of existing cable pathways that the planned installation may need to use and the conditions in locations where new cable pathways may be needed.
l. Address the adequacy of the existing signal and power Grounding systems.
m. Address the adequacy of the existing Physical Security
n. Address Site Accreditation Requirements
o. Identify all safety hazards and provide a proposed safety risk mitigation plan that assigns responsibilities. For example, if asbestos is to be disturbed, the site survey report could state that the IA will ensure that the installers are trained and qualified in proper asbestos handling and disposal procedures. All safety hazards and environmental issues must be noted in the Site Survey Report so that precautions and responsibilities can be specified in the BESEP. (See Section 7 of the SIPH for a detailed discussion of "Personnel Safety Requirements.")

p. Provide back-up documentation in the form of enclosures as discussed in the following section.
q. Document any RED/BLACK separation or other security related issues that need to be addressed.
r. Document the currently favored installation plan and address any realistic alternatives discussed with site personnel during the site survey visit.
s. Document arrangements for equipment or material storage and shipping points of contact. These should be established by the installing activity before or during the site survey period. This includes any arrangements for cryptographic material storage. If these storage locations or points of contact have not been identified, that shall be addressed in the Site Survey Report.

8.4.2 Shore Site Survey Report Enclosures

Site Survey Report shall provide enclosures that include all documentation developed during the site survey. The enclosures shall include a record of all measurements taken during the site survey. They shall include copies of any computer files obtained during the site survey, sketches made during the site survey, photographs and motion video recordings taken during the site survey, and paper documents obtained during the site survey. Exceptions can be made for large Government provided paper documents (e.g., F size drawing packages and telephone books) that may be held by the conductor of the site survey until the completion of the installation when permission is obtained from the SPAWAR Project Engineer. Photographs shall be provided in JPEG format and shall be accompanied by a sketch, floor plan, or map that shows the location, camera orientation, and jpeg file name of each picture taken during the survey.

8.4.3 Sites Survey Report Distribution

The SSR will be distributed to the sponsoring activity, usually a Program Office, the IMA, the IA, the RSIM, the site/customer, and any others as required. Appendix M provides a sample SSR. For installations with significant structural or facilities work, contact the facilities manager, local Public Works Office, and/or regional commander representatives to identify local requirements and policies affecting this type of work.

9.0 Discussions of Alternatives

During the Site Survey, the Site Survey Team will discuss installation alternatives with the site representatives to determine their preferences, and to determine what resources the site can provide to support the installation. These resources typically include floor space, cabinet space, circuit breakers, station patch panel positions, cable pathway space, connectivity, IP addresses, test equipment, and COMSEC equipment. Unless the system in question is under strict configuration management control, the site can also provide inputs regarding equipment placement with respect to ergonomics and human engineering factors at this time.

10.0 Site Training Needs

The site survey team should try to assess the amount of training that may be required to enable site personnel to operate and maintain the equipment to be installed.

SIPH Appendix J – Attachment A

SHORE SITE SURVEY CHECKLIST EXAMPLE

INSTALLATION TRACKING NUMBER_____

SITE SURVEY DATE: _____

Note:
This is not an all inclusive checklist. It is only provided as an aid or starting point for checklists specifically tailored to the needs of individual installations. Installing Activities are responsible for developing checklists and methods that will ensure that the requirements in the body of Appendix J are met.

ADMINISTRATIVE INFORMATION

1. Project Title: _____

2. Name of Activity being surveyed: _____

3. Location: Street Address: _____

City: _____State: _____ Zip Code: _____

4. Activity located at following Camp, Station, or Base: _____

Building number: _____

5. Survey Dates: _____

6. Purpose and Scope of Survey: _____

_____

7. Survey Team Leader and Members: (Name, Activity, email address, phone number)

Leader: _____

Members: _____

_____

8. Site POCs: (Name, Position at the Activity, email address, phone number)

_____

_____

_____

9. Copy of completed Shore Site Survey Checklist provided to following personnel:

Site POC: _____

Others: _____

INSIDE PLANT (ISP) DATA

10. C4I Equipment Installation Data:

10.1 General information: Building No. /Name: _____

Room No. /Name: _____

Room is operated at following security classification level: _____

Following site POC has confirmed that space has been accredited: _____

Equipment floor plan or sketch is attached: _____

Applicable equipment elevation plan or sketch is attached: _____

10.1.1 Installation data. (Note a digital camera may be used to depict installation items of interest. Resultant photos are to be included at the end of this checklist. Important! Prior to using or bringing cameras to the proposed installation site insure that site permission is obtained and follow all security directions.)

Describe equipment floor construction: (Concrete, raised floor, etc.) _____

_____

If raised floor, describe details including clearance height:
_____

_____

Is area under floor a plenum space?
_____

Is there a dropped ceiling? Is there adequate space to install additional cables? _____

_____

Are plenum cables used? _____

Describe how cabinets are secured to the concrete floor: _____

_____

Describe existing power panels/power distribution system: _____

_____

Describe UPS and/or technical power system: _____

_____

Describe existing equipment grounding system (including cabinet, rack, cable ladder, cable tray, and duct grounding): _____

_____

_____

Describe existing cable ladder/tray/duct system and conduit runs, including RED/BLACK details: _____

_____

_____

Describe proposed conduit runs. Also, need to verify wall penetrations if signal cables required to be routed to different rooms or floors in the building: _____

_____

Describe cable vaults, wiring closets, raiser cables, cable chutes to roof, exterior wall penetrations for RF cables, etc._____

_____

Describe any other pertinent installation details: _____

_____

_____

_____

_____

_____

_____

10.1.2 Planning based on using existing equipment cabinet: _____.

If not applicable, skip to para 10.1.3.

Rack space is available, rack unit nos._____ in cabinet no. _____

Describe how the cabinet is furnished with power (confirm what type power is available to existing cabinet: Technical or UPS): _____

_____

Adequate power is available (panel/ckt brkr no. /size): _____

If not, describe new power installation: _____

Describe how the existing cabinet is grounded: _____

_____

Adequate grounding is available: ____ If not, describe new installation: _____

_____

Describe how cabinet connects with existing cable tray/ducts: _____

_____

Adequate connection exists: _____ If not, describe new installation: _____

_____

Describe how new equipment interfaces with patch panels/switches: _____

_____

Adequate patching/switching exists:_____ If not, describe new installation:_____

_____

Other details: _____

_____

10.1.3. Planning based on installing new cabinets: _____

Space is available for new cabinet in Row____ Bay____. Also show on floor plan/sketch.

Describe installation details for new cabinet, regarding the following:

Attachment to the floor: _____

Power connection (panel/ckt brkr no/size):_____

_____

Grounding details: _____

Interface to cable tray/duct, etc. _____

Interface to patching/switching; describe new installations:_____

_____

Other details: _____

_____

_____

_____

_____

_____

_____

_____

(NOTE: If more than one room is involved, prepare additional data sheets for each room and add the sheets as attachments in the back of this Shore Site Survey Checklist.)

11. C4I Communications Interface Data:

Provide details of communication circuit(s) that specifically apply and connect to the proposed installation. Exercise caution since some details may be classified. Check with appropriate Station POC to determine if such information is classified. If it is, the data collected should be marked and handled appropriately (use SIPRNET for transmission of the collected data back to your home office if necessary).

The following list is suggested information to collect and is not all inclusive. Tailor to meet specific installation:

- CIRCUIT NAME
- CIRCUIT ID NUMBER
- LOCAL USER
- CIRCUIT DESIGNATOR (CCSD)
- CRYPTO NOMENCLATURE
- CIRCUIT PARAMETERS: (Bandwidth, data rate, signal format, line coding, physical connector, type of cabling, etc)
- REMARKS: (Clarify if circuit is part of a MUX channelization plan, any timing and sync requirements, etc)

11.1 Determine the project interface to the above circuits. Collect data on existing equipment as needed. Provide a sketch below of the end-to-end block or single-line circuit diagram that shows the proposed system. Indicate proposed solutions to any timing/sync issues.

12. C4I Networks and Legacy Systems Data

12.1 Collect information on C4I Networks and Legacy System that apply:

- NAME OF NETWORK
- APPLICATION
- CLASSIFICATION
- NETWORK OPERATING SYSTEM
- TOPOLOGY
- MEDIA
- NUMBER OF WORKSTATIONS
- ROUTERS/SERVERS/FIREWALLS
- IP ADDRESS
- NETMASK
- DEFAULT GATEWAY
- DNS
- DOMAIN NAME (i.e. spawar.navy.mil)
- HOST NAME
- MICROSOFT DOMAIN OR ACTIVE DIRECTORY NAME

- DHCP (if used)
- OTHER INFO (as needed)

12.2 Determine the project interface and/or connection to the above systems. Collect data on existing equipment as needed. Include a sketch, as an attachment, of the end-to-end block or circuit/network diagram that shows the proposed system. Indicate proposed solutions to any timing/sync issues.

13. Physical Plant Facilities

13.1 General: Describe general information on type of building construction, structural description of walls, floor, ceiling, lighting, windows, passageway for equipment delivery, elevators, environmental hazards such as asbestos, lead paint, and storage for gas/diesel/propane, etc.

13.2 Electrical Systems:

Caution: Observe required safety procedures when working around live electrical systems and circuits. See the Shore Installation Process Handbook, Appendix AC and Unified Facilities Criteria (UFC) 3-560-01. Safety is the PE's number one priority.

If applicable to proposed installation, describe building transformer locations (primary and step-down, etc.), size, and primary/secondary voltages; electrical switch gear room; main power panel location, size, and spare capacity; room power panel location, size, and spare capacity. A one-line power diagram should be obtained or prepared in sketch form and added to attachments.

For the power panel being considered/used, obtain following panel name plate info: manufacturer, serial number, part number, voltage, ampere rating, single or three phase, total circuit breaker positions, quantity and size of circuit breakers installed, plus spare circuit breakers and sizes available.

Obtain the following main circuit breaker information: manufacturer, serial number, part number, ampere rating, AIC rating, and whether shunt trip. Also, identify manufacturer and part number of transient protection/suppression devices installed.

If possible, obtain amperage for the input to the power panel:
A leg:
B leg:
C leg:
Neutral:

Obtain following data for emergency generator:
Capacity of generator (or generators): size, current load, available load.
Auto or manual transfer; time to restore power to the load.
Voltage/phases provided.

Obtain following data for Uninterruptible Power Supply (UPS):
Capacity of UPS: size, current load, available load
Load time UPS provides after loss of commercial power

Obtain data on DC power and associated distribution systems that support C4I requirements. Data on batteries for emergency or UPS is not desired.

13.3 Heating, Ventilation, and Air-Conditioning (HVAC)

(NOTE: The magnitude of the HVAC survey will depend on whether or not the cooling requirement of the new equipment will significantly impact the cooling capacity of the existing HVAC system. If an initial survey confirms little or no impact, then a detailed HVAC survey may not be required.)

Determine capacity of the existing HVAC. Describe the existing system: whether a conventional system with ductwork; for computer room describe if airflow is from ductwork in the ceiling, or if from a freeblow discharge plenum, from pressurized raiser floor, or window unit. Describe the return air system, whether by duct, ceiling plenum, or directly into the unit.

BTU requirements for existing equipment:

Additional BTU for new equipment:

Assess the impact on overall HVAC system.

13. 4. Equipment Grounding System (Primary concern is the equipment or signal ground)

Describe the station grounding system: Is it a single-point ground system, multi-point ground, or “Halo Ring.”

How is the station grounding system distributed though the building?
What is the distance from the ground’s tie-point to the equipment room interface?
Describe what equipment ground is available in the equipment room.
What is the interface (type hardware) to the existing equipment ground system?
How will the ground be extended to the cabinet and new equipment?
Describe the antenna and cable entry plate grounding systems
Provide a sketch of the grounding systems.

OUTSIDE PLANT (OSP) DATA

14. OSP Manhole System, Conduit and Cabling Data

(NOTE: Following information on OSP is needed if your project is going to use or upgrade any item.)

14.1 OSP manhole system and conduit data. Obtain to-scale drawings that show the routing of conduits, manhole, and cable hut locations for the entire OSP.

Also, obtain a manhole system (MHS) block diagram that shows all manholes and associated conduits.

In addition, butter fly drawings for each manhole are needed to determine which conduits are used and which are spare. Existing cabling should be designated on this drawing

14.2 OSP Cabling data. A table showing copper cable usage is required. The table should show cable designation (feeder, distribution, branch), type of copper cable with full description of pair numbers, wire gauge (AWG), splices, cross-connects, termination points on both ends, number of pairs used, bad pairs, and available good spare pairs.

A similar table showing fiber optic cable usage is required. It should show cable designation, type of fiber cable with full description of number of Multi-Mode (MM) strands and Single-Mode (SM) strands, type/size strands, termination points on both ends, number of strands used, number of bad strands, and number of available spare, good strands.

14.3 An analysis should be made to determine if existing cabling can be used. If not, a proposal for an upgrade should be determined and documented.

Antenna Systems Data

NOTE: The following information on Antenna Systems is needed if your project is going to install or upgrade any antenna.

15.l Antenna Plot/Roof Plan. Obtain a to-scale drawing of the existing antenna layout. Conduct a visual check to make sure that all antennas are shown. Make a table of antennas that lists each antenna, manufacturer, nomenclature or model number, frequency range, beam width, gain, and other characteristics so that an analysis can be made to determine a proposed location for the new antennas.

15.2 Antenna Cable Entry Details. Obtain details of cable routing from the antenna to the radio room, including entry details. Gather details on RF and Control cables, Deck Boxes, etc. Weatherproofing and grounding details should be addressed. Be sure to maintain the integrity of the existing system.

15.3 Other Pertinent Details. Obtain details of cable routing and termination within the radio room. Gather data on multiplexers, combiners, multicouplers, control units, patches, etc. that the existing cabling may be using. Again, be sure to maintain the integrity of the existing system, or have a good rationale for any new installations.

16. Attachments.
Attach sketches, tables, and photos as required to support the information gathered during the site survey.

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APPENDIX K1 - SITE SURVEY IN-BRIEF OUTLINE

1. **Introduce Team Members.**
   This portion of the In-Brief should be used to introduce the Site Survey Team Members to personnel at the site. Contact information for all the team members can be provided to site personnel at this time.

2. **Explain the purpose and impact of the Installation(s) supported by the Site Survey.**
   This portion of the In-Brief will explain the new and improved capabilities that will be provided by the installation. It will also discuss the site resources that will be required to support the installation. Pictures, presentations, brochures, and similar material showing the equipment to be installed can be distributed at this time. If a similar installation has already been completed for another site, drawings and pictures of the other site can be distributed.

3. **Explain previous arrangements made with individuals and organizations at the site.**
   This portion of the In-Brief will go over arrangements that have already been made, such as the obtaining of transportation, access to buildings, copies of drawings, etc.

4. **Present a summary of the information required by the Team and the locations to be visited.**
   This portion of the In-Brief will let the site know what team members will be looking for and where on site they will need to go. It will let the site know if photographs or video recording will be required and will confirm that doing so is allowed. It will also let the site know to whom you will be talking to obtain information. Questions concerning site survey specifics will be addressed at this time.

5. **Request the site provide assistance as required.**
   The site may be required to provide escorts or keys to buildings, aid in locating drawings, and other assistance. If arrangements have not already been made, these arrangements should be made during the In-Brief. During this portion of the survey, the site survey team should obtain a phone number list of people that can be contacted to obtain assistance. The site survey is the opportunity for the site to provide inputs into the planning process. The site should be encouraged to provide specific inputs on equipment arrangements, locations and ergonomics.

Special Note: The PE will prepare the Site Survey In-Brief using MS Power Point or some other comparable/suitable software. Hard copies of the In-Brief will be provided to the customer.

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APPENDIX K2 – SITE SURVEY IN-BRIEF

Tracking # 06-4188

CSG-7 PHASE ONE ANTENNAS RELOCATION SITE SURVEY IN-BRIEF

SPAWAR Systems Facility
Yokosuka, JA

24 May 2005

Tracking # 06-4188

Outline of Discussion

- POC Information
- Phase one Antennas Relocation Plan
- Site Requirements
- POA&M
- Questions

Tracking # 06-4188

Point Of Contact Information

- Shore Engineering Branch Head
  - Donnie Camp
    - 243-8285; campdl@spawar.navy.mil
- Regional Shore Installation Manager (RSIM)
  - Bernie Kenna
    - 243-8274; kennab@spawar.navy.mil
- Project Engineer
  - Derrick Williams
    - 243-8281; williadb@spawar.navy.mil

Tracking # 06-4188

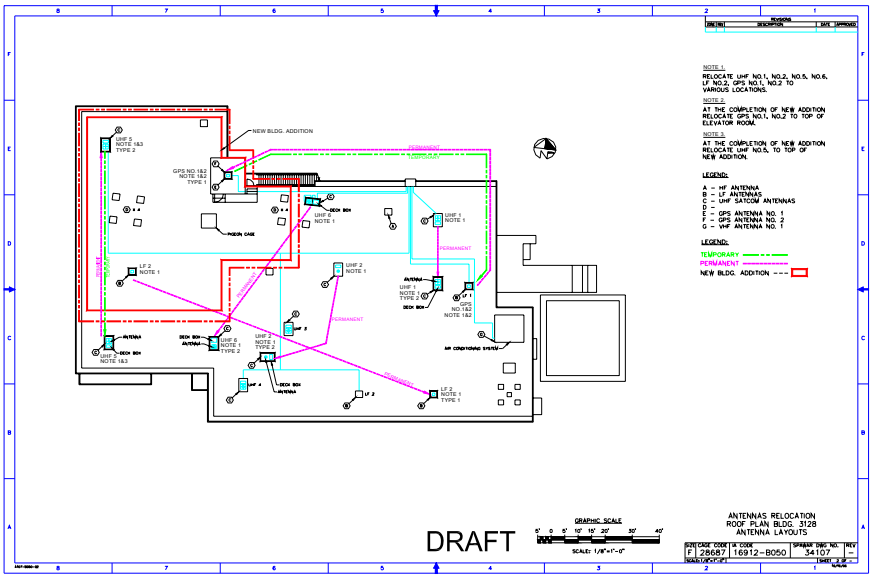
Phase One Antennas Relocation Plan

- UHF SATCOM Antennas
- GPS Antennas
- LF Antenna

SPAWAR

Tracking # 06-4188

Antennas Layout Diagram



SPAWAR

Tracking # 06-4188

Site Requirements

- Coordinate down time for the antennas.

Tracking # 06-4188

POA&M

- Site Survey 5/24/2005
- Develop BESEP 6/12/2006 – 6/19/2006
- Develop IDP 5/30/2006 – 6/23/2006
- Production 11/06/2006- 6/4/2007
  - Phase One 11/6/2006 -11/21/2006
  - Phase Two June 2007
- SOVT
  - Phase One 11/8/2006 -11/21/2006
  - Phase Two June 2007
- Training 11/8/2006 -11/21/2007
  - Phase Two June 2007

Tracking # 06-4188

Questions/Comments

APPENDIX L1 – SITE SURVEY OUT-BRIEF OUTLINE

1. **Introduce team members.**
   This portion of the Out-Brief should be used to introduce the Site Survey team members once again to personnel at the site.

2. **List the items that the team is requesting be reserved for the upcoming installation**
   This section will include items such as ground area, floor space, cabinet space, circuit breakers, ports on multiplexers, cable pairs, and other stations resources that you hope to use as part of the installation.

3. **Explain the alterations that the team is planning to make to the site or may plan to make to the site**
   The team should list items that need to be installed or modified to support the system installation. It should include items such as additional air conditioning capacity and an additional Uninterruptible Power Supply (UPS). It could also include items such as improvements to the existing building ground, installing an additional power panel, installing a solid wall and stronger door to improve physical security, and other site-specific alterations.

4. **Explain situations where alternative solutions are being or have been considered and discuss their implications**
   This portion will discuss situations where there is more than one way to complete the installation and the alternative that will be chosen has not been determined. For example, one alternative may be to put an antenna on a roof, but no one knows if the roof will support it. In this case, alternative solutions (such as building an antenna tower) should be discussed in this. This portion can also be used to discuss situations where different alternatives were examined during the Site Survey and one alternative chosen as the preferred course of action.

5. **List names, phone numbers, and E-mail addresses of local personnel who plan to provide support, and describe that support**
   An example from this section could be to list the point of contact information for the local Public Works personnel who have agreed to install an additional power panel, to provide soil analysis data, or to install additional air conditioning capacity.

6. **Explain the data that has been gathered and verified**
   This portion should be a brief summary of the data that has been gathered, with important elements highlighted. For example, an Out-Brief for an outside plant cable installation might show a map of the underground conduits that were surveyed and highlight which conduits were full and which conduits had room for the cables that would be installed.

7. **Further actions required**
   In the event that not all of the required information can be obtained during the Site Survey, this portion of the Out-Brief to explain what information is still missing and why it is important. When appropriate, this portion should also be used to request the site's assistance in obtaining the remaining information. Additionally, this portion should address actions that the site needs to complete in order to prepare for the installation.

8. **Express appreciation**
   This portion of the Out-Brief should be used to express appreciation for the site's assistance.

   Special Note: The PE will prepare the Site Survey Out-Brief using MS PowerPoint or some other comparable/suitable software. Hard copies of the Out-Brief will be provided to the customer

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APPENDIX L2 – SITE SURVEY OUT-BRIEF

SPAWAR

Tracking # 06-1027

Nova EAM Hub Site Survey at
NCTAMS LANT Out-brief

- Background
- Equipment to be Installed
- Survey Results
- Nova EAM Hub Arrangement and Elevation
- FRCB Approval – 3 Apr 2006
- Proposed Project Schedule

SPAWAR

Tracking # 06-1027

Background

- Nova is a store and forward shore messaging processing system currently in use at NCTAMS LANT and throughout the COMNAVNETOPSCOM claimancy.

- Nova S1 is currently scheduled for de-installation from NAVCOMTELSTA Naples 24-28 Apr 06 and was installed with 32 mode 1 ports.

- Nova 3 (EAM hub for EAM ckts) is scheduled for installation at NCTAMS LANT to bring dial-in coop capabilities as the Navy migrates toward a 2 RNOSC infrastructure.

Tracking # 06-1027

Equipment to be Installed

- Mode 1 rack with 32 mode 1 port capability.
- One 36” deep Great Lakes Rack to house the servers, UPS, MCAT and ANCC components.
- Compaq ML370 rack mounted Server - 2 ea.
- UPS - 2 ea.
- Dorio Text Terminals – 0 ea.
- NCD X-Terminal – 1ea.

Tracking # 06-1027

Equipment to be Installed

- System consoles – 2 ea.
- C3U chassis Red - 4 ea
- CCU cards – 32 ea.
- DM Printer - 2 ea.
- 48” wide Wrightline Racks – 1 ea.
- 24” wide Wrightline Racks – 1 ea.
- MCAT system to be relocated.

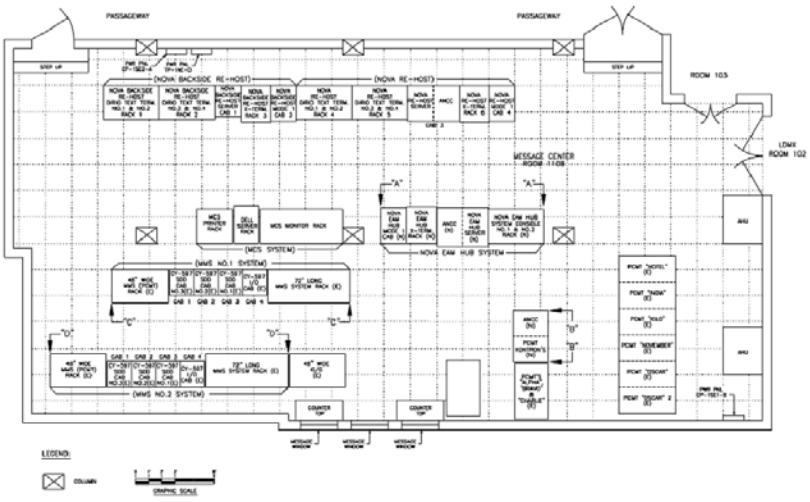
Tracking # 06-1027

Survey Results

- Power panel CP-1SE1-B Breakers 1, 3, 8, 9, 10, 11 and 17 are available for this install.
- NCTAMS LANT to disconnect power runs from these breakers and remove the power runs.
- There are new signal and power ducts required for this install.
- Existing HVAC is inadequate to cool the message center and the DMS messaging room adequately in the warmer months.
- Nova EAM hub will be installed with additional fans and venting in the GLR.

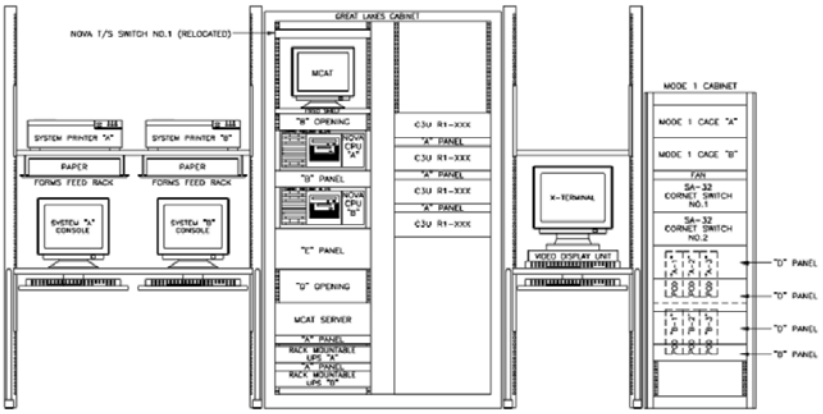
Tracking # 06-1027

Nova EAM hub Arrangement



Tracking # 06-1027

Nova EAM hub Elevation



Tracking # 06-1027

Proposed Project Schedule

Nova EAM hub Installation – 26 Jun – 28 Jul 06.

APPENDIX M - SITE SURVEY REPORT

Sample Site Survey Report
For
Imaginary Air Base
U.S. Navy EHF SATCOM and Classified LAN Node
Installations

Tracking Number 09-9999

Note:
The site survey presented here is for an imaginary combination of projects at an imaginary location. However, it is based on real findings that occurred during actual site surveys.

Prepared by
SPAWAR Systems Center Pacific
Code 4.2
27 April 2009

1.0 Introduction. From 22 to 28 March 2009, the SSC Pacific Consolidated Installation Project Z-33 Site Survey Team visited Imaginary Air Base, Fictitious Island, to gather information for the following installations.

a. EHF SATCOM Installation
b. Classified LAN Node Installation

2.0 Summary of Results. Imaginary Air Base has enough room in existing buildings to accommodate all of the equipment to be installed. However, a ground-based antenna tower will be required to establish EHF communications. In addition, substantial building modifications will be required to allow the installation of the Classified LAN Node and to isolate mechanical equipment installed to support the EHF equipment. The electrical wiring to and inside of Building 123 is not adequate to support the needs of either the EHF Installation or the Classified LAN Node. Its existing Uninterruptible Power Supply (UPS) is also not adequate to support the planned installations. The air conditioning equipment servicing the UPS room is undersized and will need to be upgraded. In addition, additional air conditioning ducts will need to be installed to adequately service the classified LAN node to be installed in Building 123, Room 150. The Joint Command Center Bunker, Bldg. 9 has a large amount of excess electrical and HVAC capacity and can easily support the equipment to be installed there. However, we found that wiring to two utility outlets in Tunnel 2 needs to be upgraded to reduce the voltage drop at the outlets and to provide adequate ground fault protection.

3.0 EHF Equipment Installation. EHF equipment will be installed at the NCTS Detachment Main Building and at the Joint Command Center Bunker. The Main Headquarters Building was examined as a possible alternative for locating the EHF SATCOM equipment. During the site survey, however, we discovered that the location of hills and trees in the area meant that an extremely high tower would be needed to obtain an unobstructed view of some EHF satellites. See enclosure (1) for maps of satellite view obstructions and theodolite readings for alternative locations.

3.1 EHF Physical Equipment Locations at NCTS Detachment Main Building, Building 123. During the site survey, Station Forces personnel and site survey team members met with the OIC of the NCTS Detachment to determine the placement of all of the equipment required for the EHF installation. Once a location was agreed to, we marked the location with tape and on our copy of the floor plan. See enclosure (2) for a scanned copy of the floor-plan mark-up. When the site survey was completed, a photocopy of the marked-up floor plan was provided to the Officer in Charge (OIC). Adequate floor space was available for all equipment. (See enclosure (3) for an Adobe Acrobat (pdf) file with floor plans showing where various pictures were taken. When you click on the camera icons shown on the floor plans, the picture taken from the location and direction shown by the icon will appear. Enclosure (4) has floor plans showing the location, orientation and file name of each indoor photograph taken during the site survey. Enclosure (5) is a CD-ROM containing all survey photographs.) However, the installation will require the construction of walls to isolate the noisy water cooling equipment, the transformers, and the air dryer associated with the EHF installation. The EHF transformers, water cooler, and air dryer

will be installed in a corner of Room 122. The location of these new walls (and new doors) is also indicated on our marked-up floor plan. The main suite of EHF SATCOM equipment will be installed in the NCTS Detachment Main Building, Building 123, Room 122. Terrestrial Extension Equipment will be installed in Building 123, Room 123. A new UPS will be installed in Room 124. The antenna will be installed on a tower to be constructed outside of the building.

3.1.1 EHF Antenna Tower Placement. Special purpose test equipment was used to create a three-dimensional model of the area surrounding Building 123. The roof of the building was considered as a possible location for an antenna platform. We contacted the Base staff Civil Engineer who informed us that the roof of the building was not capable of safely supporting the antenna platform without installing massive modifications to the existing roof. These modifications would cost about as much as building a new tower and would seriously disrupt ongoing operations at the site. Therefore, several possible locations (close to Building 123) for constructing a ground-based tower were considered. Software supplied with the special purpose test equipment was used to calculate the height that the antenna tower would need to be at each location in order to provide an unobstructed view of the satellites that we needed to see. The best location was the Southwest corner of the building because it minimized the required tower height and the cable lengths between the antenna and the EFH Suite. See enclosure (6) for the tower height calculation spreadsheet.

3.1.2 EHF Antenna Tower Construction. We obtained a copy of the soil analysis reports and core drilling data from the local PWC Technical Library. This data will be used to determine the size of the concrete footing for the tower. We also obtained the foundation plans for the building and maps of underground pipes and conduits in the area. In addition, The Public Works Officer supplied us with the name and points of contact for a local contractor whom he could task to design and build the tower. He asked the contractor to provide us with a cost estimate for constructing a 30-foot tower that would meet our requirements. We supplied the Public Works Officer with our requirements for antenna tower strength and stability, and with a copy of the data discussed previously.

3.2 EHF Equipment Installation at the Joint Command Center Bunker, Bldg. 9. Standard equipment for EHF Terrestrial Extensions will be installed in Building 9. In addition, baseband equipment for EHF Circuits will also be installed Building 9.

3.2.1 Space. All EHF equipment will be installed in existing equipment cabinets. Space in existing cabinets has been reserved for all equipment. The capacity of the existing cable duct system is far in excess of what is needed to install the EHF equipment. See duct system photos in enclosure (5) showing the amount of remaining capacity.

3.2.2 Air Conditioning. Our simulation software showed that the existing AC system could support three times the anticipated heat load that will be there after the installation is completed even if the ambient air temperature in the tunnels were to reach 40 degrees Celsius. (Ambient air temperatures in the tunnels have never exceeded 25 degrees Celsius,) acting as a heat sink. The results of our computer simulations have been

provided to the Public Works Officer and are provided as enclosure (7) to this report. The simulation of the room where the equipment will be installed showed no hot spots will be created by the planned installation.

3.2.3 Power. We connected a three-phase power analyzer to the (200 amp three phase) power panel servicing the equipment location for 8 hours during a normal work day. The analyzer showed that the peak usage on phase A was 18 amps, phase B was 23 amps, and phase C was 12 amps. We have agreed to move the circuit supplying one cabinet (Row 2 Bay 1) to a spare breaker connected to phase C (Breaker 6) to improve load balancing. A check of the existing current demands of the two cabinets that we planned to use showed approximately 1.87 ampere of current draw on each circuit. The power panel has 12 spare 20 amp breakers. We used a KO Industries CBA-1000 to check the voltage drop and circuit breaker operation for all circuits. All circuits in the equipment cabinet space were properly wired and their breakers functioned properly. However, were planning to utilize an area in Tunnel 2 as a temporary work shop. We found that the two utility outlets in this space had a 12 volt drop at 12 amps and that the ground wiring was insufficient. The breaker did not respond in time to a short circuit condition. The Public Works Officer has tagged out these outlets and has hired a contractor to replace the existing #14 AWG wiring with #10 AWG wiring, to run a dedicated #10 AWG ground wire back to the power panel, and to install new GFCI circuit breakers as a precaution. This should enable the use of the tunnel as a temporary work shop during the installation. Photographs documenting the condition of the power panels are contained in enclosure (5).

4.0 Classified LAN Equipment Location. Classified LAN Node equipment will only be permanently installed at NCTS Detachment, Building 123 under this project. The installation of equipment at connecting sites will occur on an as-needed basis under separate funding. Many connecting sites will be temporary shelters in hangar bays used for exercises. The classified LAN Node will be located in Building 123, Room 150. Telephone operators at the base previously used this room; it was never used to process classified information. It is the only room with enough space to house the equipment required for the Classified LAN Node. The operators are being replaced by machines and will be reassigned by the end of next month.

5.0 Improvements to Existing Infrastructure. Major additions and modifications to Building 123 will be required to support the needs of both system installations covered by this site survey. Unless otherwise indicated in subsequent sections, improvements will be installed by the local PWC.

5.1 Improvements to Room 150. The classified LAN Node will be located in Building 123, Room 150. Telephone operators at the base previously used this room; it was never used to process classified information or to house equipment for tactical circuits. Major changes will be required to make this room suitable for housing the Classified LAN Node.

5.1.1 Physical Security Improvements. The resistance of the room to penetration must be increased before the Classified LAN can be installed. During the site survey, we

discovered that the existing room has walls that do not rise above the level of the false ceiling. Someone could easily enter the area above the ceiling from one of the adjoining rooms and then enter Room 150 through the ceiling. The site survey team met with the Site Security Officer and a Certified TEMPEST Technical Authority and developed a plan that would allow Room 150 to meet all applicable security requirements. The existing sheetrock walls will be replaced with 8-inch thick concrete block walls that reach all the way to the true ceiling; the existing door and locks will be replaced with a steel door and lock that meet the approval of the Site Security Officer. In addition, the existing window will be filled in with concrete blocks. The door and the area above the false ceiling will be alarmed.

5.1.2 Electrical Grounding Improvements. Room 150 has no system for signal grounding. An equipotential ground grid will be installed above the ceiling and connected to the building ground ring.

5.1.3 Electrical Power Improvements. There is no power panel in Room 150. We have requested that wiring for 3-phase 208 volt power panel with a capacity of 100 Amps per Phase be supplied to this room. SSC has agreed to supply the power panel loaded with the appropriate breakers. SSC will also install electrical wiring for equipment to be installed within the room. SSC will also provide separate Uninterruptible Power Supplies for the RED and BLACK electronic equipment to be installed inside the room.

5.1.4 Communications Infrastructure Improvements. The 25-pair copper telephone cable between the room and the telephone switch room was tested during the site survey and found to be in good condition. PWC will install one new 2-inch conduit run between the Frame Room and Room 150 to accommodate an additional cable fiber optic cable and an additional copper cable run required for this project. In addition, the PWC will install 1.25-inch diameter wall penetrations for a RED conduit run. The conduit runs and penetration will be designed according to specifications supplied by SSC. SSC installers will pull new cables through the PWC installed conduits and will install all RED conduit using penetrations installed by PWC.

5.2 Building 123 Electrical Power Improvements. The electrical power situation at Building 123 will require major changes.

5.2.1 Transformer Capacity. The 50 KVA transformer outside of Building 123 is operating at its capacity when all air conditioning units are on. The PWC Master Electrician metered the current being drawn at the building's transformer and calculated that it was operating at 95 percent of its capacity. When supplied with our equipment list and power requirements, the electrician recommended that a transformer with twice the capacity of the current transformer be installed to supply the building. Interestingly, the drawings that we retained indicated that the building transformer was a 100 KVA transformer. At the time the drawings were made, the transformer supplying the building was a 100 KVA transformer. However, after it failed six years ago, it was replaced by a 50 KVA transformer on a temporary basis. The existing drawings were not updated because the replacement was supposed to be only temporary.

5.2.2 Electrical Code Violations. The building wiring has Electrical Code Violations. These violations were written up in a separate report and consisted of undersized wiring with oversized breakers being used to supply the recently installed UPS. Correcting these violations is the responsibility of the contractor who installed the UPS. This matter is being pursued by the NCTS Detachment.

5.2.3 UPS Capacity. The UPS room in Building 123 has a 25 KVA UPS installed and has enough room to install one more. The existing UPS is operating at 13 KVA at this time and the EHF equipment requires approximately 17 KVA of UPS capacity. We plan to install an additional 25 KVA UPS inside of the UPS room. This new UPS will be wired to a new UPS power panel to be installed near the EHF transmitter. (Separate UPSs for the Classified LAN Node will be installed in Room 150 as discussed previously.

5.3 Cable Duct Capacity. The existing RED signal cable ducts have sufficient capacity to handle the needs of the EHF part of this project. The existing BLACK signal cable ducts are filled at many locations along the path that we would use to connect the main suite of EHF equipment to the terrestrial extension equipment. Therefore, we mapped out a path for a new BLACK duct run. This run will be installed to connect all of the EHF equipment to each other and to the existing network of BLACK signal ducts. A new power duct run will also be required for connecting the UPS to the new power panel.

5.4 Wall Penetrations. During the site survey, we identified 3 locations where walls must be penetrated below the level of the raised floor for EHF ducts and conduits. These walls are solid concrete and are 13 inches thick. A hole also must be cut into the wall at the location of the building entrance plate for the EHF cables. (The building has no entrance plate.) Penetrations through the wall will also be required to connect Room 150 to the building ground ring. We confirmed that the local PWC is willing and able to make these penetrations. The OIC of the NCTS Detachments will provide escorts as required during the weekends when this work will take place.

5.5 Air Conditioning Capacity. The current air conditioning capacity of most of Building 123 is adequate to support our requirements. The major exception is the dedicated air conditioning for the UPS room. Twice during the previous 12 months, protective circuitry inside the UPS caused it to shut down during hot weather. The Base Civil engineer will perform a study to determine the best method for upgrading the air conditioning to the UPS room and will provide the results of this study to SSC. Our computer simulation of the building's air-conditioning system's performance after the planned installation showed that additional air conditioning ducting to Room 150 will be needed to maintain the room at a comfortable temperature after the new equipment and security upgrades are installed.

5.5.1 **Air Conditioning Analysis.** SSC Pacific has determined the adequacy of existing air conditioning capacity utilizing commercially available software capable of accepting all significant relevant inputs. These inputs included information regarding local sun exposure/building orientation, local weather extremes, building wall construction, window placement/construction, traffic (through doorways), and personnel loading. The

commercially available software has been tested in compliance with ANSI/ASHRAE Standard 140 - Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs. (This standard specifies test procedures for evaluating the technical capabilities and ranges of applicability of computer programs that calculate the thermal performance of buildings and their HVAC systems.) A manometer was used as well to record the pressure at all vents. Temperature readings were taken with a FLIR™ infrared camera. A flow hood was used to measure the cubic feet per minute (CFM) of airflow from all vents, both supply and return. Humidity readings were also taken. All data collected and input into the computer model has been provided to the Site Public Works Officer along with the results of various simulations, including the simulations for two potential solutions requiring the installation of additional ducting to room 150. This material is all included in enclosure (7). The Public Works Officer has agreed to include installing the additional ducting in the facilities improvements estimate.

5.6 Outside Plant Cable. A recent project at the base installed a new 12-strand single mode fiber optic cable between Building 123 and the Joint Command Center Bunker. The site has reserved two of these strands for use by the EHF terrestrial extension circuit. This same project also installed new single and multimode mode fiber optic cables between all of the hangars the Base Headquarters Building, and between the Base Headquarters Building and Building 123. These cables are managed by the local RITC. During the Site Survey, the local RITC, Ms. Helpful, agreed to reserve 10 strands on the multimode fiber optic cable between the Headquarters Building and Building 123 for use by the new Classified LAN. The local RITC also agreed to reserve two strands on each multimode cable connecting the Headquarters Building and the hangars.

5.7 DISA Circuits. The local DISA representative, John Doe, was contacted concerning establishing two DS1 circuits to be used to connect the Classified LAN to the Classified WAN hub locations. He informed us that the existing military communications infrastructure could handle one DS1 circuit but that the second circuit would probably need to be a commercial leased line. The NCTS Detachment will initiate the Telecommunications Service Requests needed to establish the new DS1 circuits. No additional hardware would be required to establish these circuits.

6.0 Safety Issues. During the site survey we obtained a copy of a Base-wide asbestos survey conducted by Acme Asbestos Testing Services during 1996. During this survey, Building 123 and the Command Center Bunker were determined to be free of asbestos hazards. The installation will pose no hazards to ordnance, and safety interlocks will be installed to minimize radiation hazards to personnel. The SSC contractor performing work on the antenna tower shall establish a fall protection and prevention program, for the protection of all employees exposed to fall hazards. The program shall include company policy, identify responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and evacuation procedures. The facilities improvements contract will include the firestopping of new wall penetrations, and SSC PAC will repair or replace all firestopping damaged during the installation. The safety requirements for the antenna tower design (ladders, guard rails, air terminals (lightning rods), etc.) have been provided to

the local PWC.

7.0 Installation Scheduling Considerations. During the site survey we were informed that the installation schedule should avoid planning that any work take place during the first 2 weeks in April. This is because a large number of tourists descend upon the base and local community to participate in the annual Cherry Blossom Festival. During this time, it can take hours to get from the hotels to the base. Movement on the base is also restricted because the base is open to the public at this time. No installation work will be permitted during the annual Beach Invasion summer exercise. This major 2-week military exercise is scheduled every summer between 15 July and 15 August. Also, the Command Center has formally requested that the installations be completed in time to support the exercise in 2010. The OIC of NCTS and the Commanding Officer at the Command Center have agreed that escorts and access to both buildings will be available whenever required (24 hours per day 7 days per week) if needed to ensure support for the Beach Invasion 2010 exercise.

8.0 Information to Be Obtained

8.1 PWC Cost Estimate Information. The Local PWC will supply final itemized cost estimates before the end of this fiscal year. They have provided "ballpark" cost estimates of $425,000 for the facility improvements described above and $350,000 for the antenna tower/platform construction. PWC will require that SSC provide the additional information listed in paragraph 8.5.

8.2 DISA Cost Information. The local DISA representative will provide the recurring charges for supplying the two DS1 circuits required for the Classified LAN.

8.3 Electromagnetic Compatibility Report. The site survey team collected all data needed to produce this report. The formal report is being prepared by SPAWAR Activity Hawaii and should be distributed by the end of this month.

8.4 Alarm System Specifications. The base alarm system is being upgraded. The specifications for the alarm system are held by Acme Security Systems, Charleston. The alarm system to be installed in Room 150 of Building 123 must be compatible with the new base-wide security system designed and installed by Acme Security Systems. SSC San Diego has written to the organization that manages the Acme Security Systems contract, asking them to provide cost estimates, points of contact, and other information required to integrate the new alarms into the base security system.

8.5 Detailed Design Specifications for PWC. SPAWARSYSCEN will provide PWC with a Statement of Work (SOW) containing the formal details and design guidance it needs to complete its cost estimate. This SOW is scheduled to be completed by the end of this month. The SOW will contain detailed requirements for items such as:

a. Equipotential Ground Plane Construction and Installation
b. Power Panel Specifications and Locations
c. Wall Penetrations (dimensions and positions)

d. Antenna Tower Design (data already provided to PWC)
e. Building Entrance Plate Construction and Installation
f. New Wall Construction.
g. Air Conditioning Duct Extensions

9.0 Project Integration Recommendations. Improvements to the electrical infrastructure, wall construction, and wall penetration are required for both projects. These site improvements should be completed as one integrated task to be handled by the local PWC. A single crew of professional installers should be used to mount cabinets, run cables, make connectors, and perform other standard installation tasks for both projects

10.0 Equipment and Material Storage Location. The CMS custodian has agreed to order and store the required KEMAT and cryptos. The Base Facilities office has also agreed to reserve a 400 square foot portion of tunnel 2 as an equipment and materials storage and staging area. The Supply Officer has provided SSC PAC with the required shipping addresses and POC information.

11.0 Type Accreditation has been obtained by the Program Offices for the systems to be installed. Site accreditation is the responsibility of Imaginary Air Base.

12.0 Closing Remarks. The site survey team received outstanding cooperation from all site personnel involved. The local PWC generously and quickly provided copies of all of the data requested. Questions regarding this report should be e-mailed to nobody@spawar.navy.mil.

LIST OF ENCLOSURES

Enclosure Number	Enclosure Description
1	Maps of satellite view obstructions and theodolite readings for all alternative locations
2	Scanned copy of the floor-plan mark-up
3	Adobe Acrobat (pdf) file with floor plans showing where various pictures were taken. When you click on the camera icons shown on the floor plans, the picture taken from the location and direction shown by the icon will appear.
4	Set of floor plans and maps showing the location, orientation and file name of each photograph taken during the site survey
5	CD-ROM containing all photographs
6	Tower height calculation spreadsheet
7	HVAC Computer Simulation Results

APPENDIX N – TRAINING SYSTEM INSTALLATION PLANS

SPAWAR
Template for the Preparation
of
Training System Installation Plans (TSIPs)

TRAINING SYSTEM INSTALLATION PLAN (TSIP)

FOR

TRAINING SYSTEM INSTALLATION AND TRANSFER

OF

(ENTER SYSTEM / EQUIPMENT NOMENCLATURE HERE)

AT

(***ENTER NAME AND LOCATION OF FACILITY TO RECEIVE THE INSTALLATION***)

(***INSERT COMMAND LOGO HERE***)

DATE: _____

REVISED: _____
(Latest date of Revision)

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PHASE I INITIAL AGREEMENT

FACILITY REQUIREMENTS IDENTIFICATION

(PRELIMINARY SITE SURVEY)

FOR

(***ENTER SYSTEM / EQUIPMENT NOMENCLATURE***)

AT

(***ENTER NAME AND LOCATION OF FACILITY TO RECEIVE THE INSTALLATION***)

TRAINING SYSTEM INSTALLATION PLAN (TSIP)
PHASE I INITIAL AGREEMENT
FACILITY REQUIREMENTS INDENTIFICATION
(PRELIMINARY SITE SURVEY)
TSIP E-_ _ _ _ - _ _ - _ _ _ _

The initial TSIP documentation (preliminary site survey) for facility requirements identification (System/Equipment Nomenclature) is provided in accordance with OPNAVINST 11102.2.

FACILITY REQUIREMENT SUMMARY

REQUIREMENT (check appropriate requirement)	DURATION:	RESPONSIBLE COMMAND
☐ Military Construction Required*	[6 Years]	_____ TA
☐ Special Project Required*	[37+ Months]	_____ TA
☐ Special Project Required*	[24 Months]	_____ TSA
☐ Installation Only Required*	[14 Months]	_____ TSA
☐ Installation Only Required*	[8 Months]	_____ TSA

*See attached preliminary Site Survey

Comments/Remarks:

_____ _____
DATE TRAINING SUPPORT AGENT
BY NAME/TITLE/COMMAND/CODE

The attached initial TSIP documentation (preliminary site survey) is accepted as the identification of facility requirements.

_____ If signed by direction, so state_____ _____
DATE TRAINING AGENT
BY NAME/TITLE/COMMAND/CODE

Distribution List:
TA (TSIP Coordinator)
Learning Center (TSIP Coordinator)
TSA (Cognizant Internal codes)
COMSPARWARSYSCOM (4.2, 4.3, 4.3.1-APM-L)

PRELIMINARY SITE SURVEY DATA

1. GENERAL INFORMATION AND TRAINING SYSTEM DATA

a. Date Preliminary Site was Conducted (DD/MM/YY):

b. Navy Training System Plan (NTSP) Reference or Establishing Authority.
(If there is no NTSP, cite other documentation, which establishes the requirement, etc. to include date of requirement approval.)

NTSP Number	Date	Status

c. Operational use Summary: (UNCLASSIFIED) Describe the operational use of the equipment as it applies to total force use. Note ship classes on which equipment is installed:

d. Training Concept Summary: Describe the scope of training to be established, sustained, or revised as a result of the installation (i.e., Intermediate/Organizational Level Maintenance, Operator Training, etc.).

If known, identify course name, title (CIN) and length. If non-specific, so state and describe:

Course Name	Title (CIN)	Length

e. Functional Description: Provide a brief functional description of the training equipment. (Refer to Sponsor approved requirement documents as appropriate.)

f. List of Equipment to be installed:
(If applicable, cite any identifying equipment tracking numbers (NTSP, etc.).

(1) Technical Training Equipment (TTE):

TTE Nomenclature	Quantity	Procuring Activity	Delivery Status

(2) Simulator:

Simulator Nomenclature	Quantity	Procuring Activity	Delivery Status

(3) Training Device:

TD Nomenclature	Quantity	Procuring Activity	Delivery Status

g. Interfaces/Impacts on Other Training Equipment: Describe the interfaces/impacts on other training equipment that will be relocated, and equipment that is presently installed, or planned for installation: (Consider instances of multiple, phased installations which are covered by other individual TSIPs. Where applicable, reference other TSIPs:

_____

Note: *(Timing and Synchronization issues must be addressed in the TSIP to document system requirements such as signal type (i.e., 1 PPS, 5 MHz, 100kHz) number of and type of connections to new and existing equipment, and impacts to existing equipment and systems. Specific details of the timing and synchronization system are a required part of the Installation Design Documentation (IDD). If new timing and synchronization equipment is required, it must be done in a manner that meets all known requirements and future facilitates expansion plans.)*

h. Training Equipment to be Replaced: List all training equipment that will be replaced and/or relocated as a result of this installation: (Include, if known, the intended disposition of removed equipment consistent with the requirements of OPNAVINST 1500.76A and local authority.):

Nomenclature	Part Number	QTY	Disposition

i. Learning Facility (Command/Location): Provide the learning facility's address as listed in the current Standard Navy Distribution List (SNDL). Include zip code and Unit Identification Code (UIC): _____

2. FACILITY DATA

a. Training Equipment Location at Learning Facility:

(1) Building and Room No: _____

(2) Floor Plans & Elevations. See Appendix B.

(3) Other: _____

b. Basic Facility Requirements of Training Equipment:

(1) Air Conditioning and Heating: _____

(2) Water: _____

(3) Power: _____

(4) Physical Requirements: _____

(5) Other: _____

c. Description of Military Construction (MILCON) / Special Project Requirements: Cite MILCON or Special Project number and any other applicable data: _____

3. MAJOR MILESTONES

a. Training System Ready For Training (RFT) date: _____
(The CNO established RFT date as set forth in a current Navy Training System Plan (NTSP) or other reference.)

b. Beneficial Occupancy Date (BOD) date: _____
(Date facility will be ready to receive the equipment in order to begin the installation.)

c. TSIP Data Scheduled Updates (Minimum). Update required (month/year) for MILCON programming. Update required (month/year) for special project programming: _____

d. Phase II Engineering Site Survey Scheduled Date (Month/Year): _____

PHASE II ENGINEERING AGREEMENT

INSTALLATION AND TRANSFER REQUIREMENTS

(ENGINEERING SITE SURVEY AND TRAINING SUPPORT PACKAGE ELEMENTS)

FOR

(***ENTER SYSTEM / EQUIPMENT NOMENCLATURE)***

AT

(***ENTER NAME AND LOCATION OF FACILITY TO RECEIVE THE INSTALLATION***)

If deemed necessary, note the following:

PHASE II elements contain the latest data available at the time of original PHASE I release. Though, known to be incomplete, they are included solely for information purposes.

TRAINING SYSTEM INSTALLATION PLAN (TSIP)
PHASE II ENGINEERING AND TRAINING SUPPORT PACKAGE ELEMENTS
AGREEMENT
FOR INSTALLATION AND TRANSFER REQUIREMENTS
(ENGINEERING SITE SURVEY AND TRAINING SUPPORT PACKAGE ELEMENTS)
TSIP E-_ _ _ _ - _ _ - _ _ _ _

The TSIP Phase II installations (engineering site survey and transfer requirements (training support package elements) required for transfer responsibility for the training system are provided in accordance with OPNAVINST 11102.2.

The list of training support package elements is certified as complete unless otherwise indicated below.

Comments/Remarks:

Add attachments if necessary.

_____	If signed by direction, so state_____
DATE	TRAINING AGENT BY NAME/TITLE/COMMAND/CODE

The attached TSIP Phase II engineering documentation (engineering site survey and listing of training support package elements) is accepted as the determination of installation and transfer requirements and as the basis for transfer of training responsibility.

_____	If signed by direction, so state_____
DATE	TRAINING AGENT BY NAME/TITLE/COMMAND/CODE

ENGINEERING SITE SURVEY AND TRAINING
SUPPORT PACKAGE ELEMENTS

1. GENERAL INFORMATION

a. Date Engineering Site Survey was conducted (Day/Month/Year): _____

b. Training Courses (s) Identification: (If nonspecific, so state and describe.)

Course Name	CIN / Title	Length

c. Planned Date of Transfer: Planned date of transfer of responsibility for the training system from the (from TSA to the TA): _____

d. List of Equipment:

(1) Technical Training Equipment (TTE). (If applicable, city any identifying equipment tracking numbers.)

TTE Nomenclature	Quantity	Procuring Activity	Delivery Status

(2) Training Devices: (If applicable, city any identifying equipment tracking numbers.)

TD Nomenclature	Quantity	Procuring Activity	Delivery Status

(3) Training Unique Equipment: (If applicable, city any identifying equipment tracking numbers.)

TUE Nomenclature	Quantity	Procuring Activity	Delivery Status

e. System Interface with Other Installed/Future Training Systems or equipment. Describe the interfaces/impacts on other training equipment that will be relocated, and equipment that will be relocated, and equipment that is presently installed or planned for installation.

f. See Appendix B for attached Information Assurance (IA) documentation. FRCB submit will be completed 90 days in advance of planned installation in accordance with Naval Network Warfare Command NETWARCOMINST 12271.1. Planned date FRCB submission will be complete: (Day/Month/Year): _____

g. Appendix B provides Installation Design Documentation (IDD), including the completed Installation Design (IDP).

2. MAJOR MILESTONES: See TSIP Schedule in OPNAVINST 11102.2 Encl 2. Utilize Microsoft Project for content and format. Prepare and insert into Appendix B a Plan of Action and Milestones (POA&M) that includes the following data elements:

Project Start	Certification	OPNAV 4790/CK submission
Preliminary Site Survey	Curriculum	On-Site Testing
Engineering Site Survey	Software	Installation Complete
Beneficial Occupancy Date	Spares	Ready for Use
Site Prep/Installation Prep	Test Equipt (GEN/SPEC)	Pilot
TTE/TD/Simulator Delivery	Tools (GEN/SPEC)	Ready for Training (RFT)
Eng. Data Submission Phase II	Technical Data Supt Package	Transfer Submission
Installation	Instructor/O&M Training	Final IDD & As-Built Dwgs

3. ENGINEERING SITE SURVEY DATA

In the following paragraphs, include summarized results of the engineering site survey to address what the existing conditions/capacities are versus the new requirements and identify whom will perform and provide for the difference.

a. Security and Safety Factors:

(1) Security Classification of Equipment, Courses etc. Include any ADP security requirements as set forth in OPNAVINST 5239.1B.

_____

(2) Identify any Environmental Safety issues (Federal, State, Local):

_____

(3) Pressurized Equipment Safety: Identify any pressurized equipment safety specifications, as required.

_____

(4) Nuclear Safety: Identify nuclear safety requirements.

_____

(6) Electromagnetic Radiation Safety: Include any RF hazards to personnel (HERP), fuel (HERF) and ammunition (HERO).

_____

(6) EM Security (TEMPEST survey): (If required, insert a TEMPEST Vulnerability Assessment Request into Appendix B. See Shore Installation Process Handbook Appendix P for Tempest Questionnaire.)

TEMPEST Survey Requested: ***Select***

(7) Eye and Ear hazards: Identify eye and ear safety requirements.

_____

(8) Fire Extinguishment Requirements:

(a) Type of extinguishing agent (s) recommended: _____

(b) Special precautions to be observed: _____

(c) Do existing facilities meet this requirement? (If not, explain what must be done and identify the responsible party). _____

(9) Airspace Clearance Criteria: Specify clearance requirements between the equipment and the room to accommodate operation and maintenance tasks, airflow, etc.:

_____

(10) Other: Specify any other Security and Safety Factors not previously addressed.

_____

b. Utilities:

(1) Air Conditioning

(a) The Technical Data Summary provided in the IDP, attached to Appendix B, contains all operating parameters of the equipment.

(b) Heating requirements: (The most restrictive operating temperature of the installed equipment.) Note: Unless the installation is in an extremely cold environment, e.g. outdoors, un-heated spaces, etc., heating requirements is not applicable.

(1) Room: List current BTU capabilities: _____

(2) Equipment: List equipment BTU requirements: _____

(3) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.):

_____

(c) Air conditioning/cooling requirements:

(1) Room: List current BTU capabilities: _____

(2) Equipment: List equipment BTU requirements: _____

(3) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.)

_____

(d) Ventilation requirements:

(1) Room: Specify duct and air handling/flow requirements: _____

(2) Equipment: Specify duct and air handling/flow requirements: _____

(3) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party:

_____

(e) Humidity Factors:

(1) Room: Specify dew point/relative humidity parameters. _____

(2) Equipment: Define operating and non-operating humidity parameters._____

(3) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.):

_____

(f) Air Cleanliness Requirements:

(1) Room: Specify air particulate requirements: _____

(2) Equipment: Specify air particulate requirements: _____

(3) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.):

_____

c. Plumbing:

(1) Water requirements: Include flow rate, temperature, purity, etc. _____

(2) Sewage requirements: Type, Volume/capacity, Pollution abatement requirements, etc. _____

(3) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

d. Electrical Power: (Installing activity shall annotate current building drawings to reflect any changes resulting from the installation.) (For preliminary site survey data, list the total estimated VAC, HZ, Amps, and Phase requirements.): _____

(a) Electrical Power Requirements:

(1) Room: List current capabilities. Include shunt trip and emergency shutdown requirements: _____

(2) Equipment: (List equipment VDC, VAC, HZ, Amps, and Phase Requirements): _____

(3) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

(b) Grounding Requirements: (AC, DC, digital, RF, etc.): _____

(1) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

(c) Requirements for generators, transformers, converters, etc. (Rating, capacity, etc.): _____

(1) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

(d) Lighting Requirements. Identify lumens, color, dimming controls, etc. _____

(1) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

(e) Uninterrupted power requirements: Identify facility and equipment requirements by quantity and rating, etc: _____

(1) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

(f) Lighting protection requirements: Identify facility and equipment requirements rating, etc: _____

(1) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

d. Hydraulics, Compressed Gases, Steam, Petroleum, Oil and Liquids (POL), and Other Fluids: Identify facility and equipment requirements by quantity, quality, rating, etc.:

(a) Hydraulic power requirements: _____

(b) Compressed gas requirements: _____

(c) Steam requirements: _____

(d) POL product requirements: _____

(e) Other fluids: _____

(1) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

e. Exhaust Requirements: (State, Federal, Local.) Identify facility and equipment requirements by quantity, quality, rating, etc.):_____

(1) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

f. Noise Abatement Requirements: (State, Federal, Local.) Identify facility and equipment requirements by quantity, quality, rating, etc.): _____

(1) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

g. Telecommunication Requirements: Identify internal, external, requirements, including number of stations, etc. Consider Communication Connectivity requirements. Connectivity may

be required in support of installation, testing, and normal operations. If existing connectivity is identified and agreed upon during the site survey, the TSIP will identify the connectivity and describe which systems or testing requirements this connectivity will support. The TSIP shall specify what resources such as multiplexer or router ports, cable strands, and patch panel ports are reserved for the installation. New terrestrial connectivity is normally ordered via a Feeder Telecommunication Service Request (FTSR). The TSIP will provide sufficient technical circuit data to enable the FTSR originator to prepare the request. The training site is responsible for submitting the FTSR to Defense Information Systems Agency (DISA).

_____

(1) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

h. Other: Specify any other Utilities not previously addressed: _____

i. Physical Factors and Requirements:

(a) Limitations:

(1) Space:

(a) Minimum physical cube requirements into which the equipment will fit: _____

(b) Space for foreseeable growth requirements: _____

(2) Floor loading, false flooring, false overhead, and cable runs/waveguide requirements: (Identify flooring and floor loading requirements): _____

(a) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

(3) Windows and/or special access requirements: Identify window, door, and any other special access requirements: _____

(a) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

(4) Overhead hoist requirements. Identify facility and equipment requirements by quantity, quality, rating, etc.: _____

(a) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

(5) Storage container and storage area requirements: Identify trainer requirements by type, size/capacity, etc.: _____

(a) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

(6) Security/safety limitation requirements: Identify trainer requirements. Include any classified data in computer memory: _____

(a) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

(7) Antennas: Identify equipment requirements by type, quantity, rating, mounting, etc: _____

(a) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

(8) Other Special Considerations: Identify trainer requirements and include any quantitative or qualitative data: _____

(a) Do facilities meet this requirement? (If not, explain what must be done and identify the responsible party.): _____

4. TRAINING CONFIGURATION ITEM INDEX

Configuration Before Change			
EIC	RIC/APL/AEL #	Part No.	Ref Designator, Model Type & Noun Name

Configuration After Change			
EIC	RIC/APL/AEL #	Part No.	Ref Designator, Model Type and Noun Name

5. TRAINING SUPPORT PACKAGE

1. Parts (Spare/Repair):

Identify as Spare or Repair	Description	Identification	Procuring Activity	Delivery Status

2. Test Equipment

(a) General purpose:

#	Nomenclature	Model Number	COG	FSCM	SCAT

			Code		
1					

(General purpose Test Equipment continued):

#	NSN	QTY	Procuring Activity	FY Funded	Delivery Status
1					

(b) Special purpose:

#	Nomenclature	Model Number	COG Code	FSCM	SCAT
1					

(Special purpose Equipment continued):

#	NSN	QTY	Procuring Activity	FY Funded	Delivery Status
1					

3. Tools:

(a) General purpose tools:

#	Nomenclature	QTY	Procuring Activity	Delivery Status
1				

(b) Special purpose tools

#	Nomenclature	QTY	Procuring Activity	Delivery Status
1				

4. Support Equipment: List support equipment such as roll around carts, overhead hoists, workbenches, etc., which allows for training equipment operation and maintenance, or otherwise supports the course of instruction but is not part of the curriculum. Distinguish between GFE and contractor provided equipment:

GFE	Contractor	Nomenclature	QTY	Procuring Activity	Delivery Status

5. Technical Data Support Package: Identify all technical manuals, PMS documentation, MRC, etc., to be provided:

Technical Manuals	PMS Documentation	Maint. Rqmt Cards (MRC)	Other

6. Curriculum Material: List all curriculums to be provided to the TA, including NTSP identified course materials and any contractor developed materials to support training devices. (*The identification of curriculum deliverables should include items such as Instructor Guides, Trainee Materials, handbooks, etc.*) Cite the curriculum standard or specification used, if applicable. List all Data Item Descriptions (DIDs) used. List all Training Aids to be provided. Examples include mock-ups, pre-faulted modules, fault insertion aids and unique audio-visual equipment. (List all curriculums, Data Item Descriptions (DIDs), and Training Aids:

Curriculum	QTY	Procuring Activity	Delivery Status

7. Software (if applicable):

a. Operational:

Nomenclature	QTY	Procuring Activity	SW Support	Delivery Status

b. Maintenance:

Nomenclature	QTY	Procuring Activity	SW Support	Delivery Status

c. Simulation:

Nomenclature	QTY	Procuring Activity	SW Support	Delivery Status

8. Other Equipment Documentation: List all other equipment documentation to be provided, such as software, software licenses, Software Support Activity contact information, and ADP security documentation, custody and inventory records, data lists, parts lists, etc.:

Software	Software Licenses	Software Support Activity Contact INFO

Other Equipment Documentation continued:

ADP Security Documents	Custody and Inventory RCDS	Data Lists	Parts Lists	Other

9. Unique Identification (UID) Requirements: Provide UID in accordance with Under Secretary of Defense for Acquisition, Technology and Logistics signed the Policy for Unique Identification (UID) of Tangible Items – New Equipment, Major Modifications and Re-procurements of Equipment and Spares:

6. INITIAL INSTRUCTOR/SUPPORT PERSONNEL TRAINING REQUIREMENTS

Describe all initial training required for assigned instructor personnel and for follow-on maintenance support prior to the RFT date to include location of the training, length of the training, any special certifications, qualifications or prerequisites required. Use subheadings as required to show the various types of initial training to be provided, e.g., operation, maintenance, other. Include required training for follow-on maintenance support for training equipment through a TA sponsored contractor operation and maintenance (O&M) service or a technical assistance program.

_____

7. CONTRACTOR OPERATION AND MAINTENANCE (O& M SERVICE/TECHNICAL ASSISTANCE PROGRAM

Identify whether the installed equipment is expected to be maintained through a TA sponsored contractor O&M service or a technical assistance program: _____

8. ACTIONS AND/OR DECISIONS REQUIRED:

a. Actions Required: Thoroughly define roles and responsibilities of all parties associated with this schoolhouse installation.

(1) Actions Required: _____

(2) Command Action: _____

(3) Due Date:

(4) Status: _____

b. Decisions Required:

(1) Actions Required: _____

(2) Command Action: _____

(3) Due Date:

(4) Status: _____

PHASE III
TRANSFER OF TRAINING RESPONSIBILITY
FOR

(ENTER ***SYSTEM/EQUIPMENT NOMENCLATURE***)

(ENTER ***NAME AND LOCATION OF FACILITY TO RECEIVE THE INSTALLATION***)

1. CONDUCT SECURITY/SAFETY WALK-THROUGH

The Installation Activities' OSGR (On-Site Government Representative) and Site Personnel conduct a security/safety walkthrough to certify the security and safety of the installation, to identify security/safety discrepancies, and to assign corrective action. The OSGR will annotate all discrepancies requiring correction in the SOVT document.

2. CONDUCT SOVT

The SOVT is the formal document used to test and document that the installed system/equipment is fully operational. The OSGR, SMEs, and site personnel will perform the SOVT in accordance with the SOVT document. The SOVT Team will conduct end-to-end system-level testing, ensuring system operational capabilities are demonstrated to site personnel who witness successful completion by signing the SOVT document. Insert a copy of signed SOVT into Appendix B.

3. ARRANGE AND CONDUCT TRAINING

The OSGR will ensure that the required OJT is provided to site personnel and that it covers operation and maintenance features of the installed system. The OSGR will ensure that OJT is scheduled to provide timely training to site personnel. OJT Certifications will be provided, as applicable, to all site personnel successfully completing the OJT. Record the names of those trained in an Installation Completion Report (ICR). Insert the ICR into Appendix B.

4. TYPE ACCREDITATION PACKAGE

The OSGR will ensure that the Type Accreditation package for an AIS system is delivered to the site/local DAA so that Site Accreditation can be completed. In addition to requiring this information for the Site Accreditation, the Site needs the Type Accreditation package for submittal to DISA for NIPRNET/SIPRNET connection approval.

5. LOGISTICS SUPPORT AND CONFIGURATION MANAGEMENT

The OSGR will ensure that all logistics support documentation material is delivered. All equipment, spares, and documentation will be accepted by authorized site personnel, tracked using a DD 1149, and noted in an ICR. In addition, it is the

responsibility of the installation team to prepare a Configuration Change Form (OPNAV 4790/CK) configuration management documents and provide them to the site for their inclusion into the supply system database. Insert 4790/CK into Appendix B.

6. CUT-OVER

When a Hot or Warm Cut-Over strategy has been planned for an installation, a Cut-Over Plan will be developed. The Cut-Over Plan should include a recovery and fall-back contingency plan. The OSGR and site personnel will be responsible for executing the Cut-Over Plan. Cut-Over Plans can be integrated into the SOVT document. All affected site personnel should be informed when Cut-Over Plans are executed.

7. POST INSTALLATION OUT-BRIEF

The PE and the OSGR will conduct the post installation Out-Brief to the site. The Out-Brief will explain the systems and capabilities that have been installed and will summarize the results of the SOVT. The RSIM will attend, if possible. All outstanding discrepancies will be explained and action items will be assigned to the appropriate authority, with expected completion dates. Security and safety issues will be briefed, pointing out any personnel/equipment dangers such as new Radiation Hazards, software upgrades required to protect against viruses, and intrusion detection measures.

8. The OSGR will provide a draft Site Acceptance Message/Letter during the Out-Brief. While it is preferred that the installation acceptance letter/message be the final acceptance by the site, it is acceptable to obtain a conditional acceptance letter/message with outstanding deficiencies/requirements.

9. For the purposes of Configuration Management, the PE will complete final As-Built drawings within 60 days after the completion of the installation. The As-Built drawings should be provided with the Phase III TSIP as part of Appendix B deliverables. A soft copy shall also be provided. The final As-Built drawings shall incorporate all corrections and changes marked on the redlined copies provided to the site upon the completion of the installation.

10. After completion of the SOVT certifying that the installation has been satisfactorily completed, the TA will perform whatever tests and pilot courses that the TA deems to be necessary to prove that the curriculum and training installation meets the TA's requirements. In addition, the PE will deliver the completed Configuration Change Form (OPNAV 4790/CK) documentation to the TA. After the TA tests and pilot courses are satisfactorily completed, the TA will certify that the installation is Ready for Training by signing the TSIP Phase III Transfer of Training Responsibility page.

18. The PE will complete and provide the IDD Completion Report and Training Support Package. See Appendix B.

EQUIPMENT FACILITY REQUIREMENTS
PHASE III
TRANSFER OF TRAINING RESPONSIBILITY
TSIP E-_ _ _ _ - _ _ - _ _ _ _

Signature affirms that Ship's Configuration Change Forms (OPNAV 4790/CK) have been filled out and provided to the Learning Facility. Acceptance of the (Equipment Nomenclature) installed at (Name and Location of Learning Facility to Receive the installation) is:

CONDITIONAL

*Deficiency	Command and Code Responsible To Correct	Date Correction Will Be Accomplished
(See Discrepancy List)	_____	_____

Responsibility for the above training system (including maintenance of the system/equipment), with the exception of those items listed as deficiencies, is hereby transferred and CONDITIONALLY accepted by the Training Agent in accordance with the TSIP Phase II Engineering Agreement for Installation and Transfer Requirements.

If signed by direction, so state_____
TSA BY NAME/TITLE/COMMAND/CODE/DATE

If signed by direction, so state_____

FINAL

Responsibility for the above training system (including maintenance responsibility for the system/equipment) is hereby transferred and accepted by the Training Agent in accordance with the TSIP Phase II Engineering Agreement for Installation and Transfer Requirements.

If signed by direction, so state_____
TSA BY NAME/TITLE/COMMAND/CODE/DATE

If signed by direction, so state_____
TSA BY NAME/TITLE/COMMAND/CODE/DATE

TSIP
APPENDIX A
POINTS OF CONTACT

Points of Contact: (Enter ***Command/Code/Name/Title/Telephone(DSN/COML***)

1. OPNAV Sponsor: (List CNO Program Sponsor and/or Mission Sponsor): _____

2. Training Support Agent (TSA):
(Program/Project Manager, ILS Manager, TSIP Manager, etc.): _____

3. Training Agent (TA): (List points of contact.): _____

4. Learning Facility: (As a minimum, include the Facility Manager and a point of contact within the applicable academic department.): _____

5. Installation Activity: (Installation Project Engineer or Manager.): _____

6. CNI/Naval Region/Facility Engineering Center: (List points of contact.): _____

TRAINING SYSTEM INSTALLATION PLAN (TSIP)

APPENDIX B

INSTALLATION DESIGN DOCUMENTATION

(ENTER ***TITLE OF INSTALLATION***)

AT

(ENTER ***LOCATION, Include Building and Room No***.)

DATE: _____

REVISED: _____
(Latest date of Revision)

TSIP Appendix B

Installation Design Documentation

Provide the following attachments as applicable to this installation.

Phase I:

1. Detailed POA&M Schedule
2. Floor Plan and Elevations

Phase II:

1. Detailed POA&M Schedule
2. Pre-Installation Brief
3. TEMPEST Questionnaire (if applicable)
4. Information Assurance Documentation
5. Approved SOVT Plan
6. Approved Installation Design Plan
    a. Installation Master Drawing
    b. Master Parts List
    c. Technical Data Summary
    d. Floor Plans and Elevations
    e. Antenna Layouts and Elevation
    f. Simplified Block Diagrams
    g. Cabling Block Diagrams
    h. Cable Running Sheets
    i. Cross Connect Records
    j. Distribution Frame Layout
    k. Circuit Diagrams
    l. Labeling Details
    m. Patch Panel Layouts
    n. Power Distribution
    o. Cable Routing Layouts (ISP)
    p. Cable Routing Layouts (OSP)
    q. Mechanical Assembly and Mounting Details
    r. Miscellaneous Installation Details
    s. Miscellaneous System Configuration Details

Phase III:

1. Detailed POA&M Schedule
2. Post-Installation Brief
3. TEMPEST Questionnaire (if applicable)
4. Information Assurance Documentation
5. Signed SOVT
6. Integrated Logistics Support Package
7. Training Support Package (as applicable)
8. Installation Completion Report (see SIPH Appendix W)
9. Ship's Configuration Change Form (OPNAV 4790/CK)
10. Draft Completion Message
11. Approved As-Built Drawings
    a. Installation Master Drawing
    b. Master Parts List
    c. Technical Data Summary
    d. Floor Plans and Elevations
    e. Antenna Layouts and Elevation
    f. Simplified Block Diagrams
    g. Cabling Block Diagrams
    h. Cable Running Sheets
    i. Cross Connect Records
    j. Distribution Frame Layout
    k. Circuit Diagrams
    l. Labeling Details
    m. Patch Panel Layouts
    n. Power Distribution
    o. Cable Routing Layouts (ISP)
    p. Cable Routing Layouts (OSP)
    q. Mechanical Assembly and Mounting Details
    r. Miscellaneous Installation Details
    s. Miscellaneous System Configuration Details

APPENDIX O1
- INSTALLATION BESEP (SAMPLE MESSAGE)

```
RAAUZYUW  0871836-UUUU--.
ZNR UUUUU
R 191836Z APR 05
FM SPAWARSYSCEN SAN DIEGO CA
TO OPNAV DET SITE R FT DETRICK MD
INFO CNO WASHINGTON DC
COMNAVNETWARCOM NORFOLK VA
OPNAVSUPPACT WASHINGTON DC
COMSPAWARSYSCOM SAN DIEGO CA
PEO C4I AND SPACE SAN DIEGO CA
SPAWARSYSCEN SAN DIEGO CA
SPAWARSYSCEN CHARLESTON SC
SPAWARSYSCEN CHARLESTON DET NORFOLK VA
BT
UNCLAS
MSGID/GENADMIN/SPAWARSYSCEN CHARLESTON DET//
SUBJ/BASE ELECTRONIC SYSTEM ENGINEERING PLAN (BESEP) FOR GCCS-M 4.X
/AT THE NAVY ALTERNATIVE COMMAND CENTER.  TN: 05-0184//
REF/A/DOC/COMSPAWARSYSCOM SAN DIEGO CA/13JUN2003/V2//
REF/B/CON/SPAWARSYSCEN SAN DIEGO CA/17MAR2005//
REF/C/DOC/SPAWARSYSCEN SAN DIEGO CA/31MAR2005//
NARR/REF A IS THE SPAWAR SHORE INSTALLATION PROCESS HANDBOOK VERSION
2.  REF B IS THE SITE SURVEY.  REF C IS THE SITE SURVEY REPORT.//
POC/TIM BOGGS/PE (CODE J855)/SPAWARSYSCEN CHARLESTON/NORFLOK VA
/TEL:(757) 558-6843/EMAIL:TIMOTHY.BOGGS@NAVY.MIL//
POC/JAMES SCHLESSER/ETC/SPAWARSYSCEN CHARLESTON/NORFOLK VA
/TEL:(715) 558-6856/EMAIL:JAMES.SCHLESSER@NAVY.MIL//
POC/BILL BABER/CIV/SPAWARSYSCEN CHARLESTON/NORFOLK VA
/TEL:(757) 462-7168/EMAIL:WILLIAM.BABER@NAVY.MIL//
POC/DAVID CAMPBELL/SUPERVISOR/OPNAV DETACHMENT SITE R/FORT DETRICK MD
/TEL:DSN: 988-3845/TEL:(717) 878-3845
/EMAIL:DAVID.CAMPBELL@AJCC.NAVY.MIL//
POC/BART GIBBON/AIS/OPNAV DETACHMENT SITE R/FORT DETRICK MD
/TEL:DSN: 988-9415/TEL:(717) 878-3898/EMAIL:BART.GIBBON@AJCC.NAVY.MIL
//
POC/GLENN ROSS/ITC LCPO/OPNAV DETATCHMENT SITE R/FORT DETRICK MD
/TEL:DSN: 998-3387/TEL:(717) 878-3387/EMAIL:ROSS.GLENN@AJCC.NAVY.MIL
//
GENTEXT/REMARKS/1. IAW REF A AND AS DISCUSSED IN REFS B AND C, THE
FOLLOWING BESEP CONFIRMS THE PLAN FOR ACCOMPLISHING GCCS-M
HARDWARE AND SOFTWARE TECHNOLOGY REFRESH AT ALTERNATE NAVY COMMAND
CENTER (ANCC).
A. SCOPE AND PURPOSE: THE PURPOSE OF PROJECT 05-0184 IS TO
ACCOMPLISH THE TRANSITION FROM GCCS-M 3.X HP-UNIX SERVER BASED
ARCHITECTURE TO GCCS-M 4.X SUN BASED ARCHITECTURE IN A PC CLIENT
ENVIRONMENT.
B. SYSTEM DESCRIPTION: GCCS-M ASHORE PROVIDES CNO, FLEET AND UNIFIED
COMMANDERS-IN-CHIEFS, TYPE COMMANDERS AND SUBORDINATE COMMANDS ASHORE
WITH SINGLE INTEGRATED COMMAND AND CONTROL INFO MANAGEMENT SYSTEM TO
RECEIVE, STORE, MAINTAIN AND DISPLAY OPERATIONAL INFO TO ASSESS UNIT
CHARACTERISTICS, EMPLOYMENT SCHEDULING, MATERIAL CONDITION, COMBAT
READINESS, WARFIGHTING CAPABILITIES, POSITIONAL INFO AND DISPOSITION OF
```

OWN AND ALLIED FORCES AND TO ASSIST IN OPTIMIZING THE ALLOCATION OF THESE FORCES. GCCS-M ASHORE PROVIDES CURRENT GEO-LOCATIONAL INFO ON HOSTILE AND NEUTRAL LAND, SEA AND AIR FORCES INTEGRATED WITH INTELLIGENCE AND ENVIRONMENTAL INFO AND NEAR REAL TIME WEAPONS TARGETING DATA TO SUBMARINES.
C. INSTALLATION SITE AND LOCATION DETAILS:
(1) THIS INSTALLATION AT THE ANCC.
(2) LIST OF EQUIPMENT TO BE INSTALLED:
(A) COMMUNICATIONS CENTER (ROOM 2C68):
ONE NEW EQUIPMENT SERVER RACK WITH:
FOUR SUNFIRE 280R SERVERS (COMMS 1, COMMS 2, WEB, AND INTEL).
THREE COMPAQ DL 380 SERVERS (DC1, DC2, AND EXCHANGE).
ONE SUN 3510 ARRAY.
ONE CALTEX LAN MUX.
ONE AVOCENT AV-400-8 KVMS.
ONE RP-117 LCD RACKMOUNT MONITOR.
ONE 19 INCH ROTATING DRAWERS WITH KEYBOARD AND MOUSE.
(B) ROOM 2B72:
ONE DELL OPTIPLEX GX280 PC CLIENT WORKSTATION WITH L685 LCD MONITOR (MONITOR RELOCATED FROM GCCS-M 3.X), KEYBOARD AND MOUSE.
(C) ROOM 2B64:
ONE DELL OPTIPLEX GX280 PC CLIENT WORKSTATION WITH L685 LCD MONITOR (MONITOR RELOCATED FROM GCCS-M 3.X), KEYBOARD AND MOUSE.
(D) N7 OFFICE (ROOM 2S41):
ONE DELL OPTIPLEX GX280 PC CLIENT WORKSTATION WITH L685 LCD MONITOR (MONITOR RELOCATED FROM GCCS-M 3.X), KEYBOARD AND MOUSE.
(E) ROOM 2B57:
FOUR DELL OPTIPLEX GX280 PC CLIENT WORKSTATIONS, EACH WITH EIZO L795 LCD MONITOR, KEYBOARD AND MOUSE.
ONE PC IMAGERY WORKSTATION WITH PREDATOR VIDEO KIT.
(F) N2 OFFICE (ROOM 2S11):
ONE DELL OPTIPLEX GX280 PC CLIENT WORKSTATION WITH L685 LCD MONITOR (MONITOR RELOCATED FROM GCCS-M 3.X), KEYBOARD AND MOUSE.
(G) N4 OFFICE (ROOM 2M13):
TWO DELL OPTIPLEX GX280 PC CLIENT WORKSTATIONS, EACH WITH EIZO L795 LCD MONITOR, KEYBOARD AND MOUSE.
(H) N3/N5 OFFICE (ROOM 2B50):
ONE DELL OPTIPLEX GX280 PC CLIENT WORKSTATION WITH EIZO L795 LCD MONITOR, KEYBOARD AND MOUSE
2. EQUIPMENT TO BE REMOVED:
ONE ML 370 SERVERS.
TWO HP C3600 SERVERS.
SIX HP B2600 PC CLIENT WORKSTATIONS.
ONE ARCUS TRIMM RAID.
TWO 18” LCD MONITORS.
SIX KEYBOARD/MOUSE.
3. GCCS-M 3.X EQUIPMENT TO REMAIN IN PLACE TO SUPPORT NAVY STATUS OF FORCES (NSOF) IN GCCS-M 4.X ENVIRONMENT:
SIX HP C3600 SERVERS.
FOUR HP B2600 CLIENT WORKSTATIONS.
TWO ARCUS TRIMM RAIDS.
SEVEN 18 INCH LCD MONITORS.
THREE KVMS.
SEVEN KEYBOARD/MOUSE.
D. FACILITY REQUIREMENTS:
(1) STRUCTURAL: NO STRUCTURAL ADDITIONS OR MODIFICATIONS ARE REQUIRED TO SUPPORT THIS PROJECT.

(2) POWER: THERE ARE NO SPECIAL POWER REQUIREMENTS TO SUPPORT THIS PROJECT.
(A) COMMUNICATIONS CENTER: TWO 20 AMP BREAKERS (NUMBER 7 FROM POWER PANEL 1RPIA AND NUMBER 15 FROM POWER PANEL 1RBIB)WILL PROVIDE REQUIRED POWER FOR GCCS-M 4.X EQUIPMENT TO BE INSTALLED IN THE COMMUNICATIONS CENTER, EQUIPMENT ROW 1, RACK 3, VIA A SPLIT QUAD OUTLET FLOOR BOX FEEDING TWO RACK MOUNTED POWER STRIPS. POWER IS SUFFICIENT TO SUPPORT THIS PROJECT.
(B) POWER FOR ALL OTHER EQUIPMENT WILL BE DRAWN FROM EXISTING OUTLETS.
(3) AIR CONDITIONING / HEATING:
(A) COMMUNICATIONS CENTER: HVAC IS ADEQUATE WITH THE EXCEPTION OF RETURN AIR FLOW. MEASUREMENTS OF HVAC SYSTEM SHOW: 1738 CFM AT 60.7 DEGREES F, EQUALS TO 113000 BTU/HR. EXISTING EQUIPMENT: 60300 BTU/HR. EQUIPMENT TO BE INSTALLED: 14000 BTU/HR. RESIDUAL SYSTEM CAPACITY: 48000 BTU/HR. THE AMBIENT TEMPERATURE IN THE ROOM WAS 72 DEGREES F DUE TO INSUFFICIENT RETURN AIR VENTILATION. SITE FACILITIES MANAGER SHOULD CONDUCT AN HVAC SURVEY AND TAKE CORRECTIVE ACTION.
(B) ALL OTHER SPACES HAVE ADEQUATE HVAC TO ACCOMMODATE THE INSTALLATION OF WORKSTATIONS. HEAT LOAD OF 850 BTU/HR PER UNIT WHICH IS 950 BTU/HR LESS THAN THE UNITS BEING REPLACED.
(4) LIGHTING: EXISTING LIGHTING IS SUFFICIENT TO SUPPORT THIS PROJECT.
(5) GROUNDING: THE GCCS-M 4.X SYSTEM WILL TIE INTO THE EXISTING GROUNDING BAR SYSTEM. THIS GROUND SYSTEM MEETS MIL-STD-188-124B.
E. ENVIRONMENTAL AND SAFETY CONCERNS:
(1) NO HAZARDOUS CONDITIONS TO PERSONNEL, ORDNANCE, OR FUEL WILL EXIST AS A RESULT OF THIS INSTALLATION. RADIATION HAZARDS TO PERSONNEL, ORDNANCE, OR FUEL DO NOT EXIST. THERE IS NO SAFETY OF FLIGHT CONSIDERATIONS. FIRE PROTECTION MEASURES EMPLOYED AT THIS SITE ARE CONSIDERED ADEQUATE.
(2) ALL WORK ON POWER PANELS, EQUIPMENT AND CABLE INSTALLATIONS AND COSMETIC WORK WILL BE CONDUCTED IAW REF A AND APPLICABLE GUIDANCE DOCUMENTS LISTED IN REF A, APPENDIX AC.
F. SECURITY REQUIREMENTS:
(1) NO SPECIAL CONSIDERATIONS.
(2) PHYSICAL SECURITY EMPLOYED AT THE ANCC IS WITHIN THE DEFINED SECURITY ENVELOPE FOR GCCS-M 4.X.
(3) EXISTING FACILITIES ARE CLASSIFIED AS TEMPEST APPROVED. THIS INSTALLATION SHALL COMPLY WITH THE REQUIREMENTS. IT WAS DETERMINED THAT GCCS-M DESIGN COMPLIES WITH APPLICABLE TEMPEST GUIDANCE DOCUMENTATION AND IS A RECEIVE ONLY SYSTEM. UPON COMPLETION OF INSTALLATION, SPAWAR PROJECT ENGINEER SHALL SUBMIT A TEMPEST REQUIREMENTS QUESTIONNAIRE, IF REQUIRED, IAW OPNAVNOTE C5510.
(4) INSTALLATION OF ALL ELECTRONIC DEVICES WILL BE CONDUCTED IAW REF A AND APPLICABLE GUIDANCE DOCUMENTS LISTED IN REF A, APPENDIX AC.
G. COMMUNICATION CONNECTIVITY:
(1) GCCS-M REQUIRES SIPRNET CONNECTIVITY.
(2) ANCC SPACES INVOLVED IN THIS PROJECT ARE CURRENTLY ACCREDITED FOR GENSER ACCESS.
H. TIMING AND SYNC REQUIREMENTS:
(1) NO SYSTEM TIMING AND SYNCHRONIZATION REQUIRED FOR GCCS-M.
I. SYSTEM TESTING:
(1) SPAWAR PROJECT ENGINEER WILL PRODUCE A SYSTEM OPERATIONAL VERIFICATION TEST (SOVT) PLAN TO THE COMMAND PRIOR TO COMMENCING TESTING.

(2) SOVT WILL BE PERFORMED BY SPAWAR PROJECT ENGINEER AND WITNESSED BY COMMAND REPRESENTATIVES.
J. LOGISTICS SUPPORT:
(1) THE GCCS-M ASHORE 4.X SYSTEM EQUIPMENT WILL BE SUPPORTED IAW PROCEDURES IN THE INTEGRATED LOGISTICS SUPPORT (ILS) AND USER'S LOGISTICS SUPPORT SUMMARY (ULSS) DOCUMENTS. ONCE THE COMMAND HAS SIGNED THE SOVT, IT WILL BE THE RESPONSIBILITY OF THE COMMAND TO MAINTAIN AND PROVIDE THE MAINTENANCE TO THE SYSTEM. THERE IS NO REQUIREMENT FOR GENERAL PURPOSE ELECTRONIC TEST EQUIPMENT (GPETE) OR SPECIAL PURPOSE ELECTRONIC TEST EQUIPMENT (SPETE).
(2) FINAL COPIES OF ALL INSTALLATION AS-BUILT DRAWINGS WILL BE PROVIDED TO THE COMMAND WITHIN 60 DAYS AFTER THE COMPLETION OF HARDWARE INSTALLATION. ELECTRONIC COPIES OF ALL INSTALLATION DOCUMENTATION WILL BE UPLOADED TO DOCUMENTUM DATABASE BY SPAWAR PROJECT ENGINEER WITH NOTIFICATION TO PMW-150 VIA THE WEEKLY SITREP.
K. OTHER SPECIAL CONSIDERATIONS: NONE
L. ACTIONS OR RESPONSIBILITIES:
1) SPAWAR PROJECT ENGINEER IS RESPONSIBLE FOR THE FOLLOWING:
(A) CONDUCT IN-BRIEF AND OUT-BRIEF.
(B) REVIEW AND RELEASE AN INSTALLATION BESEP MESSAGE.
(C) REVIEW INSTALLATION DESIGN PLAN (IDP) DRAWING.
(D) CONDUCT SITE ASSESSMENT.
(E) DELIVER INSTALLATION EQUIPMENT AND MATERIALS.
(F) PERFORM GCCS-M 4.X HARDWARE AND SOFTWARE INSTALLATION.
(G) RED LINE IDP DRAWINGS UPON COMPLETION OF HARDWARE INSTALLATION. ONE COPY OF RED LINED DRAWING WILL BE PROVIDED TO THE COMMAND. A SECOND COPY WILL BE DELIVERED TO THE PMW-150 ASHORE CONFIGURATION MANAGER FOR INCLUSION INTO SITE SPECIFIC CONFIGURATION DRAWING.
(H) CONDUCT A COMPLETE HARDWARE AUDIT AND FORWARD REPORT TO PMW-150 ASHORE CONFIGURATION MANAGER.
(I) OBTAIN A COMMAND SIGNATURE (GOVERMENT) FOR SITE SPECIFIC CONFIGURATION DRAWING.
(J) CONDUCT TRAINING AS OUTLINED IN PMW-150 WORKSCOPE.
(K) CONDUCT SOVT AND DOCUMENT OUTSTANDING DISCREPANCIES AND ISSUES.
(L) PREPARE AND DELIVER DD-1149 DOCUMENTATION.
(M) PROVIDE FOR THE DISPOSITION/DISPOSAL OF REMOVED/UNUSED EQUIPMENT, MATERIAL AND DEBRIS.
(N) PREPARE AND DELIVER FINAL AS-BUILT DRAWING PACKAGE.
2) ANCC WILL BE RESPONSIBLE FOR THE FOLLOWING:
(A) ACCEPT DELIVERY AND MAKE ARRANGEMENTS TO STORE MATERIAL AND EQUIPMENT UNTIL ARRIVAL OF THE INSTALLATION TEAM.
(B) PROVIDE ACCESS TO SPACES AND ASSIGN ESCORTS AS REQUIRED.
(C) PROVIDE 30 DEDICATED IP ADDRESSES FOR SIPRNET CONNECTIVITY AS REQUIRED BY INSTALLATION.
(D) REQUEST SITE FACILITIES MANAGER CONDUCT HVAC SURVEY OF COMMUNICATIONS CENTER AND TAKE CORRECTIVE ACTION TO IMPROVE AND STABILIZE RETURN AIR FLOW.
(E) REQUEST POWER DISTRIBUTION DIAGRAM AND AMPLIFYING INFORMATION FOR ALL SPACES FROM SITE FACILITIES MANAGER.
(F) ASSIGN PERSONNEL TO WITNESS SOVT AND VALIDATE SITE SPECIFIC CONFIGURATION DRAWINGS.
(G) SIGN SOVT AND SITE SPECIFIC CONFIGURATION DRAWINGS.
(H) DRAFT AND RELEASE INSTALLATION COMPLETION MESSAGE AS OUTLINED IN EXAMPLE CONTAINED IN SOVT.
2. UNLESS OTHERWISE DIRECTED INSTALLATION WILL PROCEED TO SUPPORT THE PLANNED 30 SEP 05 COMPLETION OF PRODUCTION WORK.//
BT

INSTALLATION BESEP (SAMPLE LETTER)

2804
Ser 4231/001
06 Aug 08

From: Commanding Officer, Space and Naval Warfare Systems Center Pacific
To: Distribution List

Subj: BASE ELECTRONIC SYSTEM ENGINEERING PLAN FOR INSTALLATION OF THE INTEGRATED SUBMARINE AUTOMATED BROADCAST PROCESSING SYSTEM

Ref: (a) NSTISSAM TEMPEST/2-95 of 12 DEC 1995 (TEMPEST RED/BLACK Installation Guidance)
(b) OPNAVINST C5510.93F/MCO C5510.19 - Navy/Marine Corps Implementation of National Policy on the Control of Compromising Emanations (C), Current Edition
(c) Operational Logistic Support Summary (OLSS) for the AN/FYQ-87(V) Data Processing System

Encl: (1) AN/FYQ-87 (V) Integrated Submarine Automated Broadcast Processing System (ISABPS) Installation Details for NCTAMS LANT
(2) AN/FYQ-87(V) ISAPBS Equipment Tables for NCTAMS LANT
(3) Actions and Responsibilities List by Command

1. Scope and Purpose. This Base Electronic System Engineering Plan (BESEP) documents the plans and responsibilities for the installation of an AN/FYQ-87 (V), Integrated Submarine Automated Broadcast Processing System (ISABPS), at Naval Computer and Telecommunications Area Master Station Atlantic (NCTAMS LANT) Norfolk, VA. This installation will provide the submarine Broadcast Control Authorities (BCAs) with an operationally suitable Broadcast Keying Site (BKS) capable of supporting the new Very Low Frequency (VLF) Transmitter installation at NCTAMS LANT Detachment (NCTAMS LANT DET) LaMoure, ND. The Capability will also be provided to enable the ISABPS at NCTAMS LANT to key the VLF Transmitter at Naval Computer and Telecommunications Station (NCTS) Cutler, Maine for split array operations or as an alternate source of broadcast data. The descriptions and actions defined in this BESEP will be limited to those required to install ISABPS and activate all communications connectivity with participating sites.

2. System Description. The AN/FYQ-87 (V) ISABPS is part of the Fleet Submarine Broadcast System (FSBS). ISABPS is an integrated system comprised of sixteen (16) cabinets of modern computers, network equipment, computer controlled patch and switch panels, cryptographic equipment, time synchronization equipment, and telecommunication equipment. ISABPS is designed to provide an automated interface with the Submarine Satellite Information Exchange System (SSIXS) shore processor located at the Broadcast Control Authority (BCA) site. In addition to processing General Service (GENSER) broadcast data from SSIXS, inputs from Special Intelligence (SI) sources is also accepted. Emergency Action Messages (EAMs) from the National Command Authority (NCA) are also received for immediate transmission.

GENSER and SI messages as well as EAMs are processed by VERDIN, AN/URC-62 (V), and a VLF/LF multi-media and multi-channel receiver-transmitter system. The ISABPS design and performance has been proven operationally and is under exacting configuration management. Enclosure (1) sheets 5 and 6 provide a basic functional diagram of ISABPS.

3. Installation Sites and Location Details. The ISABPS suite will be installed in the CSE Room 279 of Building M51 at the Naval Base Norfolk, Virginia. Enclosure (1) provides simple drawings depicting this installation. ISABPS equipment will be located in the position shown in elevation "A-A" of enclosure (1) sheets 3 and 5. This will require the removal of Room 280 walls by site personnel prior to the start of the ISABPS installation. An ancillary equipment rack, Bay No. 17, will also be installed with the ISABPS installation to house the station ANCC chassis. The ANCC equipment will provide ISABPS connectivity to required communications circuits. ISABPS will also require a Model AVA-3 VLF/LF active Vertical Antenna. ISABPS will require the installation of two Global Positioning System (GPS) antennas for use with the Time Frequency Distribution System (TFDS). These antennas will be installed on the roof of Building M-51 in the locations shown in enclosure (1) sheet 7.

4. Facility Requirements. The following paragraphs will address structural, power, lighting, grounding, environmental control, and other physical plant requirements.

   a. Structural. The ISABPS portion of the installation will require the installation of sixteen (16) ISABPS bays of equipment and one (1) empty equipment bay. The empty equipment bay will house the station ANCC equipment. As agreed during the site survey, site personnel will complete the ANCC equipment installation prior to the start of the ISABPS SOVT testing. As agreed during the site survey, walls that make up Room 280 within CSE Room 279 will be removed by site personnel prior to the start of the ISABPS installation. All inter-system cabling will be run in new cable ducting mounted on the top of the cabinets which will connect to existing station signal ducting. The equipment bays will be mounted to 4" wood foundations attached to the concrete floor. One (1) AVA-3 Whip Antenna will be installed on a new mounting plate and attached to the north wall at the roof line of Building M-51 in the location shown in enclosure (1) sheet 7. Two (2) GPS receive antenna's will be installed on new mounting plates on the south wall of the building in the location shown in enclosure (1) sheet 7.

   b. Power. ISABPS requires Uninterruptible Power Source (UPS) to maintain the submarine broadcast in case of a station power failure. The ISABPS installation will require 10.2 KVA of critical technical power. While the existing UPS power source in Building M-51 is adequate to support this requirement, power panel TP-25E-C located in the CSE Room 279 of Building M-51 will require conversion from technical power to critical technical power (UPS power). As discussed during the site survey this conversion will be accomplished by site personnel prior to the installation start date.

   c. Lighting. The existing overhead lighting system in the CSE Room 279 of Building M-51 is considered adequate for this project.

   d. Grounding. The ISABPS installation will tie into the existing ground system employed in Building M-51. This ground system is considered adequate for this project.

e. Environmental Control. The ISABPS equipment to be installed uses room air for cooling. The ISABPS dissipates 27,987 BTU/HR of additional heat. The existing environmental system in Building M-51 is adequate to support this project.

f. Antennas. One (1) AVA-3 whip antenna will be installed on the north wall at the roof edge of Building M-51 above Room 281. Two GPS receive antennas will be installed on the south wall at the roof edge directly above CSE Room 279. The cables will run on top of the roof and penetrate through an existing cable entry box on the south side of the roof directly above CSE Room 279.

5. Environmental and Safety Concerns. No hazardous conditions to personnel, ordnance, or fuel will exist as a result of this installation. Radiation Hazards to personnel, ordnance, or fuel do not exist. There are no safeties of flight considerations. Fire protection measures employed at this site are considered adequate.

6. Security Requirements. The following paragraphs will address physical, communication, transport, and information security requirements as applicable. TEMPEST compliance is also addressed.

a. Physical Security. Physical security measures employed at this site are considered adequate for this project. All spaces involved in the installation of the ISABPS suite are within defined security envelopes.

b. Communication Security. Communication security requirements will be met by several different types of cryptographic equipment. There are four major types of cryptographic units used in the ISABPS configuration: the KG-34, KG-84A, KG-84C, and KW-46. Additional information is provided in enclosure (2).

c. TEMPEST Compliance. The existing facilities are classified as TEMPEST approved. This installation shall comply with the requirements of references (a) and (b) to prevent compromising the TEMPEST certification of the facility. A countermeasure TEMPEST review (CTR) was performed on the ISABPS design by the Certified TEMPEST Technical Authority (CTTA). It was determined that the ISABPS design complies with applicable TEMPEST guidance documentation. Upon completion of the installation, NCTAMS LANT Norfolk, VA shall submit a TEMPEST Requirements Questionnaire, if required, in accordance with reference (b).

7. Connectivity. The ISABPS installation at NCTAMS LANT will require connectivity with NCTAMS LANT DET LaMoure, COMSUBLANT, COMSUBPAC, NAVCOMTELSTA Cutler, and an AUTODIN Switching Center. Enclosure (1) sheet 5 of 7 provides a connectivity diagram.

8. System Timing and Synchronization. ISABPS requires the use of Precision Time and Time Interval (PTTI) equipment. This installation will be completed using modern Global Positioning System (GPS) receivers and an advanced Time and Frequency Distribution System (TFDS). This equipment will provide precise time, time interval, and frequency reference data that is used to maintain the critical timing requirements of the VLF broadcast.

9. System Testing, Transition, and Operational Cut-over plans. The ISABPS installation is a new capability and requires no continuity of operations. Upon completion of the installation, a site representative will be asked to witness and participate in a System Operational Verification Test (SOVT). Upon satisfactory completion of the SOVT, the system will be certified for operational use and turned over to site personnel.

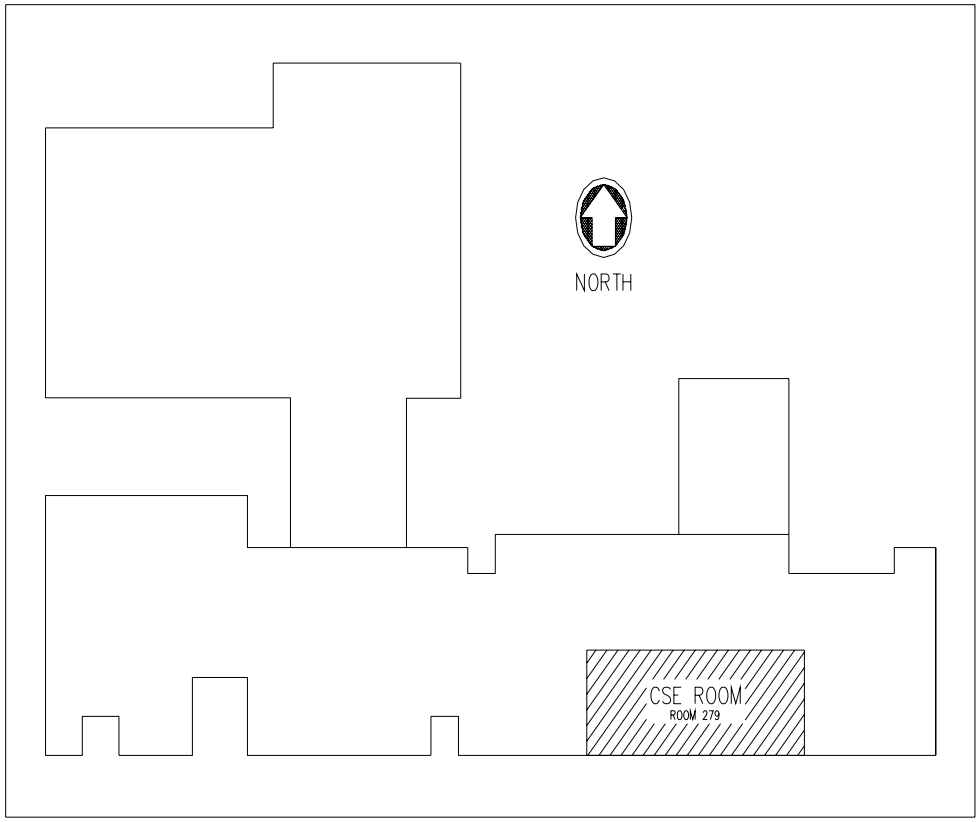
10. Logistic Configuration. ISABPS equipment will be maintained and supported in accordance with the procedures contained in reference (c). The Integrated Logistic Support (ILS) for all cryptographic equipment installed with ISABPS will be the responsibility of the facility through currently approved procedures. Enclosure (2) provides a list of required General Purpose Electronic Test Equipment (GPETE). ISABPS has no SPETE requirements. NCTAMS LANT Norfolk, VA should review their allowances against enclosure (2) and forward deficiencies to Naval Weapons Station (WPNSTA) Earle (Code 701). As agreed during site survey, NCTAMS LANT Norfolk will have designated site personnel complete operations and maintenance training at the ISABPS schoolhouse located at FTC Norfolk prior to completion of this installation.

11. Removal and Disposal. This installation is a new capability and no equipment or cable removal and disposal requirements exist. Any removal or disposal associated with the site preparations of room 280 will be accomplished by site personnel.

12. Other Special Considerations. The ISABPS suite will be prefabricated, checked and tested at SPAWARSYSCEN Pacific prior to shipment to NCTAMS LANT Norfolk, VA. This system and associated installation material will be shipped in a 20-foot sea van. It is required that this van be staged at a location near building M-51 to allow unloading of all equipment and installation materials.

13. Actions and Responsibilities: Enclosure (3) provides a detailed list of responsibilities by Command for the ISABPS installation.

Distribution:
COMSUBLANT
COMSUBPAC
NCTAMS LANT Norfolk, VA
NTCC Hampton Roads
NCTS Cutler
SPAWARSYSCOM
SPAWARSYSCEN Pacific
SPAWARSYSCEN Atlantic



KEY PLAN

BLDG. M-51
SECOND FLOOR
N.T.S.

NCTAMS LANT	NORFOLK	VIRGINIA
KEY PLAN		
BESEP NO. ISA-BESEP-01-U-RBC0		
REVISION B		SHEET 1 OF 7

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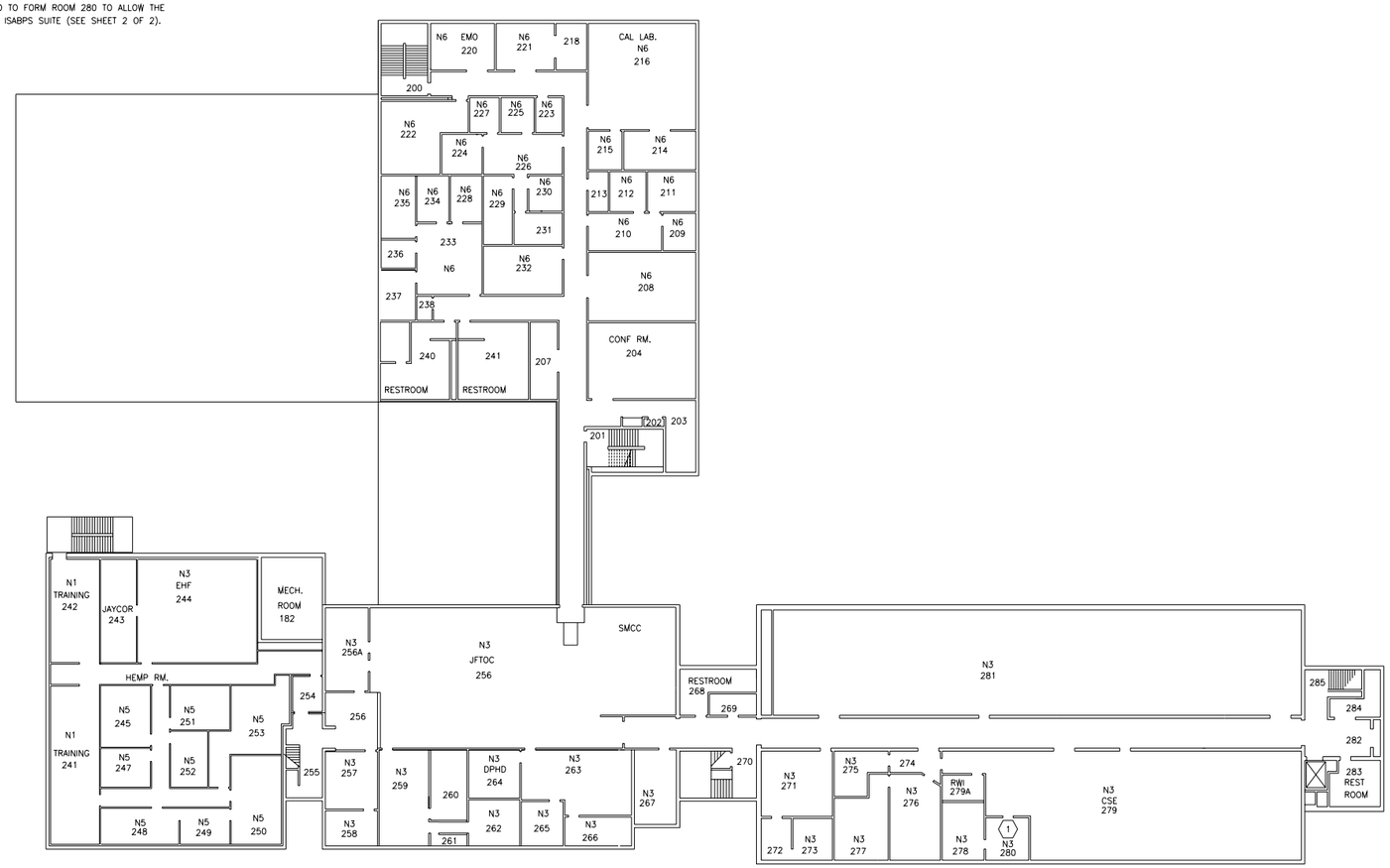
NOTES:

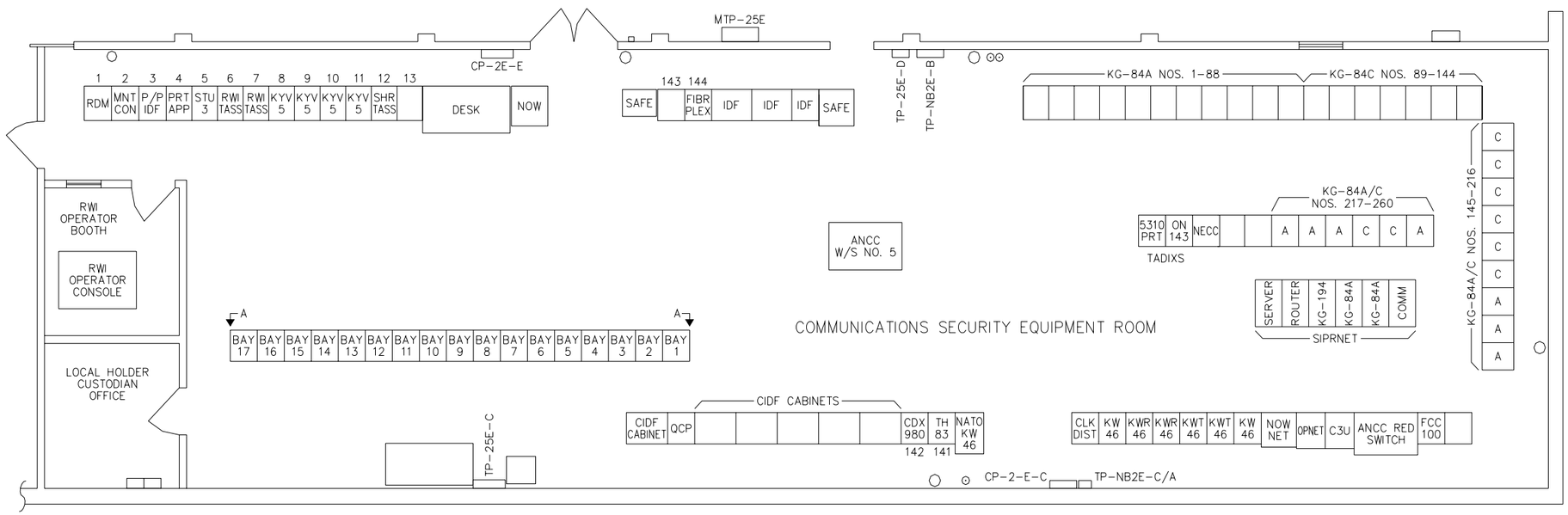
1. REMOVE WALLS USED TO FORM ROOM 280 TO ALLOW THE INSTALLATION OF AN ISABPS SUITE (SEE SHEET 2 OF 2).



NCTAMS LANT	NORFOLK	VIRGINIA
COMMUNICATIONS SECURE EQPT ROOM EQUIPMENT ARRANGEMENT		
BESEP NO. ISA-BESEP-01-U-RBC0		
REVISION B		SHEET 2 OF 7

NOTES:

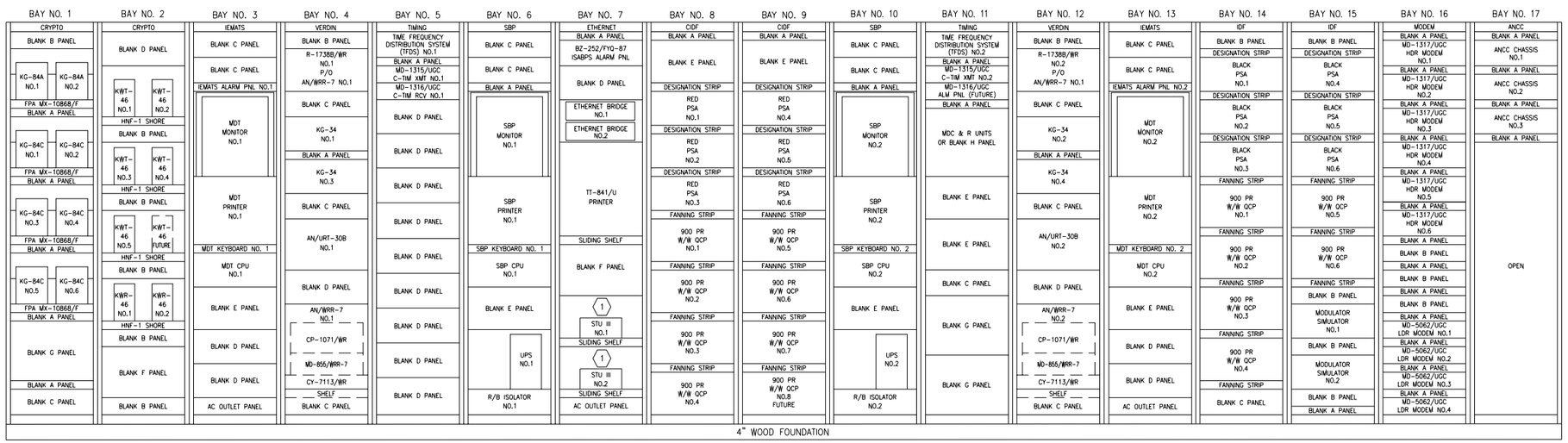
1. DRAWING SHOWN WITH ROOM 280 WALLS REMOVED.



NCTAMS LANT NORFOLK VIRGINIA
COMMUNICATIONS SECURE EQPT ROOM
EQUIPMENT ARRANGEMENT
BESEP NO. ISA-BESEP-01-U-RBC0
REVISION B SHEET 3 OF 7

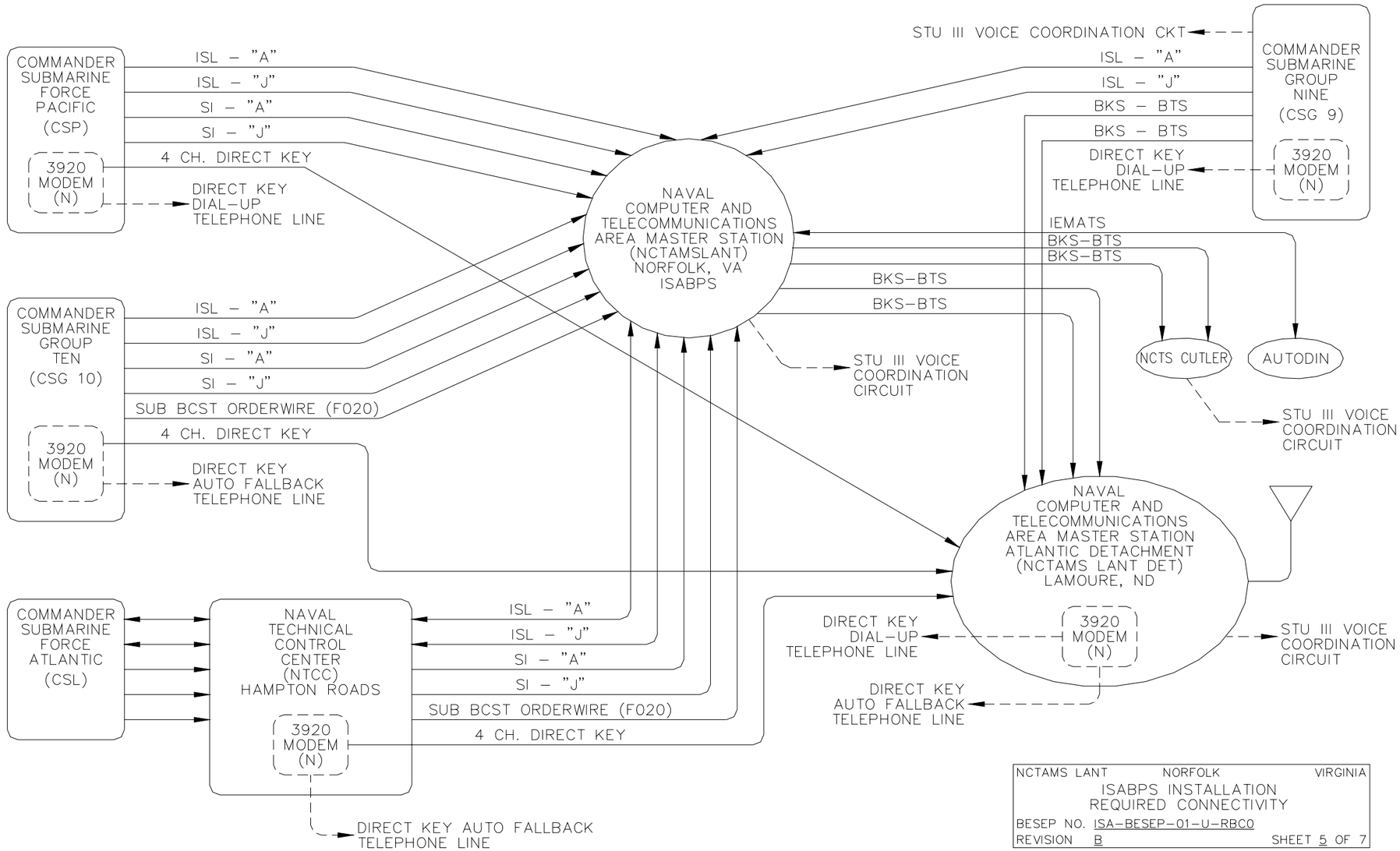
NOTES:

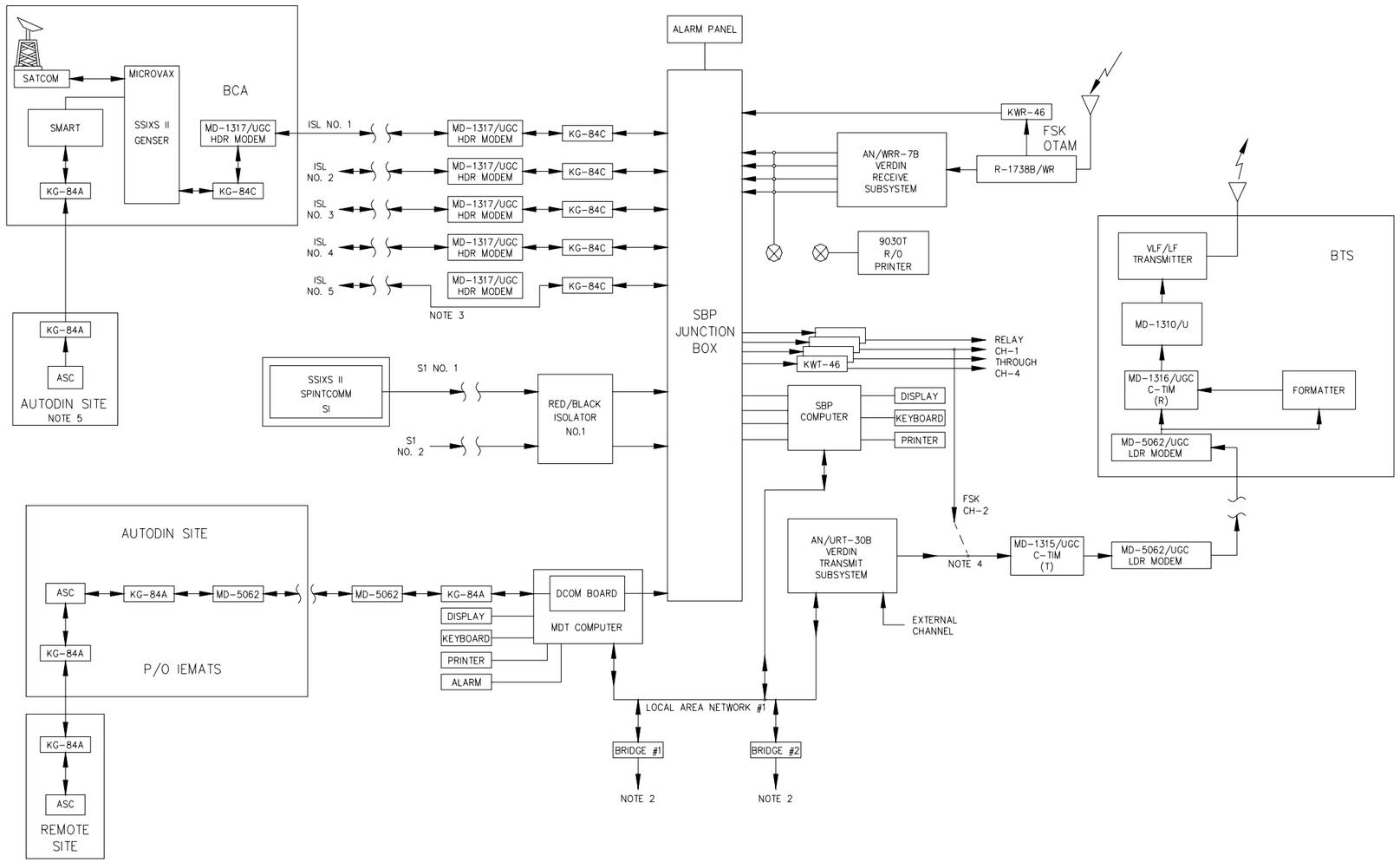
1. STU III EQUIPMENT WILL BE FURNISHED BY NCTAMS LANT NORFOLK, VA.



ELEVATION "A – A"
(N.T.S.)

NCTAMS LANT	NORFOLK	VIRGINIA
COMMUNICATIONS SECURE EQPT ROOM EQUIPMENT ELEVATION "A–A"		
BESEP NO. ISA–BESEP–01–U–RBC0		
REVISION B		SHEET 4 OF 7


COMMANDER SUBMARINE FORCE PACIFIC (CSP)
3920 MODEM (N)
ISL – "A"
ISL – "J"
SI – "A"
SI – "J"
4 CH. DIRECT KEY
DIRECT KEY DIAL-UP TELEPHONE LINE
COMMANDER SUBMARINE GROUP TEN (CSG 10)
3920 MODEM (N)
ISL – "A"
ISL – "J"
SI – "A"
SI – "J"
SUB BCST ORDERWIRE (F020)
4 CH. DIRECT KEY
DIRECT KEY AUTO FALLBACK TELEPHONE LINE
COMMANDER SUBMARINE FORCE ATLANTIC (CSL)
NAVAL TECHNICAL CONTROL CENTER (NTCC) HAMPTON ROADS
3920 MODEM (N)
ISL – "A"
ISL – "J"
SI – "A"
SI – "J"
SUB BCST ORDERWIRE (F020)
4 CH. DIRECT KEY
DIRECT KEY AUTO FALLBACK TELEPHONE LINE
NAVAL COMPUTER AND TELECOMMUNICATIONS AREA MASTER STATION (NCTAMSLANT) NORFOLK, VA ISABPS
STU III VOICE COORDINATION CIRCUIT
STU III VOICE COORDINATION CKT
COMMANDER SUBMARINE GROUP NINE (CSG 9)
3920 MODEM (N)
ISL – "A"
ISL – "J"
BKS – BTS
BKS – BTS
DIRECT KEY DIAL-UP TELEPHONE LINE
IEMATS
BKS–BTS
BKS–BTS
BKS–BTS
BKS–BTS
NCTS CUTLER
AUTODIN
STU III VOICE COORDINATION CIRCUIT
NAVAL COMPUTER AND TELECOMMUNICATIONS AREA MASTER STATION ATLANTIC DETACHMENT (NCTAMS LANT DET) LAMOURE, ND
3920 MODEM (N)
DIRECT KEY DIAL-UP TELEPHONE LINE
DIRECT KEY AUTO FALLBACK TELEPHONE LINE
STU III VOICE COORDINATION CIRCUIT
NCTAMS LANT NORFOLK VIRGINIA
ISABPS INSTALLATION
REQUIRED CONNECTIVITY
BESEP NO. ISA–BESEP–01–U–RBC0
REVISION B
SHEET 5 OF 7

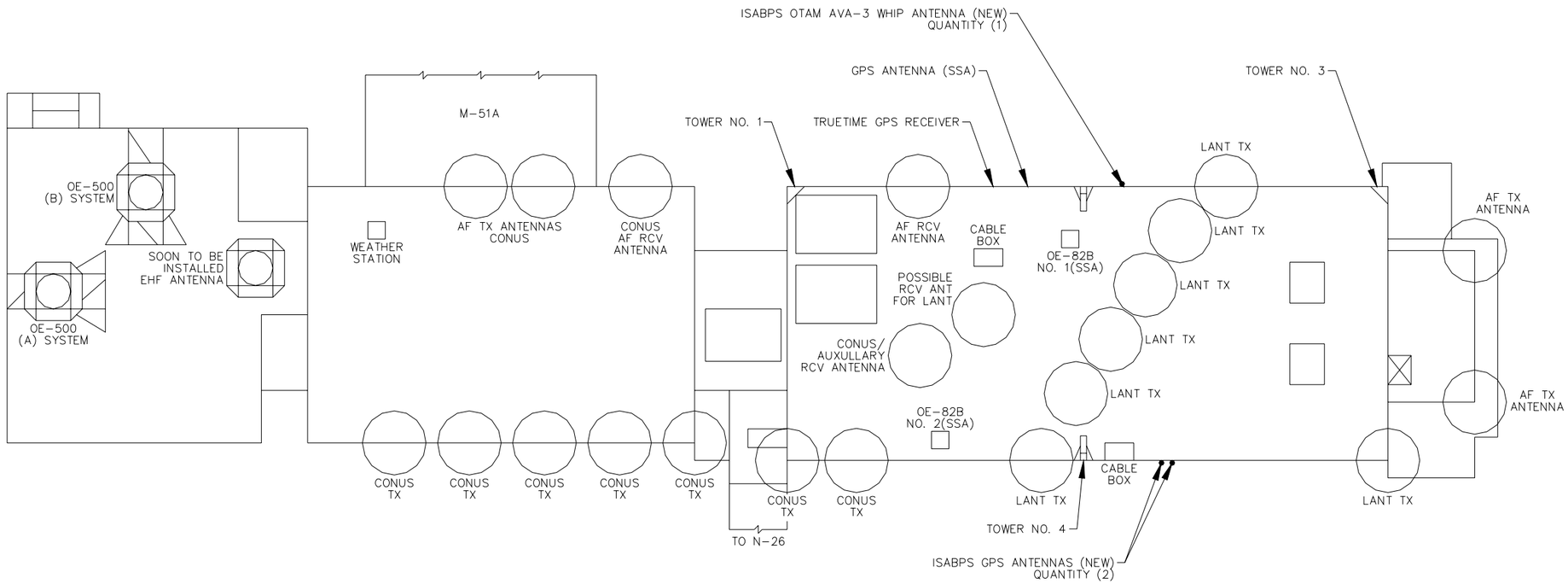


NOTES:
1. ⊗ DENOTES PATCH IS REQUIRED.
2. TO SYSTEM #2 LOCAL AREA NETWORK.
3. THE MD-1317/UGC MODEM IS BYPASSED DURING DIGITAL LINK OPERATIONS.
4. THE OUTPUT OF KWT-46 NO.2 IS PATCH/SWITCHED TO THE INPUT OF THE C-TIM (T) DURING FSK OPERATIONS.
5. DESIGNATED AUTODIN ASC MUST BE DIFFERENT SITE THAN THE ISABPS DESIGNATED AUTODIN ASC.

NCTAMS LANT NORFOLK VIRGINIA

ISABPS SINGLE SBP SUBSYSTEM

BESEP NO. ISA-BESEP-01-U-RBCO
REVISION B SHEET 6 OF 7



NCTAMS LANT	NORFOLK	VIRGINIA
BUILDING M-51 ROOF LAYOUT		
BESEP NO. ISA-BESEP-01-U-RBC0		
REVISION B		SHEET 7 OF 7

TABLE 1
ELECTRONIC EQUIPMENT PROCUREMENT
NCTAMS LANT NORFOLK, VA

ITEM NO.	NOMENCLATURE AND NOUN NAME	TOTAL REQ'D	ON HAND	PROCUREMENT RESPONSIBILITY			REMARKS
				SPAWAR SYSCEN PACIFIC	NCTAMS LANT NORFOLK, VA	SPAWAR SYSCOM SD	
1	AN/URT-30B TRANSMITTING SET						
1A	MT-6888/URT-30B ELECTRICAL EQUIPMENT SHELF	2	0	X			
1B	C-11614/ART-53 CONTROL UNIT	2	0	X			
1C	MD-1310/U VLF/LF MODULATOR	2	0	X			
2	AN/WRR-7 RECEIVING SET						
2A	CY-7113/WR ELECTRICAL EQUIPMENT ENCLOSURE	2	0	X			
2B	CP-1071/WR DIGITAL DATA PROCESSOR	2	0	X			
2C	MD-855/WRR-7 DEMODULATOR/POWER SUPPLY	2	0	X			
2D	R-1738B/WR RADIO RECEIVER	2	0	X			
3	SUBMARINE BROADCAST PROCESSOR						
3A	CENTRAL PROCESSOR UNIT (CPU)	2	0	X			
3B	SVGA MONITOR	2	0	X			
3C	KEYBOARD	2	0	X			
3D	TT-841/U PRINTER	2	0	X			
4	MESSAGE DISTRIBUTION TERMINAL (MDT)						
4A	CENTRAL PROCESSOR UNIT (CPU)	2	0	X			
4B	SVGA MONITOR	2	0	X			
4C	KEYBOARD	2	0	X			
4D	TT-841/U PRINTER	2	0	X			
5	MD-1317/UGC HIGH DATA RATE MODEM	6	0	X			
6	NB-20E ETHERNET BRIDGE	2	0	X			
7	ST-500 ETHERNET TRANSCEIVER	10	0	X			
8	HP-355D RF ATTENUATOR	3	0	X			
9	ANN-2-SA ALARM-MONITOR	2	0	X			
10	ZSC-2-2 RF SPLITTER 1-INPUT 2-OUTPUTS	1	0	X			
11	MODULATOR SIMULATOR	2	0	X			
12	TIME FREQUENCY DISTRIBUTION SYSTEM	2	0	X			
13	MD-1315/UGC C-TIM TRANSMIT	2	0	X			
14	MD-1316/UGC C-TIM RECEIVE	1	0	X			

TABLE 1 (CONTINUED)
ELECTRONIC EQUIPMENT PROCUREMENT
NCTAMS LANT NORFOLK, VA

				PROCUREMENT RESPONSIBILITY			
ITEM NO.	NOMENCLATURE AND NOUN NAME	TOTAL REQ'D	ON HAND	SPAWAR SYSCEN PACIFIC	NCTAMS LANT NORFOLK, VA	SPAWAR SYSCOM SD	REMARKS
15	E311A RED/BLACK ISOLATOR	2	0	X			
16	BZ-252/FYQ-87(V) ISABPS ALARM PANEL	1	0	X			
17	TT-841/U QTAM PRINTER	1	0	X			
18	PATCH/SWITCH ASSEMBLY (PSA)	12	0	X			
19	DMPS-9 POWER SUPPLY FOR PSA	12	0	X			
20	MD-5062/UGC LDR MODEM	4	0	X			
21	STU-III SECURE TELEPHONE	5	0		X		
22	UPS-1 UNINTERRUPTIBLE POWER SUPPLY	2	0	X			
23	MX-10868/F FIXED PLANT ADAPTER (FPA)	4	0	X			
24	MT-6242/U BACKPLANE/SHORE MOUNT	4	0	X			
25	TSEC/KG-84C CRYPTO	6	0		X		
26	TSEC/KG-84A CRYPTO	2	0		X		
27	TSEC/KG-34-254 CRYPTO	4	0	X			
28	KWT-46/TSEC CRYPTO	5	0		X		
29	KWR-46/TSEC CRYPTO	2	0		X		
30	PLGR GPS RECEIVER	2	0	X			

TABLE 2
GENERAL PURPOSE ELECTRONIC TEST EQUIPMENT
(GPETE) PROCUREMENT

ITEM NO.	FSCIM(*)/MODEL NUMBER	SPMIG*	GPETE/ SPETE	QUANTITY			NOUN NAME	SCAT CODE
				REQ FOR OPS	EXIST	BAL REQ'D		
1	28480/MODEL 5328A	2772	GPETE	1	1	0	Frequency Counter	4296
2	80058/AN/USM-425	945	GPETE	1	1	0	Oscilloscope	4308
3	14031/MODEL 2182-03	1406	GPETE	1	1	0	TTY Distortion Generator	4585
4	55026/MODEL 260-6XLP	2765	GPETE	1	1	0	AC/DC Multimeter	4245
5	89536/MODEL 8000 B/U	903	GPETE	1	1	0	Digital Multimeter	4237
6	50423/MODEL 323-20 MOD 40	1537	GPETE	1	1	0	RMS Multimeter	4205
7	54778/MODEL 3586C	1533	GPETE	1	0	1	Frequency Selective Voltmeter	4218
8	14031/MODEL 2682	1405	GPETE	1	1	0	Distortion Analyzer	4586

* These numbers are keyed to Standard PMS Material Identification Guide (SPMIG)

TABLE 3
EQUIPMENT CHARACTERISTICS TABULATION
(PER UNIT BASIS)

ITEM NO.	NOMENCLATURE AND NOUN NAME	DIMENSIONS (INCHES)			WT	QUANTITY			INPUT POWER (WATTS)	VOLT/ CAT	HZ	PHASE	HEAT DISS BTU/HR	RMKS
		HT	W	D	(LBS)	EXIST	NEW	TOTAL						
1	SUBMARINE BDCST PROCESSOR	-	-	-	-	-	-	-	1220 (610 EA)	115 VAC	60	SINGLE	4166 (2083 EA)	
	A. CENTRAL PROCESSING UNIT	7.00	19.00	20.10	35	0	2	2	400					
	B. MONITOR	13.90	13.90	14.80	34	0	2	2	90					
	C. KEYBOARD	1.50	18.00	8.00	3	0	2	2						
	D. TT-841/U PRINTER	11.00	17.20	25.00	35	0	2	2	120					
2	MSG DISTRIBUTION TERMINAL (MDT)	-	-	-	-	-	-	-	1220 (610 EA)	115 VAC	60	SINGLE	4166 (2083 EA)	
	A. CENTRAL PROCESSING UNIT	7.00	19.00	20.10	35	0	2	2	400					
	B. MONITOR	13.90	13.90	14.80	34	0	2	2	90					
	C. KEYBOARD	1.50	18.00	8.00	3	0	2	2						
	D. TT-841/U PRINTER	11.00	17.20	25.00	35	0	2	2	120					
3	AN/URT-30B TRANSMITTING SET	-	-	-	-	-	-	-	270 (135 EA)	115 VAC	60	SINGLE	920 (460 EA)	
	A. MT-6888/URT-30B ELECT EQUIP SHELF	10.47	19.00	24.84	30	0	2	2						P/O ITEM 2
	B. C-11614/ART-53 CONTROL UNIT	7.75	5.00	19.75	12	0	2	2						P/O ITEM 2
4	AN/WRR-7 RECEIVE SET	-	-	-	-	-	-	-	2300 (1150 EA)	115 VAC	60	SINGLE	7900 (3950 EA)	
	A. CY-7113/WR-7 ELEC EQUIP ENCL.	17.50	17.15	26.00	82	0	2	2						P/O ITEM 3
	B. CP-1071/WR DIGITAL DATA PROC	8.75	17.25	23.75	56	0	2	2						P/O ITEM 3
	C. MD-855/WRR-7 DEMOD/PWR SUPPLY	8.75	17.25	23.75	87	0	2	2						P/O ITEM 3
	D. R-1738B/WR RADIO RECEIVER	8.75	17.25	23.75	96	0	2	2						P/O ITEM 3
5	MODULATOR SIMULATOR	5.25	19.00	15.00	20	0	2	2	340 (170 EA)	115 VAC	60	SINGLE	1160 (580 EA)	
6	TIME FREQ DIST SYSTEM (TFDS)	5.50	19.00	21.00	62	0	2	2	220 (110 EA)	115 VAC	60	SINGLE	750 (375 EA)	
7	TSEC/KG-84C CRYPTO	7.80	7.50	14.66	23	0	6	6	90 (15 EA)	115 VAC	60	SINGLE	306 (51 EA)	USED W/ ITEM 8
8	TSEC/KG-84A CRYPTO	7.80	7.50	14.66	23	0	2	2	30 (15 EA)	115 VAC	60	SINGLE	102 (51 EA)	USED W/ ITEM 8
9	MX-10868/F FIXED PLANT ADAPTER	8.72	19.00	21.62	10	0	4	4		115 VAC	60	SINGLE		
10	MT-6242/U BACKPLANE SHORE MOUNT	9.50	19.00	18.40	44	0	4	4		115 VAC	60	SINGLE		

TABLE 3 (CONTINUED)
EQUIPMENT CHARACTERISTICS TABULATION
(PER UNIT BASIS)

ITEM NO.	NOMENCLATURE AND NOUN NAME	DIMENSIONS (INCHES)			WT	QUANTITY			INPUT POWER (WATTS)	VOLT/ CAT	HZ	PHASE	HEAT DISS BTU/HR	RMKS
		HT	W	D	(LBS)	EXIST	NEW	TOTAL						
11	KWT-46/TSEC CRYPTO, XMT	7.62	4.88	16.9	23	0	5	5	250 (50 EA)	115 VAC	60	SINGLE	855 (170 EA)	USED W/ ITEM 9
12	KWR-46/TSEC CRYPTO, REC	7.62	4.88	16.90	23	0	2	2	100 (50 EA)	115 VAC	60	SINGLE	340 (170 EA)	USED W/ ITEM 9
13	TSEC/KG-34-254 CRYPTO	7.00	17.45	22.00	64	0	4	4	292 (73 EA)	115 VAC	60	SINGLE	1000 (250 EA)	
14	MD-1315/UGC C-TIM TRANSMIT	3.50	19.00	14.00	30	0	3	3	40 (20 EA)	115 VAC	60	SINGLE	136 (68 EA)	
15	MD-1316/UGC C-TIM RECEIVE	3.50	19.00	14.00	30	0	1	1	20 (20 EA)	115 VAC	60	SINGLE	68 (68 EA)	
16	E311A RED/BLACK ISOLATOR	5.25	19.00	20.00	30	0	2	2	240 (120 EA)	115 VAC	60	SINGLE	820 (410 EA)	
17	BZ-252/FYQ-87(V) ISABPS ALARM PNL	7.00	19.00	8.00	10	0	1	1	20 (20 EA)	115 VAC	60	SINGLE	68 (68 EA)	
18	TT-841/U PRINTER	11.00	18.00	25.00	89.5	0	1	1	120 (120 EA)	115 VAC	60	SINGLE	410 (410 EA)	
19	PATCH/SWITCH ASSEMBLY (PSA)	7.00	9.00	11.00	13	0	12	12						
20	DMPS-9 POWER SUPPLY	3.75	2.25	6.50	1	0	12	12	900 (75 EA)	115 VAC	60	SINGLE	3072 (256 EA)	USED W/ ITEM 19
21	HP-355D RF ATTENUATOR	2.60	2.75	6.00	3	0	3	3						
22	MD-5062/UGC LDR MODEM	3.50	19.00	18.00	25	0	4	4	120 (30 EA)	115 VAC	60	SINGLE	408 (102 EA)	
23	MD-1317/UGC HDR MODEM	5.40	16.90	16.70	20	0	6	6	204 (34 EA)	115 VAC	60	SINGLE	696 (116 EA)	
24	ANN-2-SA IEMATs ALARM MONITOR	1.75	19.00	8.00	5		2	2	40 (20 EA)	115 VAC	60	SINGLE	136 (68 EA)	
25	NB-20E ETHERNET BRIDGE	3.20	17.00	12.40	7	0	2	2	120 (60 EA)	115 VAC	60	SINGLE	408 (204 EA)	
26	ST-500 ETHERNET TRANSCEIVER	3.80	3.50	1.75	1	0	10	10						
27	STU-III SECURE PHONE/MODEM	3.25	9.00	11.00	10	0	2	2	32 (16 EA)	115 VAC	60	SINGLE	110 (55 EA)	
28	UNINTERRUPTIBLE PWR SUPPLY UPS	11.50	7.70	14.50	71	0	2	2	N/A	115 VAC	60	SINGLE	N/A	
								TOTAL	8.158			TOTAL	27.987	

POWER CALCULATIONS

ASSUMED POWER FACTOR = 80%

TRUE POWER = 8.158 W

APPARENT POWER = 10.2 KVA

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AN/FYQ-87(V) ISABPS Installation

Actions and Responsibilities List by Command

PEOC4I PMW 770 San Diego, CA:

1. Providing funding to NCTAMS LANT Norfolk, VA for procuring additional ANCC assets necessary to support the ISABPS installation.
2. Providing funding to COMSUBLANT for the procurement of additional connectivity equipment associated with this installation.

COMSUBLANT:

1. Submitting TSR for two (2) geographically diverse, CCITT V.29, 9600 BPS, synchronous, KG-84C covered, full period, full duplex, 4-wire, voice grade, Basic (3002) unconditioned ISL circuits between COMSUBLANT and NCTAMS LANT Norfolk, VA. Audio circuits will use the MD-1317/UGC modem with a center frequency of 1700 Hz. Digital connectivity will be 2400 BPS, KG-84C covered, synchronous, full duplex, full period circuits.
2. Submitting TSR for two (2) geographically diverse, MIL-STD-188C, 50 BPS, synchronous, KW-46 covered, transmit only, N2 conditioned SI circuits between COMSUBLANT and NCTAMS LANT Norfolk, VA.
3. Submitting TSR for one (1) CCITT V.34, 4800 BPS, KW-46 covered, full duplex, 4-wire voice grade, Basic (3002) unconditioned Direct Key Circuit between COMSUBLANT and NCTAMS LANT DET LaMoure, ND.
4. Providing a commercial grade, CCITT V.34, fallback telephone line to the Paradyne 3920 modem for use as an Auto-fallback telephone line for the Direct Key circuit.

COMSUBPAC:

1. Submitting TSR for two (2) geographically diverse, CCITT V.29, 9600 BPS, synchronous, KG-84C covered, full period, full duplex, 4-wire, voice grade, Basic (3002) unconditioned ISL circuits between COMSUBPAC and NCTAMS LANT Norfolk, VA. Audio circuits will use the MD-1317/UGC modem with a center frequency of 1700 Hz. Digital connectivity will be 2400 BPS, KG-84C covered, synchronous, full duplex, full period circuits.
2. Submitting TSR for two (2) geographically diverse, MIL-STD-188C, 50 BPS, synchronous, KW-46 covered, transmit only, N2 conditioned SI circuits between COMSUBPAC and NCTAMS LANT Norfolk, VA.
3. Submitting TSR for one (1) CCITT V.34, 4800 BPS, KW-46 covered, full duplex, 4-wire voice grade, Basic (3002) unconditioned Direct Key Circuit between COMSUBPAC and NCTAMS LANT DET LaMoure, ND.
4. Providing a commercial grade, CCITT V.34, fallback telephone line to the Paradyne 3920 modem for use as a dial-up Direct Key circuit from COMSUBPAC to NCTAMS LANT DET LaMoure, ND.

COMSUBGRU Ten:

1. Submitting TSR for two (2) geographically diverse, CCITT V.29, 9600 BPS, synchronous, KG-84C covered, full period, full duplex, 4-wire, voice grade, Basic (3002) unconditioned ISL circuits between COMSUBGRU Ten Kinigs Bay, Georgia and NCTAMS LANT Norfolk, VA. Audio circuits will use the MD-1317/UGC modem with a center frequency of 1700 Hz. Digital connectivity will be 2400 BPS, KG-84C covered, synchronous, full duplex, full period circuits.
2. Submitting TSR for two (2) geographically diverse, MIL-STD-188C, 50 BPS, synchronous, KW-46 covered, transmit only, N2 conditioned SI circuits between COMSUBGRU Ten Kings Bay, Georgia and NCTAMS LANT Norfolk, VA.
3. Submitting TSR for one (1) CCITT V.34, 4800 BPS, KW-46 covered, full duplex, 4-wire voice grade, Basic (3002) unconditioned Direct Key Circuit between COMSUBGRU Ten Kings Bay, Georgia and NCTAMS LANT DET LaMoure, ND.
4. Providing one (1) commercial grade, CCITT V.34, fallback telephone line to the Paradyne 3920 modem for use as an Auto-fallback telephone line for the Direct Key circuit to NCTAMS LANT DET LaMoure, ND.

COMSUBGRU Nine:

1. Submitting TSR for two (2) geographically diverse, CCITT V.29, 9600 BPS, synchronous, KG-84C covered, full period, full duplex, 4-wire, voice grade, Basic (3002) unconditioned ISL circuits between COMSUBGRU Nine Bangor, Washington and NCTAMS LANT Norfolk, VA. Audio circuits will use the MD-1317/UGC

modem with a center frequency of 1700 Hz. Digital connectivity will be 2400 BPS, KG-84C covered, synchronous, full duplex, full period circuits.

2. Submitting TSR for two (2) geographically diverse, MIL-STD-188C, 50 BPS, synchronous, KG-34 covered, transmit only, D2 conditioned BKS-BTS circuits between COMSUBGRU Nine and NCTAMS LANT DET LaMoure, ND. These circuits will use the MD-5062/UGC modem, which uses FSK.
3. Providing a commercial grade, CCITT V.34, fallback telephone line to the Paradyne 3920 modem for use as a dial-up Direct Key circuit to NCTAMS LANT DET LaMoure, ND.

NCTS Cutler:

1. Coordinating with NCTAMS LANT Norfolk, VA during the testing and checkout phase of the ISABPS installation at NCTAMS LANT Norfolk, VA.

SPAWARSYSCEN Pacific:

1. IDP development
2. Provide equipment specified in enclosure (2) of SPAWARSYSCEN Pacific letter 2300 Ser 04N/xxx dated DD Mmm YY.
3. Procure, ship and stage installation materials.
4. Develop SOVT for the ISABPS installation at NCTAMS LANT Norfolk, VA.
5. Installation of the ISABPS at NCTAMS LANT Norfolk, VA.
6. Conduct testing as defined in the SOVT's.
7. Certify proper system operation to site personnel.
8. Provide On-The-Job Training (OJT) to ISABPS maintenance and operator personnel at NCTAMS LANT Norfolk, VA.
9. Provide Maintenance Assistance Modules (MAMs) kit for the ISABPS suite.
10. Provide technical documentation for the ISABPS equipment.
11. Provide formal as-built installation drawings to each site 30 days after completion of the installations.

NTCC Hampton Roads:

1. Providing physical space for the installation of the Paradyne 3920 modems used by COMSUBLANT for Direct Key connectivity to NCTAMS LANT DET LaMoure, ND.
2. Providing personnel to assist in the installation testing of the Paradyne model 3920 modems.

NCTAMS LANT Norfolk, VA:

1. Upgrading existing CSE Room power panel TP-25E-C from Technical power to Critical Technical power. This conversion must be completed prior to the start of the ISABPS installation.
2. Relocation of the existing watch standers desk, Navy Orderwire (NOW) equipment and one safe to the locations shown in enclosure (1) of SPAWARSYSCEN Pacific letter 2300 Ser 04N/xxx dated DD Mmm YY.
3. Removal of temporary walls making up Room 280 to provide adequate space to install the ISABPS suite in the configuration shawn in enclosure (1) of SPAWARSYSCEN Pacific letter 2300 Ser 04N/xxx dated DD Mmm YY.
4. Providing ANCC connectivity for all required ISABPS circuit connectivity to include the ANCC chassis and interface cards in sufficient quantities to meet current and future ISABPS connectivity requirements. This equipment must be installed and tested prior to the commencement of ISABPS SOVT testing.
5. Providing a temporary location for the 20-foot sea van, which will be used to transport the ISABPS from SPAWARSYSCEN Pacific to NCTAMS LANT Norfolk, VA.
6. Requesting release of Communications Security (COMSEC) Material System (CMS) material required for the ISABPS as defined in Table 4-1.
7. Ordering the cryptographic keying material for all ISABPS circuits as directed by the Communications Control Office (CCO) for each circuit.
8. Ordering the Cryptographic maintenance keying materials.
9. Submitting a TSR for two (2) geographically diverse, MIL-STD-188C, 1200 BPS, KG-34 covered, transmit only, D2 conditioned BKS-BTS circuits between NCTAMS LANT Norfolk, VA and NCTAMS LANT DET LaMoure, ND. These circuits will use the MD-5062/UGC modem, which uses Frequency Shift Keying (FSK).
10. Submitting a TSR for two (2) geographically diverse, MIL-STD-188C, 1200 BPS, KG-34 covered, transmit only, D2 conditioned BKS-BTS circuits between NCTAMS LANT Norfolk, VA and NCTS Cutler. These circuits will use the MD-5062/UGC modem, which uses Frequency Shift Keying (FSK).

11. Submitting a TSR for one (1) MIL-STD-188C, 300 BPS, synchronous, KG-84A covered, full-duplex, D2 conditioned IEMATS circuit between NCTAMS LANT Norfolk, VA and the Honolulu AUTODIN Switching Center (ASC). This circuit will use the MD-5062/UGC modem, which uses Frequency Shift Keying (FSK).
12. Establishing a STU-III voice coordination circuit and providing all necessary equipment between NCTAMS LANT Norfolk, VA, NCTS Cutler, ME, and NCTAMS LANT DET LaMoure, ND.
13. Coordinating with the designated BCAs and ALT BCAs in the submission of TSRs for the Intersite Link (ISL) and SI circuits required for proper ISABPS operations.
14. Providing personnel to assist in the diagnostic and operational testing of the ISABPS suite.
15. Sanitizing secure spaces for cleared Secret personnel during installation and testing.
16. Providing ongoing local logistics and maintenance support during the installation phase of this project.
17. Ordering ribbons for the 9030RT printers due to long lead time (American Computer Resources, Inc. P/N 0109030, cost $21.00/box of six or Data Products, P/N 312151, cost $51.00/box of 12).
18. Determining and acquiring additional test equipment beyond existing assets (see enclosure (2)).
19. Certifying acceptability of the ISABPS installation by safety and health professionals.
20. Acceptance of the ISABPS installation upon satisfactory completion of the SOVT certification.
21. Submitting a TEMPEST Requirements Questionnaire if required.
22. Providing station personnel to attend the ISABPS operator-training course at Fleet Training Center (FTC) Norfolk, VA prior to the completion of the installation.
23. Providing station personnel to attend ISABPS maintenance training course at Fleet Training Center (FTC) Norfolk, VA prior to the completion of the installation.
24. Coordinating with NCTAMS LANT DET LaMoure, ND during the testing and checkout phase of the ISABPS installation at NCTAMS LANT Norfolk, VA.
25. Providing two (2) commercial grade, CCITT V.34, fallback telephone lines to each Paradyne 3920 modem for use as an Auto-fallback telephone line for the Direct Key and Dial-up circuits.

SPAWARSYSCEN Atlantic:

1. BESEP, IDP, installation and checkout of the new Versimux chassis between COMSUBLANT and NTCC Hampton Roads.
2. Circuit interconnectivity wiring for the ISL, Direct Key, and SI connectivity from COMSUBLANT to NTCC Hampton Roads.
3. Provide formal as-built installation drawings to the site and SPAWARSYSCEN Pacific.

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APPENDIX P – TEMPEST REQUIREMENTS QUESTIONNAIRE (TRQ)

TEMPEST REQUIREMENTS QUESTIONNAIRE (FOR NAVY AND MARINE CORPS FACILITIES)

1. Should the criteria of OPNAVINST C5510.93F/MCO C5510.19 (Navy/Marine Corps Implementation of National Policy on the Control of Compromising Emanations (C), January 2002) apply, provide the following requested data (TEMPEST Requirements Questionnaire) and submit to:

COMMANDING OFFICER
SPAWAR SYSTEMS CENTER ATLANTIC
CODE 58250
PO BOX 190022
NORTH CHARLESTON, SC 29419-9022

2. Provide the name, address, position title, and phone number (at the facility where classified processing will occur) of a point of contact that is knowledgeable of the processing requirements, the types of equipment to be used and the physical layout of the facility.

3. Provide the specific geographical location, address and zip code, where classified processing will be performed.

4. What are the classification level(s) of material to be processed/handled by electronic or electromechanical information system(s) and what percentage is each level?

5. What special categories of classified information are processed?

6. Is there a direct connection (wireline or fiber) to a Radio Frequency (RF) transmitter(s) located either locally or at a remote site?

7. Are there any RF transmitters located within 6 meters of the system processing National Security Information or the system's RED lines?

8. Describe how access is controlled to your facility including the building, compound, plant, property, and/or parking lots. Where are the visitors first challenged/identified? Include controls such as alarms, guards, patrols, fences, and warning signs. Provide a simple layout of the facility and adjacent uncontrolled areas.

9. Are there other tenants in the building who are not U.S. departments/agencies or their agents?

10. Are there any known foreign business or government offices in adjacent buildings?

11. Provide the make and model number of all equipment used to process, transfer, or store classified information. Include computers, peripherals, network servers, network hardware, multiplexers, modems, encryption devices (COMSEC), etc.

12. Have on-site TEMPEST tests been conducted on any of these equipment(s)? If so, which ones? When was the test(s) conducted? Who conducted the test(s)? Have all deficiencies (if any) been resolved?

13. Has a TEMPEST Facility Zoning test been conducted? If so who conducted the testing and when?

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SPAWAR
Installation Design Plan (IDP) Development Standard

06 Aug 2009

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1. General Requirements

The Installation Design Plan (IDP) shall specify methods and materials in enough detail to enable professional installers to complete an installation that meets all requirements. Ideally, the IDP should enable installers to efficiently complete the installation without referring to any other documentation. In addition to providing the information required for the installation, the IDP shall contain, when applicable, categories of drawings that are traditionally required for training, maintenance, and configuration management. Block diagrams and patch panel layouts are examples of these drawing categories. An IDP drawing package shall consist of a set of independent drawings linked together by the Master Drawing List. The relationships between these drawings are illustrated in Attachment 1. Table 1 lists the Drawing Category Codes and the associated Drawing Category Names that must appear as part of the title on the Title Sheet of each drawing. All drawings developed for an IDP must be assigned to one of these categories.

1.1 Installation Requirements Drawings, Shore Standard Plans, and Installation Control Drawings

Installation Requirements Drawings (IRDs) are standard system installation design drawings defined in the IRD Standard provided as enclosure (3) of SPAWARINST 4720.5. IRDs will eventually replace both Shore Standard Plans and Installation Control Drawings (ICDs) for SPAWAR C4ISR systems. If an IRD exists for a system being installed, that IRD shall be used to form the basis of the IDP. The IDP shall make maximum use of the contents of the IRD to minimize the effort required to develop the IDP and to standardize, as much as is practical, the look and feel of the installations for the system. If there is no IRD, but there is a Shore Standard Plan, the Shore Standard Plan shall be used to extract system design information to support the development of the IDP. If there is no IRD or Shore Standard Plan, but there is an ICD for ship installations, the ICD may be used to extract system design information as long as the developer is aware of the different design requirements for ship and shore installations. For example, the developer of the IDP should know that low smoke (LS) cable called for in most ICDs will not meet the requirement for plenum rated cable in shore installation situations. When no IRD, Standard Plan, or ICD exists, the IDP developer will have to conduct system design activities to obtain the needed information.

1.2 Standard SPAWAR Drawing Formats

IDPs shall closely follow the standard F and A size formats provided in the attachments except when the installation is funded by an activity outside of SPAWAR that requires the drawings to be in accordance with UFC 1-300-09N in order that they may be used by NAVFAC DBB or DB construction contracts. Developers of IDPs are encouraged to comply with the IDEA CAD Standards Rev B dated 7 February 2005 (Attachment 22) with the minor exceptions listed at the end of this section. While compliance with the IDEA standard is a requirement for IRDs, it is only encouraged for IDPs at this time. This is to allow IDP developers time to learn the standard as well as to avoid any unnecessary costs that would be caused by a sudden and unexpected change. Whenever feasible and unless otherwise specified, drawings shall be designed so that all technical details are legible when they are printed on 11” x 17” paper using a laser printer with a resolution of 600 dpi x 600 dpi or better. Exceptions may be made for extremely complex drawings where larger printouts are needed to capture all of the required relationships on a single legible sheet. Drawings shall be developed using computer-aided drafting tools and distributed in an AutoCAD file format (dwg) readable using AutoCAD 2007. When an IRD forms the basis for the IDP, line weights, font

sizes, and layer usage shall remain identical to the IRD as much as possible. Border design, title block arrangement, and other common formatting features shall be based as much as possible on the IDP templates as depicted in the attachments to this standard. The included templates provide the proper formats. The quantitative values and notes listed on these templates are illustrative only. They should only be copied by personnel qualified to know if and when these notes and quantities apply. All finished IDPs shall be provided in AutoCAD dwg file format for repository storage for retention, configuration control, and reusability. A single Adobe Acrobat pdf file is also desired for repository storage for readability and general distribution. If the pdf file is larger than 10 Megabytes, the drawing can be broken down into logical chunks for placing into two or more pdf files. This will allow customers and others without the capacity to view dwg (AutoCAD file format) files to conveniently review and use the drawings. Adobe Acrobat files shall be created by plotting from AutoCAD or equivalent software using the monochrome.ctb plot style table and any other measures needed to produce a drawing that is legible when plotted in black and white. IDPs follow the standard F and A size formats provided in the IRD standard AutoCAD (dwg file) templates. As stated earlier, while the IDEA standard is not mandated for IDPs, it is encouraged. The IDEA standard is provided as Attachment 22 to this appendix and when followed for IDPs these exceptions and clarifications are allowed:

a. The “Romans” font style may be used to replace monotxt.shx font except in tables where the letters must be a fixed width to keep data in proper alignment. Shx fonts shall be used except in rare instances where multiline text (MTEXT) is required.
b. Yellow objects should be changed to color 7 (black on paper) or green.
c. Attributes may be used to create title blocks.
d. Requirements that apply to ships in the IDEA standard, apply to buildings in IDPs.

1.3 File Size Reduction Policy

Drawings should be constructed in a manner that avoids unnecessary increases in the drawing file size. Drawing files shall be purged of unused named objects prior to submittal to the repository.

1.4 Standard SPAWAR AutoCAD File Naming Convention

AutoCAD drawing file names shall be constructed as follows:

a. SPAWAR Cage Code – 28687 followed by a dash.
b. As-Built ID Number followed by a dash. This number is the last six digits in the drawing number of the Master As-Built Drawing for the system being installed. A Master As-Built drawing is created the first time that a system is installed at a site. The first time that a system is installed at a site, the last six digits of the IDP drawing number and the As-Built ID on that drawing will be the same because that IDP will become the Master As-Built Drawing. Subsequent installations that alter that system will have a different IDP with a different drawing number, but will retain the As-Built ID number. In these cases, the PEs will use the red-lined IDP to modify the Master As-Built – NOT the IDPs – to create the As-Built drawing package submitted at the end of the installation. In cases where the IDP is modifying a system that does not have a Master As-Built drawing, the As-Built ID number shall be 000000, and the General Notes in the drawing shall explain the drawing situation for the affected system. If there are several previous As-Built drawings for the system, the notes shall list the drawing numbers of these As-Built drawings. If drawings are missing, the notes shall explain this also.

c. IA Code NOT followed by a dash. The IA code shall be A when SSC Charleston is the installing activity, B when SSC San Diego is the installing activity, and C when any other organization is the installing activity.
d. A drawing number followed by a dash. It shall consist of three parts:
   1. A Drawing Category Code followed by a dash. All of the Drawing Category Codes are listed in Table 1.
   2. Three zeros followed by a dash. These three digits are used in IRDs to assign a 3-digit unit number used during the development of Ship Installation Drawings (SIDs). Unit codes do not have an immediate application in shore IDPs or As-Builts, but is retained in the drawing numbering schema for commonality and potential future use.
   3. Drawing Set Number. This is a seven digit number starting with the number 2 followed by the six-digit SPIDER Tracking Number (TN) for that specific installation. Master As-Built drawings shall retain the original drawing set number from the first installation. If the installation is an integrated installation combining tasks covered by more than one tracking number, then one of the tracking numbers shall be designated as the primary tracking number and the primary tracking number shall be used to form the drawing set number.
e. Drawing Section Number. This is a three digit indicator originally designed to correspond to a drawing sheet number, but which shall now normally be all zeros to indicate that the entire drawing is in one file. In the days when most AutoCAD dwg (computer file format) files only contained information for one drawing sheet, this indicator corresponded to a sheet number. Placing all sheets of each drawing category in a single file is now required unless this will result in a dwg file large enough (~ 6 megabytes) that the developer's workstation becomes sluggish and impacts development. If a drawing category needs to be broken up into more than one dwg file, the first part of the drawing shall have 001 as the section number, the second part 002, etc.
f. Revision Indicator. A hyphen will indicate the preliminary revision and an alphabetic character (or characters) will represent approved subsequent drawing revisions.
g. Examples of complete file names are:
   1. 28687-081234-A010-000-2090999-000-.dwg (A file with this name indicates that it is an IDP for TN 09-0999 and that the installation is an upgrade to an existing system whose configuration is documented by Master As-Built Drawing Set No 081234.)
   2. 28687-081212-B120-000-2081212-000-.dwg (A file with this name indicates that it is an IDP for TN 081212 and that the installation is a first time (new) installation.)
   3. 28687-091234-C080-000-2091234-000A.dwg (A file with this name indicates that it is part of a Master As-Built Drawing Set No 091234.)
   4. 28687-000000-A040-000-2080100-000-.dwg (A file with this name indicates that it is an IDP for an upgrade, TN 08-0100, to a system for which no Master As-Built Drawing Set exists.)

1.5 Standard SPAWAR Adobe Acrobat (pdf) File Naming Convention

As stated above in Section 1.2, finished IDPs are also desired in a pdf (Adobe Acrobat) format file for ease of viewing and general distribution. A single pdf file for the entire drawing package is desired, unless the resulting file exceeds 10 megabytes in which case it can be broken down into multiple files. The Adobe Acrobat file naming format for pdf is the same as the AutoCAD file naming format except that:

a. The drawing category code will always be 020;
b. The drawing section number (previously known as sheet number) becomes the pdf file section number. If the IDP is all in one file, this will be 000. If an IDP drawing set needs to be broken up into more than one pdf file, the first part of the IDP shall have 001 as the section number, the second part 002, etc.
c. The revision indicator is the revision indicator of the Installation Master Drawing.

Table 1 - Drawing Categories

Drawing Category Code	Drawing Category Name	Appendix Q Attachment Number	Drawing Size
N/A	Drawing Tree	1	F
000	Functional Interface Diagram (FID)	2	Custom
010	Site Master Index	3	F
020	Installation Master Drawing	4	F
022	Master Parts List	5	F
023	Technical Data Summary	6	F
040	Floor Plans and Elevations	7	F
050	Antenna Layouts and Elevations	8	F
060	Simplified Block Diagrams	9	F
070	Cable Block Diagrams	10	F
080	Cable Running Sheets	11	A
090	Cross Connect Records	12	A
100	Distribution Frame Layout	13	F
110	Circuit Diagrams	14	F
120	Labeling Details	15	F
130	Patch Panel Layouts	16	F
140	Power Distribution	17	F
160	Cable Routing Layouts	18A & B	F
171	Mechanical Assembly and Mounting Details	19	F
180	Miscellaneous Installation Details	20	F
181	Auxiliary Cooling Diagram	None *	F
182	Auxiliary Dry Gas Diagram	None *	F
183	RF Transmission Line Diagram	None *	F
184	Synchro Data Transmission Drawing	None *	F
190	Miscellaneous System Configuration Details	21	F

* No sample of this drawing type is provided as an attachment to this Appendix. See the IRD Standard for an example of this drawing type.

1.6 External References (XREFs)

When you attach a drawing to an IDP drawing as an XREF, you link that referenced drawing to the current IDP drawing, and any changes to that external drawing are displayed when the IDP drawing is opened. However, before the IDP drawing can be published, the External References or **XREFs**

shall be bound to the IDP drawing using the Bind Xrefs dialog box in AutoCAD or an equivalent command. This will allow the drawing to be used independently of the external reference.

1.7 Zip Files

The use of zip files shall only be used when e-mailing multiple drawing files, but **zip files are not to be used when uploading IDPs in the SPAWAR approved repositories** as zip files interfere with the repository search features and identification/navigation in repository folders.

1.8 AutoCAD Attributes

The use of AutoCAD attributes is not required but is allowed. The tags for title block attributes, when used, shall be in accordance with the requirements in Section 1.10.1.1.

1.9 Equipment Identification

The IDP should clearly identify equipment to be installed (new), existing equipment, and future planned equipment. When this distinction needs to be made, a legend will be provided showing the methods used to distinguish the categories.

1.10 Standard Drawing Block Elements

In this case the word “block” refers to a set of boxes on the drawing, not an AutoCAD drawing block.

1.10.1 Title Block Data Elements

Each sheet of each drawing shall have a title block. The first sheet of every drawing category within an IDP shall include a full title block in the lower right corner as illustrated in Attachment 4, zone 1A. Subsequent sheets shall have the drawing title identified in the lower right-hand corner of each sheet and a continuation Title Block containing the SIZE, CAGE CODE, AS-BUILT ID, IA CODE, DRAWING NO., REV, SCALE, MASS, and SHEET (number). The Title Block format is very similar to that of the IRD in order to minimize required changes in going from an IRD to the IDP. Examples of a continuation title blocks are provided in many of the attachments at the end of this appendix. The dimensions of these blocks can be extracted from a sample electronic template provided in the Shore Installation Process Handbook CD-ROM .

1.10.1.1 Title Block Attributes

The use of Title Block attributes is not mandatory. The following guidance is provided so that when attributes are used for Title Block data, the attributes feature is used in a standard way to make future data mining easier. An attribute is a label or tag that attaches text to a block in a drawing. This text can be imported by software programs (such as NFM3 and CADCapture/Documentum) and used to create a drawing database that can serve to track and categorize drawings. When used, the standard attributes shall be attached to a single block called DWG_DATA2. These standard attributes shall be used to create the title, drawing number, and other information that can be normally seen in the lower right of the drawing.

1.10.1.2 Drawing Title

The drawing title shall be centered in the largest enclosed box in the title block. The first line of the IDP drawing title shall indicate the location of the installation. Examples include COMSUBGRU 10, KINGS BAY GA and NCTS DIEGO GARCIA, T-SITE. The second line of the IDP title shall

indicate the name or nomenclature of the system being installed followed by the word "INSTALLATION". An example of this would be AN/WRR-12 SLVR INSTALLATION. When an IRD is the basis for an IDP, the first line of the title used by the IRD shall be replaced with a line indicating the location of the installation and the second line shall be changed by adding the word "INSTALLATION" at the end. The third line of the title shall be one of the drawing categories listed in Table 1. Two examples of these categories are ANTENNA ELEVATIONS and SYSTEM ELEVATIONS. When the title is part of a standard set of AutoCAD attributes attached to the drawing, the three lines in the title shall be three separate attributes called UPPER_TITLE_LINE, MIDDLE_TITLE_LINE, and LOWER_TITLE_LINE.

1.10.1.3 Drawing Size

This field is a single letter that identifies the size of the drawing used when the drawing is plotted at its full size. The SPAWAR standard calls for the use of A and F size drawings. The Drawing Size may be part of a standard set of AutoCAD attributes attached to the drawing. When this is done, the attribute tag shall be DWG_SIZE. Table 2 provides dimensions for standard size drawings.

DRAWING SIZE	WIDTH (TOP TO BOTTOM IN INCHES)	LENGTH (LEFT TO RIGHT IN INCHES)
A	11	8.5
B (not standard)	11	17
C (not standard)	17	22
D (not standard unless required by non-SPAWAR sponsor to follow UFC 1-300-09N)	22	34
F	28	40
H (not standard)	28	44 TO 143

Table 2 - Standard Drawing Sizes

1.10.1.4 CAGE Code (Commercial and Government Entity)

The CAGE Code for SPAWAR Systems Command shall be entered for all shore installation drawings developed by SPAWAR or any of its direct reporting organizations. At this time, the CAGE Code is 28687. The SPAWAR Drawing Number may be part of a standard set of AutoCAD attributes attached to the drawing, even though this number will not change. When this is done, the attribute tag for this data element shall be CAGE_CODE.

1.10.1.5 AS-BUILT ID

If an IRD forms the basis for the IDP, the Expanded Ship Work Breakdown Structure (ESWBS) block found in IRDs is not applicable to shore IDPs or As-Builts. The ESWBS block is only used in IRDs to support subsequent development of Ship Installation Drawings (SIDs). An "AS-BUILT ID" block has taken the place of the ESWBS block. The "AS-BUILT ID" block is used for identification of the Master As-Built drawing that the installation will impact. This AS-BUILT ID number is the last six digits in the Master As-Built drawing number for the system being modified. A Master As-Built drawing is created the first time that a system is installed at a site or relocated to another location.

1.10.1.6 IA Code

The Installation Activity (IA) code used in IDPs and As-Builts identifies the organization performing the installation. A is used when SSC Charleston is the installing activity, B when SSC San Diego is the installing activity, and C when any other organization is the installing activity. The IA Code may be part of a standard set of AutoCAD attributes attached to the drawing. When this is done, the attribute shall be IA_CODE.

1.10.1.7 Drawing Number

Drawing numbers for IDPs and As-Builts are 15 digit numbers. The first 4 digits are the drawing category or type code (see Table 1) followed by a dash (e.g., 020-). The next 4 digits represent a 3 digit unit code followed by a dash. Unit codes are used in IRDs to assign a 3-digit unit number used during the development of SIDs. Since unit codes do not have an immediate application in shore IDPs or As-Builts, but are retained in the drawing numbering schema for commonality and potential future use, 000 will be used for the unit code (i.e., 000-). For IDPs, the next seven digits will begin with the number 2 followed by the six-digit SPIDER tracking number for that specific installation. For Master As-Built drawings based on older SPAWAR drawings with six-digit drawing numbers, the next seven digits will begin with the number 2 followed by the original six-digit drawing numbers. Master As-Built drawings based on newer SPAWAR drawings (having 15-digit drawing numbers), will keep the drawing numbers assigned to the first installation of the system. The SPAWAR Drawing Number may be part of a standard set of AutoCAD attributes attached to the drawing. When this is done, the attribute tag shall be DWG_NO.

1.10.1.8 Revision

This field is the revision level for the drawing. It appears below the letters “REV” at the lower right of the title block. The revision status of a drawing is indicated by an uppercase letter or letters, or in the case of the initial release, by a dash. The letter “A” identifies the first official approved change. Each successive approved change uses the next letter of the alphabet in sequence; the letters “I”, “O”, “Q”, “S”, “X”, and “Z” shall not be used. The revision after revision Y is identified by the letters “AA”, and the one after that by the letters “AB”, and the next by the letters “AC”. The first revision after revision “AY” is revision “BA”. When a change is made to a multi-sheet drawing, the revision letter is updated for all sheets affected and for sheet 1. This is true whether or not sheet 1 is affected by the change. The revision letter of sheets not affected by the change does not advance. The Revision Letter may be part of a standard set of AutoCAD attributes attached to the drawing. When this is done, the attribute tag shall be REV. Unofficial drawing revisions that are being distributed for review but that have not been reviewed and approved shall be indicated by a number following the dash or the latest approved revision letter. This should prevent unofficial copies from being confused with official approved drawings.

Note: The drawing level method of revision control described in Section 7.1 of ASME Y14.35M shall be used. For example, if a new sheet is to be added to a drawing at Revision Level B, the new sheets will be at Revision Level C as will the first sheet. Unaffected sheets would remain at their previous revision levels. Affected existing sheets would be changed to Revision C.

1.10.1.9 Sheet Number and Number of Sheets

This Sheet Number field is filled out on every drawing sheet. It appears after the word "SHEET" in the lower right of the title block. The Number of Sheets shows the number of sheets in the drawing. It is always an integer number. The first sheet in the drawing set will be the only sheets that will list the total number of sheets in the drawing set. All other sheets will leave this field blank. In cases where the number of sheets in a drawing is greater than ten and renumbering all of the remaining drawing sheets would be prohibitively expensive (due to the requirement to renumber sheets, borders, and internal references (like "See sheet 5.")), a sheet number followed by a letter may be used if a drawing is revised. Inserting sheet 2A between sheets 2 and 3 in a 20 sheet drawing, would avoid the need to renumber sheets 3 through 20. The Number of Sheets may be part of a standard set of AutoCAD attributes attached to the drawing. When this is done, the attribute tag for shall be NO_OF_SHEETS.

Note: Added sheets shall be numbered in an alpha-numeric sequence. For example, three new sheets added between sheets 4 and 5 would be numbered 4A, 4B, and 4C. See ASME Y14.35M Section 7.5.

1.10.2 Scale Block

The Scale block shall contain the scale of the objects shown on the sheet if all objects are drawn to a single scale. (All floor plans, cabinet elevations, cable routing layouts, and labeling details shall be drawn to scale in model space so that the AutoCAD program can be used to determine the dimensions of the objects and to scale objects. A graphic scale and text description shall be included with all scaled drawings so dimensions can be readily determined when the drawing size is reduced. Graphic scales are discussed later in this document.) The word "NONE" shall be entered in the "SCALE" box of the title block when nothing in the drawing is to scale. The words "AS SHOWN" shall be entered in the "SCALE" box of the title block when more than one scale is used on the drawing. This is different guidance from that provided in ASME Y.14.100-2004 which requires the "predominant" scale to be entered in this case. The problem with this method is that the "predominant" scale is not always clear and that confusion could result if scale information were inadvertently omitted below a detail.

1.10.3 Signature Blocks

There are two signature blocks immediately to the left of the title block on the first sheet of each drawing. The one on the right is for the IDP or As-Built developing activity to review and approve the drawing package for delivery to IA. The other is for the formal SPAWAR approval (See Section 5 of the SIPH). When an IRD is used as the basis for develop of an IDP, the IRD developer's information shall be replaced by the IDP developer's information.

1.10.4 Materials, Dimensions, and Tolerance Block

Drawings depicting dimensions or material specifications shall have a Materials, Dimensions, and Tolerance Block immediately to the left of the Signature Blocks. When this block is required, it shall follow the guidance in the templates. Statements similar to "Tolerances are in accordance with commercial practice unless otherwise indicated" shall not be used on any drawing when tolerances for the dimensions shown are important for an installation's success.

1.10.5 Reference Drawing(s) List Block

The title sheet of every IDP drawing category besides Installation Master Drawings shall have a Reference Drawing(s) List located immediately to the left of either the Materials, Dimensions, and Tolerance Block or (if there is no Materials, Dimensions, and Tolerance Block) the Approval Blocks. Installation Master Drawings shall reference all of the other drawings in the IDP. Other drawings in the IDP that were developed or modified as a result of the installation shall reference the Installation Master Drawing and any drawings mentioned in the notes. Simplified Block Diagrams will normally reference the related Cable Block Diagram(s). Cable Block Diagrams will normally reference related Circuit Diagrams, Labeling Details, and any Cable Running Sheets. Installation Master Drawings have a Reference Index that contains the information that the Reference Drawing(s) List Block requires and more.

1.10.5.1 "No." (Number) Column

The text in the "No." column will be a sequential number starting with the number 1. The numbers are used when referrals to the references are in the notes.

1.10.5.2 "Drawing Title" Column

The text in the "Drawing Title" column will be the complete actual title of the referenced drawing as it appears in the drawing's title block, except that the text is on two lines instead of three.

1.10.5.3 "Drawing No." Column

The text in the "Drawing No." column will be the full drawing number for a referenced SPAWAR drawing. When non-SPAWAR drawings are referenced, it consists of the drawing owner's CAGE Code combined with the drawing number on the title block.

1.10.6 Sheet Index

The first sheet of every multiple-sheet drawing shall contain a Sheet Index that lists the contents, file name and revision level of each sheet in the drawing. It eliminates the need for the "Revision Status of Sheets block that appears on IRDs and in Figure 8 of ASME y14.35M-1997. It shall appear on the first sheet of each drawing to the immediate left of the Revision History block in the upper right-hand corner. The following guidance based on ASME Y14.35M, Section 7.4.2, shall be followed:

Whenever a revision is made on any sheet, the revision letter shall be entered on the affected sheet and on the Sheet Index. Use one of the following methods.
(a) At original release, enter a — (dash) in the REV column.
(b) Enter the revision letter under which a sheet is added or revised.
(c) Enter a notation, such as CANC or DEL, when a sheet is canceled.

Unofficial drawing revisions that are being distributed for review but that have not been formally reviewed and approved may be indicated by a number following the dash or the latest approved revision letter. The initial draft of the original drawing would be revision "1", the next "2", et cetera. The first unofficial revision to an approved Rev – drawing would be revision -1, and the first unofficial revision to revision A would be Revision A1. This would enable installing activities to keep track of a proposed revision to the IDP as it evolves at the working level before it is submitted

for final review and approval. It should also prevent draft drawings from being confused with approved documents.

1.10.7 Distribution Notice Block

All SPAWAR IDP drawings for externally funded installations at DoD sites shall carry the following notice on the first sheet unless there is a clearly valid reason to allow distribution outside of DoD: "DISTRIBUTION AUTHORIZED TO THE DEPARTMENT OF DEFENSE AND U.S. DOD CONTRACTORS ONLY FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: (enter date) OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO THE INSTALLATION ACTIVITY AT (fill in the organization and code of the IA), OR SPAWAR SYSTEMS COMMAND CODE 4.2." All SPAWAR IDP drawings for PEO funded projects at DOD sites shall carry the following slightly different notice, unless there is a clearly valid reason to allow distribution outside of DoD: "DISTRIBUTION AUTHORIZED TO THE DEPARTMENT OF DEFENSE AND U.S. DOD CONTRACTORS ONLY FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: (enter date) OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO THE INSTALLATION ACTIVITY AT (fill in the organization and code of the IA), or PEO (fill in PEO organization, i.e., C4I, SPACE, or EIS)". The distribution notice shall be located above every title block in the location shown on the templates provided with this appendix. See DOD Directive 5230.24 (dated 18 Mar 1987), Distribution Statement D for the basis of this requirement. IDPs for installations at Non-DOD US Government Agency (e.g., Department of Homeland Security) sites, and IDP drawings that will need to be provided to other Government Agencies (like the example drawings in this appendix) shall use Distribution Statement C in accordance with DoD Directive 5230.24.

1.10.8 Graphic Scales

A graphic scale and text description shall be included with all scaled drawings so dimensions can be readily determined when the drawing size is reduced. The graphic scale shall be designed for practical use and shall be clearly legible when the drawing is reproduced on an 11" x 17" piece of paper. The graphic scale or scales should be placed above the continuation title block (the title block that appears on sheets other than sheet 1) in the approximate location shown on the templates. In the rare circumstances when scaled objects are shown on the first sheet, the graphic scale or scales should be placed above the distribution statement. Graphic scales shall not appear on drawings like simplified block diagrams that do not depict scaled objects. The graphic scales provided with IRD shall be utilized in the IDP whenever it is practical to do so.

1.10.9 Revision History Block

Whenever it is practical to do so, the location of a change shall be identified on the drawings by the use of the ZONE column (of the Revision History Block) and the use of a revision letter. Whenever it is practical to do so, the clear description of each of the changes shall appear in the DESCRIPTION column. When the changes resulting from one or more change notices are so extensive that fully describing them is impractical, the description column shall contain a clearly phrased general description or summary of the change. Drawing revisions that are being distributed for review but that have not been reviewed and approved shall be indicated by a number following the dash or the latest approved revision letter.

1.10.9.1 Removal of Revision History

Revision history entries less than five years old shall not be removed. Once five years have passed, removal of the revision history may be accomplished by removing one complete revision history at a time until enough space is available to record the current revision or revisions. If not enough space can be freed in this manner, continuation sheets (e.g., 1A, 1B, etc.) shall be used.

1.10.10 Security Classification Marking

Security classification for drawings shall be marked in accordance OD-5220.22-M. They are not required for unclassified drawings.

1.10.11 Drawing Zone Requirements

All drawing sheets, except A size drawings, shall include zones for reference purposes. Size A may also be zoned. Zones are indicated by alphabetical (vertical) and numerical (horizontal) entries in the border of the drawing. The alphabetical (vertical) lettering shall start at “A” on sheet one in the lower right and left corners and on each subsequent sheet (i.e., sheet one will start with “A”, sheet two with “A”, etc.). The numerical (horizontal) entries shall start with “1” on the lower and upper right corners of sheet 1 and continue with consecutive numbering throughout the drawing (i.e., on an F size drawing, sheet 1 will start with “1” and go to “8”, sheet two will start with “9” and go to “16”, sheet 3 will start with “17” and go to “24”, etc.).

1.10.11.1 Inserted Sheet Zoning

If a sheet is inserted within an existing drawing (e.g., sheet 2A), the inserted sheet shall have alphabetic (horizontal) zone designators continuing the lettering scheme of the sheet it is inserted after (i.e., if sheet three is zoned 17-A through 24-F, sheet 3A shall be zoned 17-G through 24-L).

1.11 Abbreviations

Abbreviations shall be in accordance with ASME Y14.38-2007. In IDPs, abbreviations shall be used only when their meanings are unquestionably clear to the intended reader. Abbreviations that are not in common use shall be explained in the legend whether or not they are included in ASME Y14.38. The reasons for this are that ASME Y14.38 will often provide several definitions for the same abbreviation, and installers should not be expected to carry a copy of this standard with them. Abbreviations used in the field of a drawing and not referenced in ASME Y14.38 shall always be explained by notes and/or legends on the drawing, even when they are in common use.

1.12 Dimensioning and Tolerancing

Dimensioning and tolerancing shall be in accordance with ASME Y14.5M. This should be taken care of automatically by the CAD program (typically AutoCAD). Scale dimensions to layout (paper) space. Except for isolated instances, Dimensions shall be Associative. (IAW IDEA CAD standards 7 Feb 2005, Section 3.2) For new drawings, make the following changes to the AutoCAD drawing template as required by Section 3.4 of the IDEA standard.

1.12.1 Lines and Arrows

- Dimension Lines Lineweight = 0.15mm
- Extension Lines Lineweight = 0.15mm

1.12.2 Text

- Text Appearance - Text Style = TEXT

- Text Appearance - Text Height = 0.15625

1.13 Model and Paper Space

The use of model and paper space shall follow the general guidelines in the IDEA CAD Standard. Layout names shall make it easy to connect the layout name to a drawing sheet. Normally, "01" shall be used as the layout name for sheet 1, "02" for sheet 2, etc. All "scratchpad items" (e.g., preliminary diagrams) and items that do not appear in the layouts shall be removed from model space prior to drawing publication or uploading into a repository.

1.13.1 Use of Modeling

Depictions of simple physical objects, such as cabinets (on cabinet elevations or on outline and installation drawings), antennas, power panels, blank panels, doorways, raised floor tiles, cable duct, and rooms shall be drawn to true scale (1:1) in model space. In circumstances where rendering a complex physical object to scale will require an undue number of labor hours, and the fine detail scale information is not needed for the success of the installation, an outline of the object drawn to scale may be used and the fine details (e.g., switches and indicator lights on equipment shown in a cabinet) omitted. Cabling diagrams and other diagrams designed to show how different parts of the system are interconnected should not be to scale.

1.14 Notes

Drawings shall contain all notes necessary to allow installers to safely and correctly interpret the drawings and complete the installation. General Notes will follow the form shown in the provided templates and conform to Section 4.26 of ASME Y14.100-2004 except where it conflicts with the following guidance. General Notes may either be labeled "General Notes" (Navy Tradition and IRD Standard) or "Notes" (per Y.14.100-2004, Section 4.26). The term "General Notes" is preferred by the Navy to distinguish them from local notes, defined separately in Y.14.100-2004, Section 4.26.6(b), which "are not included in the listing of general and flagnotes."

1.14.1 Location

As many general notes (includes flagnotes) as will fit comfortably on sheet 1 shall be located on sheet 1 and numbered consecutively as a single listing starting with note 1. When notes are continued beyond sheet 1, the notes should be continued on sheet 2 and the last note on sheet 1 should state "NOTES CONTINUED ON SHEET 2".

1.14.2 Flagnotes

Flagnotes are notes that are located with the general notes but apply only to specific areas or points on the drawing. A flagnote shall be identified by a flagnote symbol. Flagnotes symbols are placed around the note number when a note is referenced in the field of the drawing is the preferred method to indicate which specific note applies at that location. **A triangle is the preferred flagnote symbol for IDPs.** A flagnote symbol need not be used when specific direction is given to a drawing note, such as "SEE NOTE 3" or when the note number is indicated in the area of a table or identified as "NOTES". The same flagnote symbol shall be used throughout the drawing. Flagnote symbols shall not conflict with or resemble other symbols used on the drawing. This guidance is from ASME Y14.100-2004, Section 4.26.6.

1.14.3 References to Other Documents

IDPs shall follow the guidance in ASME Y14.100-2004, Section 4.26.6(h), regarding references to other documents. It states that "**References to other documents** for the purpose of specifying requirements or drawing interpretation **shall be as specific as possible.** The whole of a given document shall not be made applicable by reference unless **all** of its provisions are required. When a portion of a document is applicable, the extent of its applicability shall be stated. However, reference to paragraph numbers in other documents shall not be made. Reference shall be made to a method, identified requirement, class, grade, or type. Reference shall be made only to documents whose technical accuracy and **availability** are assured." (Emphasis added.) Ironically, many drawings contain a statement such as "Interpret drawing per ASME Y14-100-2004", therefore violating the standard being referenced. SPAWAR policy is to allow references to specific paragraphs to be made only when other methods cannot be used to reliably identify a specific requirement. According to ASME Y14.100-2004, Section 4.26.2(a), "Reference documents shall be cited using 'per', 'conforming to', 'as specified in', or 'in accordance with" (or 'IAW').

1.14.4 Use of Indefinite Terms

Indefinite terms such as "and/or", "etc.", "e.g.", and "i.e." shall not be used on IDPs. This is a requirement of Section 4.26.4 of ASME Y.100-2004 that shall apply to all IDP drawings. These terms may occasionally appear on an IRD because an IRD (unlike an IDP) needs to address a wide and indefinite variety of potential circumstances. If the IDP is based on an IRD with such an indefinite term, the IDP developer shall examine the alternatives and replace the indefinite note with a definite statement.

1.15 Symbols

Symbols used in IDPs, including standard symbols, shall be explained in a legend or in the notes. Standard symbols should be used whenever possible. Section 4.19 of ASME Y.100-2004 lists documents containing standard symbols for a wide variety of circumstances, but these documents are rarely needed for IDP development. The standard symbols used most frequently in IDPs are covered by TIA/EIA-606-A and the BICSI Telecommunications Distribution Methods Manual (TDMM). The glossary at the back of the BICSI TDMM (11th Edition) has similar but not always identical symbols to the ones used in TIA/EIA-606-A. The National CAD Standard (NCS) includes extensive information on symbols also. (Module 6 contains over 6,000 Graphic Symbol Representations. Symbols are organized by MasterFormat™ 2004 number and type in NCS 3.1. The MasterFormat is a master list of numbers and titles for organizing information about construction requirements, products, and activities into a standard sequence.) AutoCAD Electrical 2008 Ships with Over 2,000 Standards Based Schematic Symbols. Placing all symbols in the legend is required to prevent any potential confusion resulting from conflicting standards and to allow all users to fully understand the drawings.

1.16 UFC 1-300-09N Drawing Requirements

The applicability section of this document states that "This UFC applies to projects for all NAVFAC activities, and their contractors that are preparing construction contract drawings, specifications, and Request for Proposals for shore facilities, and is applicable to both Design-Bid-Build (DBB) and Design-Build (DB) projects." Section 7-3.2.2 requires users to comply with the United States National CAD Standard (NCS) with stated exceptions. UFC 1-300-09N addresses SPAWAR installations in Section 8-1.4.4, which is quoted below.

"There are two types of drawings for SPAWAR projects: Type (1) are drawings of the building, site and other facilities, and Type (2) are drawings for electronic and other equipment to be installed within, on, or adjacent to the building. Although Type (2) drawings are sometimes prepared by SPAWAR, both types should bear standard NAVFAC title blocks and drawing numbers in accordance with Chapter 7. On drawings that require SPAWAR approval, SPAWAR signature can be applied in the NAVFAC Signature Block in the supplemental location and the SPAWAR drawing cross reference number can be provided on the border sheet (see 7-3.5.2, 7-3.7, and 7-4). SPAWAR may also need to review where project impacts an adjacent facility, such as electromagnetic radiation from police stations or hospitals affecting antennae, transmitters, and receivers."

1.16.1 UFC 1-300-09N Applicability

When UFC 1-300-09-N, Section 8-1.4.4 is considered in context of the scope or applicability of the instruction, the requirement to be in compliance with the National CAD Standard (NCS) is applicable to projects where SPAWAR is tasked to provide drawings that will be used by NAVFAC DBB or DB construction contracts. Project Engineers involved with these types of projects need to be aware of the existence of UFC 1-300-09N and the purpose of the National CAD Standards. For more information on the NCS see http://www.nationalcadstandard.org/publications.php.

2. Parts Lists

The purpose of this section is to provide requirements for all parts lists provided in an IDP. Additional detailed requirements for Master Parts Lists are discussed in Section 3. The Master Parts list is a special drawing that consolidates important information from all of the other Parts lists in an IDP. All parts and material required to complete an installation shall be listed in the Master Parts Lists and on at least one Standard Parts List in the IDP. Standard Parts Lists are required on several categories of drawings to identify installation material. These parts lists shall follow the format shown in the templates with the exception that column widths may be adjusted slightly if needed to include critical information on one line. The parts list on any drawing shall be a complete list of all material items and special tools needed for typical installers to complete the tasks covered by the drawing. It shall list the equipment, parts and materials that will form the completed installation, consumable items (e.g. rags, lubricant, and alcohol for cleaning parts), and special tools or jigs (e.g. custom antenna mounting templates, unusual hole punches, and specialized crimpers for rarely used connectors). Parts list columns and their contents are described in the following sections.

2.1 Database Software

Installing Activities should consider the use database software to improve the accuracy and efficiency of their parts list development. Useful automation can be achieved for little cost using software (standard AutoCAD and Access) already available to most installation activities. The purpose of utilizing database software is to:

a. Increase the speed, accuracy, and consistency of parts list development
b. Enable the automatic or semi-automatic generation of master parts lists
c. Enable the automatic or semi-automatic generation of ordering documents
d. Enable parts on a parts list to be connected to other database fields used to trace the status of ordered items, item locations, item costs, etc.

e. Enable the development of very accurate materials cost estimates for similar future projects.
b. Enable the combination of parts list from a series of system upgrades to be combined automatically to provide an accurate list of the items installed at a site.

2.1.1 Commercially Available Software for Parts List Automation

This is not an endorsement of any of the following products. Installing Activities are responsible for choosing the software that works best for them.

Both *Autodesk Inventor* and *AutoCAD Mechanical* provide some parts list automation capability and may be worth considering.

2.2 Use of IRD Parts Lists

When an IRD is available for a single system, the IDPs that install that system shall make maximum use of the parts lists provided in the IRD. The IDP will normally include some items in addition to those contained in the IRD. These are typically items needed to adapt the IRD design to the site. When the IDP developer notices an error in an IRD parts list, the developer shall submit an IRD Change request as required by Section 4.3 of the SPAWAR IRD Standard.

2.3 Bubbles Callouts and other Identification Means

Bubble callouts are circles with (part list) find numbers inside attached to a leader arrow (pointing to where the part is used). Bubble callouts shall be used to indicate the location of all newly installed hardware. However, when possible, equipment, connector types, and other key items shall be identified by a label on the field of the drawing as shown in Attachments 7, 8, and 10. This serves two purposes. The first purpose is to save users the effort of constantly referring to the parts list. The second purpose is to allow the bubble callouts to be removed, when the drawing is used for an IDP describing future modifications to the system, without removing information needed for troubleshooting and drawing comprehension.

2.4 Parts List Column Headings

All standard parts lists shall have a title block with the words “PARTS LIST” on top and the following column headings. References in this section to a database field sizes and types are the same as used in the 2003 version of the SIPH. They are based on a working database developed to automatically generate parts lists for projects in Guam, Japan, and Diego Garcia. Adhering to the database guidance should aid future data sharing efforts and will improve the consistency of drawing “look and feel” across the enterprise.

2.4.1 Find Number (Heading: “FIND”)

This is the number assigned on every line entry to facilitate the location of the item in the drawing. It appears in the databases as an INTEGER field limited to values from 1 to 999. Some Past IDPs and other Navy drawings have used the ITEM heading for this column, but this practice is being discontinued for two reasons. One reason is to distinguish the numbers in this column from the Item Numbers used in the Master Parts List. The other reason is that, according to ASME Y.34M-1996, Find Number is the correct term. The find number for each item that appears on the parts list either shall appear in the body of the drawing, either in a note or in a callout (a number in a circle with a leader pointing to the location on the drawing where the item is used) or its purpose shall be

explained in the remarks column. Conversely, each material item callout or referral in the body of the drawing or remarks column shall be found in the parts list.

2.4.2 Description (Heading: "DESCRIPTION").

This field can contain up to 96 characters. It should be a complete description of the item. The description should be in the style shown on parts lists in the drawings provided as attachments. When items listed in the IRD are not needed, the description shall be changed to "NOT USED" to avoid confusion and the need to renumber subsequent line items that would be caused by deleting the item.

2.4.3 Furnished By (Heading: "FURN BY").

This column may contain up to six characters. IRDs normally indicate who will furnish each item by having either "SWE" for Supplied With Equipment, or "IAF" for Installation Activity Furnished. The following codes shall be used as appropriate on installations which are not covered by a single IRD:

a. CONTR: This indicates material to be furnished by the contractor performing the installation.

b. GOVT (or specific Government Activity Identifier): This indicates that the material is to be furnished by the government. GOVT should not be used when several different Government Activities will be performing the installation. In these cases, it is often useful to specify in the IDP which particular Government Activity is responsible for providing what material(s). Examples are the Installing Activity (e.g, SSC SD), the Program Office (e.g., PMW790), the In-Service Engineering Agent, and the Site receiving the installation. Codes for these individual Government Activities other than PMWs, when used, shall be explained in the legend.

c. VARIES: It is theoretically possible that identical items on two different drawings within the IDP will be furnished by two different sources. In this case, the word "VARIES" shall be entered under "FURN BY" and an explanation provided in the notes.

2.4.4 Quantity (Heading: "QTY")

This is the number of units of measure of the item that will be required to complete the installation or fabrication task described by the drawing. The use of "A/R" for "as required" in this space is prohibited. When A/R appears in the IRD, the IDP shall substitute the actual quantity needed or, if the exact quantity is uncertain, the quantity to be ordered to cover anticipated needs along with a note in the remarks column indicating that the quantity is an estimate. In a parts list database, this shall be a single precision floating point number field ("Single" type in Microsoft Access). Designers need to coordinate all parts lists in an IDP to ensure that the same exact part (not part number) is not called out as required on two different drawings within the same IDP. For example, an installation requires that two DSUs be installed. The Floor Plan and Cabinet Elevation Parts List will call for a quantity of two DSUs. The designer will enter a quantity of two on the line for DSUs on the Floor Plan and Cabinet Elevation Parts List. The same DSU could also appear on the parts list for Cable Block Diagram, but **only as a reference item ("REF" or "0" entered for quantity). Equipment quantities shall be specified on the Floor Plans and Elevations parts list.** This will prevent the items from being counted twice in the Master Parts List.

2.4.4.1 Substitute Items

According to Figure 4 of ASME Y14.34M-1996, "The find number column on the parts list and the quantity column can be used to indicate substitute parts or bulk items. The preferred item is indicated by entering the applicable find number in the find number column and the actual quantity required, if known shall be shown in the quantity column….The substitute item is indicated by the same find number as the preferred item in the find number column and the abbreviation SUB or ALT for substitute or alternative part shall be shown in the quantity column."

2.4.4.2 Items to be Removed from an Altered System

Negative quantities shall be entered when the IDP will be removing items that were installed under the previous version of the IDP. These negative quantities will become positive or zero quantities in the final As-Built.

2.4.5 Unit of Measure (Heading: "U/M").

These are abbreviations for the unit of measure (different from the unit of issue) used to define the quantity discussed above. The abbreviations given in this field shall be one of the two letter abbreviations used by the Navy Supply System and shown in Table 3. In the database, this is a three-character text field that allows for future expansion.

2.4.6 National Stock Number (Heading: "NSN").

This column will contain the National Stock Number (NSN) for the item if one is available. If the Government provides National Stock Numbered material, the Part Number and Supplier columns do not need to be filled out. Within the database, the National Stock Number should be broken down into its Federal Supply Class (FSC) and National Item Identification Number (NIIN) components. The Federal Supply Class field in the database should be a text field with a field size of four characters. The NIIN field should be a text field. Hyphens may be included to bring the maximum length to 12 characters in exported databases. In addition, the database should include a 3 character (one is for expansion) text field for the two-character Cog Code associated with every National Stock Numbered item.

2.4.7 Supplier/Manufacturer (Heading: "SUPPLIER OR MFGR")

This column is for entering the name of the organization whose part number appears in the Part Number column. When possible, it should be the manufacturer's name. When the manufacturer's part number is not known, however, the supplier's name and part number shall be used. In the provided database, this is a text field with a field size of 24 characters. Cage Codes (FSCMs) shall not appear in this column. However, they should be provided in a separate text field within the database whenever they are available.

2.4.8 Part Number (Heading: "PART NUMBER")

This is the Part Number of the supplier or manufacturer listed in the "SUPPLIER OR MFGR" column. This length of this field in the provided database is limited to 32 text characters.

2.4.9 Remarks (Heading: "REMARKS")

This is shall be a 50-character field in the database. If more than 50 characters are required or the remark will not fit in the column, use a General Note.

The following abbreviations were taken from the Unit of Issue abbreviations in NAVSUP Publication 409, MILSTRIP MILSTRAP Desk Guide, Revised 05/03, COG I Stock No. 0530-LP-011-2240.

CODE	DESCRIPTION	CODE	DESCRIPTION	CODE	DESCRIPTION
AM	Ampoule	FT	Foot	PR	Pair
AT	Assortment	FV	Five	PT	Pint
AY	Assembly	FY	Fifty	PZ	Packet
BA	Ball	GL	Gallon	QT	Quart
BD	Bundle	GP	Group		
BE	Bale	GR	Gross	RA	Ration
BF	Board Foot			RL	Reel
BG	Bag	HD	Hundred	RM	Ream
BK	Book	HK	Hank	RO	Roll
BL	Barrel				
BO	Bolt	IN	Inch	SD	Skid
BR	Bar			SE	Set
BT	Bottle	JR	Jar	SF	Square Foot
BX	Box			SH	Sheet
		KT	Kit	SK	Skein
CA	Cartridge			SL	Spool
CB	Carboy	LB	Pound	SO	Shot
CD	Cubic Yard	LG	Length	SP	Strip
CE	Cone	LI	Liter	SX	Stick
CF	Cubic Foot			SY	Square Yard
CK	Cake				
CL	Coil			TD	Twenty-four
CN	Can	MC	Thousand Cubic Feet	TE	Ten
CO	Container	ME	Meal	TF	Twenty-five
CS	Case	MR	Meter	TI	Tin
CT	Carton	MX	Thousand	TN	Ton
CY	Cylinder			TO	Troy Ounce
CZ	Cubic Meter	OT	Outfit	TS	Thirty-six
		OZ	Ounce	TU	Tube
DR	Drum				
DZ	Dozen	PD	Pad	VI	Vial
		PG	Package		
EA	Each	PK	Pack	YD	Yard
		PM	Plate		

Table 3 - Unit of Measure and Unit of Issue Abbreviations

3. Standard Drawing Categories

3.1 Functional Interface Diagram (FID) (Drawing Category Code 000, Attachment 2)

The Functional Interface Diagram (FID) is not part of the IDP development process, but is shown here to demonstrate the relationship of the FID to the drawings developed below the FID in the Drawing Tree, Attachment 1 in the drawing set at the end of this Appendix. The FID shows the various equipment constituents in the terrestrial, distribution and switching, and RF distribution areas before the proposed installation in the current IDP package. Future FIDs would show changes made through installations since the last revision of the FID. FIDs have their own standard for format that is not covered here.

3.2 Site Master Index (Drawing Category Code 010, Attachment 3)

Site Master Indexes shall be used as a starting point for development of IDPs that modify existing installed systems. Site Master Indexes are intended to only list current approved original or revised Master As-Built Drawings. A Site Master Index for a given site is generated electronically by the SPAWAR approved document repository, and it only exists if at least one Master As-Built drawing has been uploaded to the repository for that site. Master As-Built Drawing sets are a special class of C4ISR system As-Built drawings. A Master As-Built Drawing set depicts a C4ISR system in its entirety. **Any IDPs and the resulting As-Builts that only depict changes or a portion of a given system are NOT Master As-Built Drawings.** As-Built drawings, like those that result from new system installations, depict the configuration of the system in its entirety. The establishment of Master As-Built Drawings and associated Master Site Indexes shall occur as new systems are deployed or existing ones are relocated. It will take many years to obtain configuration control of shore C4I facilities, but the envisioned end state is one current Master As-Built Drawing set for each deployed C4I system on file and indexed in the Shore Installation Repository. **To achieve that end state, all Master As-Built Drawings shall be updated by the IA that implements a system modification. The update to the Master As-Built Drawings shall constitute the As-Built deliverable for that installation.**

3.2.1 Incorporating Master As-Built Drawings into Site Master Indexes.

When Master As-Built Drawings are uploaded into the workflow for the approved SPAWAR document repository an attribute can be selected to indicate that it is a Master As-Built Drawing package – meaning that this drawing set accurately depicts the entire configuration of that system. Once the upload of the Master As-Built Drawing is completed, it automatically starts or updates a Site Master Index for that site.

3.2.2 Developing and Maintaining Site Master Indexes

For many years, the Navy has not strictly adhered to a configuration management discipline at shore facilities. Recently, the Navy has started to take steps to regain configuration control of important Navy shore communication nodes. While it will take many years to regain configuration control at shore sites, it begins with everyone that participates in the Shore Installation Process. When installation projects do not follow the drawing standards and associated processes of this document, and Master As-Built Drawings are not kept up-to-date, those projects impact the Navy's ability to maintain a documented configuration of installed systems. The N5's and N4's at Navy commands can play an important gatekeeper role in requiring delivery of and upload of Master As-Built Drawings into the approved SPAWAR document repository. The resulting Site Master

Indexes not only indicate what systems are installed at a site, but each index is also automatically linked to the actual Master As-Built Drawings. If the standards and processes described in this document and the Master Index and Master As-Built approach is universally adopted by all participating in the Shore Installation Process, C4I configurations ashore can always be known and controlled.

3.3 Installation Master Drawing (Drawing Category Code 020, Attachment 4)

All IDPs shall contain an F-size Installation Master Drawing. The Installation Master Drawing described in the previous version of the SIPH has been greatly affected by three new IRD drawing categories. An example is shown in Attachment 4. This drawing shall contain the Shore Work Plan Tracking number from the SPIDER database, identify the project location(s) and provide a brief project abstract close to the center of the sheet. The drawing shall contain the required blocks previously discussed in Section 1.1. The title in the title block will normally identify the system by nomenclature (item name and, if available, type designation). However, if the Installation Master Drawing is for a project encompassing the installation of multiple systems, the Installation Master Drawing shall provide a name that will capture the overall purpose of the integrated installation. In these cases, the title could be something similar to DISA SWP RELOCATION (requires all systems at a site to be moved) or NCTS BAHRAIN FY09 SITE UPGRADE. This drawing will also normally include a Vicinity Map and Site Map. The following paragraphs provide amplifying information about the contents of the Installation Master Drawing.

3.3.1 Cover Sheet

The Installation Master Drawing may contain an associated cover sheet. Cover sheets are optional. When provided, cover Sheets will be free-form single sheets with an artistic flair and shall contain the title of the installation. The cover sheet will be on sheet zero of the Installation Master Drawing (layout 00) that they are associated with. They will not be listed on the sheet index of the associated drawing, have a title block, or require a border. Cover sheets shall not increase the size of the Installation Master Drawing by more than 300 kilobytes.

3.3.2 The Reference Index

The Installation Master Drawing lists of all of the documents that the installation crew should have on hand in order to successfully complete the installation in a “Reference Index” list. It lists all of the other drawings in the IDP. Every applicable drawing category is listed. The IRD inspired REFERENCE DRAWING(S) block is not used on this drawing category. The classic REFERENCE INDEX block is retained. The reason for doing this was to eliminate the redundancy that would be caused by following the IRD standard for this kind of drawing. (The IRD standard lists most drawings twice on the Master Drawing List. The list on IRD Master Drawing List sheet 1 does not include revision level information or references other than drawings. The list on IRD Master Drawing List sheet 2 does not include a sequential (Line/Item/Row) number.) The REFERENCE INDEX block may include Technical Manuals, Users Manuals, instructions for making connectors, et cetera. The REFERENCE INDEX shall list the following:

- **a.** Each individual IDP drawing identified by a title and the 15-digit drawing number, and revision level (or dash if drawings are not revised). This is the only place in the IDP where drawing revision levels are shown.
- **b.** Each required equipment technical publication (e.g., a technical manual) which is needed to complete the installation or initial configuration of the equipment) by document title and

document identification number. Documents whose relevant information is incorporated in the IDP should not be listed. Whenever practical, the IDP shall provide enough guidance to ensure standards compliance without requiring installers to conduct research into the contents of a standard. Standards documents that are listed shall be called out in a note, and shall be provided to the lead installer at the site while the installation is in progress. The note or notes shall clearly explain to an average installer why the document is listed and the specific section or sections of the document that apply. Notes similar to "GROUND IAW MIL-HDBK-419A" are strictly prohibited because of their lack of specific direction to the installer and the historical failure of these kinds of notes to achieve compliance with standards. They are also a violation of ASME Y14.100-2004, Section 4.26.6(h), as explained in Section 1.13.3.

3.3.3 Required Notes and Statements

The first note on the Master Drawing List shall provide the web address (URL) for finding the document within the SPAWAR Shore Repository and the e-mail address of the project engineer responsible for providing the document to the repository. The first sheet shall also provide the following three statements near the center of the first sheet using approximately the same text style and height as the drawing title. (The use of AutoCAD MTEXT is allowed may require a true type font to be substituted for a native AutoCAD (shx) font.)

3.3.3.1 Project Location(s) Statement.

The statement will identify the organization(s) that will be receiving the installations and the geographical location of the installation site. If the installation will take place at a single building on a base, both the base and the building should be identified.

3.3.3.2 Project Identification (ID) Number Statement

The Project Identification (ID) Number Statement shall appear immediately below the Project location statement. The Project ID Number will be the Shore Work Plan Installation Tracking Number for the installation. When the installation is an integrated installation that has more than one tracking number, one tracking number shall be designated as the primary by the project engineer and used in the Project ID statement. In these cases, a general note shall be added to the Installation Master Drawing to identify all of the Tracking Numbers associated with the integrated installation.

3.3.3.3 Project Abstract

The Project Abstract is a brief summary of the purpose or purposes of the installation(s) covered by the listed drawings. It shall appear below the Project ID Number Statement. It should identify the equipment or systems being installed and/or removed.

3.3.4 Technical Data Chart

As of the date of this publication, the Technical Data Chart containing the operating parameters of all equipment being installed is no longer part of the Installation Master Drawing. It has been moved to a new category of drawing (Category Code 023) to align future IDPs with the IRD standard.

3.3.5 Master Parts List

As of the date of this publication, the Master Parts List is no longer part of the Installation Master Drawing. It has been moved to a new category of drawing (Category Code 022) to align future IDPs with the IRD standard.

3.3.6 Vicinity Map

A Vicinity Map may be used illustrate the geographical location of the installation and other important, related areas. The Vicinity Map shall generally follow the illustration shown in Attachment 4. Vicinity maps are optional.

3.3.7 Site Map

A Site Map is used to graphically illustrate the Military Base plan and/or the immediate site affected by the new installation. The Site Map shall show all new installations of items outside existing buildings (air conditioners, generators, equipment shelters, etc.) and installations involving new buildings. Outside cable plant installations also require a Site Map showing where the cable will be installed. A recent As-Built drawing may be a source for a Site Map. The Site Map will generally follow the form shown in Attachment 4.

3.3.8 Building Plan

A Building Plan is used when the installation design is complex enough to require multiple sheets of Floor Plans. In the example illustrated in Attachment 4, the installation project is occurring in multiple spaces on different floors. In smaller or less complex installations, where the entire installation project is contained within a small space, a Key Plan depiction on the Floor Plan drawing is sufficient. See Section 3.5.8.

3.4 Master Parts List (Drawing Category Code 022, Attachment 5)

All IDPs shall contain an F-size Master Parts List. This is expected to be, for most future installations, a modified version of the Master Parts List in the IRD. To improve accuracy of the generation of the master parts list, these lists should be computer generated using a database automatically linked to all the parts lists in the IDP. The Master Parts List, consolidates important data from all the other parts list in the IDP.

3.5 Technical Data Summary (Drawing Category Code 023, Attachment 6)

The format and content of the Technical Data Summary is fully described in Section 3.3.5 and Figure 4 of the IRD standard. Creating a technical data summary for systems that have an IRD only requires changes to the standard title, references and approval blocks. If there is no IRD or As-Built that can be used, the IDP developer needs to list all equipment in the Technical Data Summary table and place data in all of the non-ship power requirements columns, the Average Heat Dissipation column, and the uncrated dimensions columns. The temperature and humidity data columns shall be completed whenever data is available from the manufacturer or the government. The crated dimensions column shall be completed if storage or transportation of large crated equipment or large quantities of equipment is required at the site. Crated weight information and air flows columns shall be completed whenever information is readily available. Technical data summaries shall be prepared and reviewed by engineers or other individuals with the background needed to understand the data being presented and to recognize contradictions in the data or data that is suspect or obviously wrong. Appropriate tests shall be conducted when electrical data is

unavailable or suspect so that accurate data can be presented. Uncertainties in the data or the temporary use of estimates not based on testing or manufacturer's data shall be documented in the notes. Power consumption estimates and manufacturer's data shall be verified during SOVT testing of the first installation of any system variant, to provide hard data for electrical current and power consumption, unless notes on the IRD for the variant or on the IDP:

a. State that all electrical current and power data was verified through system testing.
b. Identify the organization conducting the tests
c. Identify the SOVT or other test document that provided the test results.

3.6 Floor Plans and Elevations (Drawing Category Code 040, Attachment 7)

Floor Plans and Elevations identify the location of equipment to be installed within buildings. All elevations shall be clearly tied to a location on the floor plan by using the View X-X technique. This is illustrated in the example drawing provided as Attachment 7. Notes on floors plans should indicate when the area above or below the floor is used for environmental (HVAC) air and provide information on raised floor height and false and true ceiling heights when this information is not provided elsewhere in the drawing.

3.6.1 Use of IRD System Elevations to Create IDP Floor Plans and Elevations

IRD System Elevation drawings shall be used as much as possible during the development of Floor Plan and System Elevations drawings for IDPs. The intent is to standardize the elevations of all systems as much as possible for configuration management and standardization of operations and maintenance. IRDs include overhead and elevation views that are designed to be cut and pasted into IDP Floor Plans and Elevations when the arrangement shown in the IRD can be installed at the site. Unfortunately, there will be situations where space restrictions may require equipment arrangements that are considerably different from the arrangement shown in the IRD requiring the development of new drawings. When this occurs, every effort shall be made to retain the key human interface characteristics as much as possible.

3.6.2 Site Coordination and Aesthetic Considerations

Floor Plan and Cabinet Elevations should be coordinated with the site to help to ensure customer satisfaction and to take advantage of local wisdom. The site may have plans for the use of floor space that could conflict with the IDP developers initial plans. The site might know that the roof leaks above the proposed cabinet location or that floor beneath it is weak (maybe because of the leak). The site may object to the use of cabinets that do not match the existing color scheme at the site. (This has happened.) These are just a few examples of situations where advanced coordination with the site can prevent future rework.

3.6.3 Floor Plan and Elevation Drawings Engineering Considerations

Whether an IRD exists or not, the IDP developer is the person responsible for considering the following issues when developing Floor Plan and Elevation Drawings, and the PE is responsible for ensuring that these considerations are properly addressed in the design.

3.6.3.1 Working Space and Access to Exits

The IDP developer shall ensure that the floor plan and elevation design will not place equipment (in cabinets or racks) at a location that causes the equipment to intrude into the working space for power panels required by the National Electrical Code. See SIPH Appendix AC, Section 3.8, for

information on required power panel clearances. The IDP developer must also consider the need for working space around other equipment and the equipment being installed. Section 6.11.7 of SIPH Appendix AC addresses SPAWAR and TIA-942 requirements for cabinet clearances. Equipment placement shall also not block access to safety boards or fire exits.

3.6.3.2 Equipment Cooling

The placement of equipment that will generate heat must ensure that enough cooling air flow or other provisions for cooling (e.g. chilled water) will exist to prevent an unacceptable heat build-up. When an IRD has been developed, and the guidance in the IRD is followed, air flow within the installed cabinets and racks should be adequate. When there is no IRD, the IDP developer is responsible for ensuring that the placement of equipment will allow for adequate cooling of the equipment. In most cases, this means that the placement will allow adequate clearances for all air vents and equipment fans. In some cases the installation of thermostats and fans in the equipment cabinets will be needed to insure against an unacceptable heat build-up. IDP developers should consider the location of air conditioning vents when determining equipment locations.

3.6.3.3 Human Factors

IDP developers are responsible for ensuring that the placement of equipment is made with careful consideration of human factors. This is especially important for the placement of keyboards and monitors that will be used frequently. The IDP developer may need to install additional lighting inside of or near cabinets to provide for adequate visibility during maintenance. Noisy equipment should be placed outside of areas normally occupied by operations personnel. See Section 18 of SIPH Appendix AC for additional information about Human Engineering.

3.6.3.4 Seismic Considerations

The risk of significant seismic activity shall be considered when cabinet choices are made. The use of “Zone 4” rated racks and cabinets is required in seismically active regions of the United States and overseas, including coastal California, Washington State, Alaska, Guam, Crete, Italy and Japan in order to meet best commercial practices for these areas. They are available from several manufacturers. Seismic considerations are also important when placing equipment within racks and cabinets. Very heavy equipment shall be placed near the bottom of cabinets to reduce the risk of mounting hardware failure and injuries during seismic events.

3.6.3.5 Determining Appropriate Cabinet Depth

Cabinets shall be purchased with sufficient height and depth to allow:

- **a.** Cabinet doors to be closed without placing any stress on connectors and cable.
- **b.** Equipment to be installed so that it does not protrude more than 5 cm past the front of the cabinet with the exception of patchcord management hardware and handles for sliding equipment. The 5 cm allowance is for older equipment with switches and knobs mounted on the face.
- **c.** Vertical power strips to be mounted with no equipment blocking access to the power strip.
- **d.** Adequate clearance for proper cable management.
- **e.** Unobstructed access to cable and wire entry points.

3.6.3.6 RED/BLACK Separation Requirements

The IDP must be designed to meet all of the separation distances required by the CTTA based on NSTISSAM TEMPEST/2-95 with 2-95A. The strictest requirements are for separation distances between radios and RED equipment. Planners need to be very careful when designing installations where RED equipment will be near radios and public address systems and to ensure that other RED and BLACK equipment separation requirements are met.

3.6.3.7 Requirements for meeting RED/ BLACK Installation Guidance

In order for an Installation Design Plan (IDP) to be approved by SPAWAR, an IDP shall completely conform to the applicable NSTISSAM TEMPEST 2-95A recommendation (per its Table 3-1) unless a letter is provided from the CTTA indicating that total conformance to the recommendations in NSTISSAM TEMPEST 2-95A is not required. In these cases, the date of the letter, the name of the CTTA, and the RED/BLACK criteria required by the CTTA shall be identified in notes on the appropriate drawings (typically floor plans and elevations).NSTISSAM TEMPEST /2-95, RED/BLACK Installation Guidance (with NSTISSAM TEMPEST/2-95A Amendment of 3 February 2000) divides facilities into nine different categories and provides installation recommendations for each of those categories. The drawing notes shall state which set of recommendations were used to develop the design, and shall also annotate key dimensions that are required to meet those recommendations (TEMPEST requirements). For example, if Recommendation C is being followed (the recommendation for the highest risk combination of equipment and space), and RED equipment is being installed in the same room as BLACK equipment, then notes on the floor plans, cable path, and other appropriate drawings shall state something similar to:

1. NSTISSAM TEMPEST /2-95 “Recommendation C” followed per CTTA John Doe, via e-mail to SSC Joe Engineer dated 7 Jan 2007.
2. RED and BLACK equipment cabinets must be installed as shown to meet TEMPEST requirements. No design changes shall be made that reduce the separation between RED equipment and the following items to less than 1 meter, without obtaining permission from the PE and CTTA:
a. BLACK equipment.
b. BLACK wire lines that leave the room
c. BLACK power lines
d. Equipotential Ground Plane Conductors that leave the room
3. Cable pathways must be installed as shown to meet TEMPEST requirements. No design changes shall be made that reduce the separation between RED cables and BLACK cables that leave the room, and RED cables and BLACK power lines to less than 5 centimeters.
4. Shielded cables are required to have a 360 degree termination at each end to shielded connectors as shown to meet TEMPEST requirements.
5. RED equipment must be at least three meters from the RF transmitter per NSTISSAM TEMPEST /2-95 “Recommendation C”, paragraph 5.

3.6.4 Change from Previous Requirement

The previous version of the SIPH stated that “Upon completion of the installation, the final As-Built drawings will not include the legend items used to distinguish between the installation and the existing items.” This requirement has been changed to: “The final As-Built drawings will include the legend items used to distinguish between the installation and the existing items, but the drawing

will show all installed items as existing." This will make it easier to make the IDP for the next installation. (You won't have to put in all of the "(E)" symbols.)

3.6.5 Parts List

Floor Plans and Elevations drawings shall have Parts Lists. This parts list shall include all installed communications equipment, cabinets, and blank panels.

3.6.6 Bubbles Callouts and other Identification Means

Bubble callouts are circles with (part list) find numbers inside attached to a leader arrow (pointing to where the part is used). Bubble callout shall be used to indicate the location of all newly installed equipment and cabinets. However, when possible, equipment and blank panels shall be identified by a label on the field of the drawing as shown in Attachment 7. This serves two purposes. The first purpose is to save users the effort of constantly referring to the parts list. The second purpose is to allow the bubble callouts to be removed when the drawing is used for future modifications to the system. (See Section 2.5 for additional guidance.)

3.6.7 Proper Orientation

The key plan and details associated with a floor plan shall be oriented in the same direction as the floor plan. The sides of the building and room shall be parallel to the edges of the drawing sheet when possible.

3.6.8 Key Plan

A building key plan shall be provided with all floor plans and cable routing drawings. A building Key Plan is necessary to show the location of rooms, floors and areas inside a building that are affected by the installation. The building key plan will generally follow the form shown in Attachment 7.

3.6.9 Required Information

Floor Plans and Elevations shall:

- **a.** Show outlines of the position of all equipment cabinets, racks, and related furniture (for example, Wright Line Furniture for holding servers and workstations).
- **b.** Clearly indicate the locations of power panels, safety boards, doors, fire extinguishers, alarm pull handles, ground boxes, entrance plates, furniture, doorways, and other items that installations must not restrict access to.
- **c.** Clearly identify the location of known hazards such as asbestos, lead paint, and loose raised deck.
- **d.** Indicate the locations of the individual tiles, if the room uses raised computer decking.
- **e.** Provide a graphical scale with text description so that distances can be gauged regardless of the drawing size. There is no "preferred" scale. The border of the drawing should be scaled in AutoCAD to make maximum use of the available paper space. This is true for both floor plans and elevations. The PE should have the manufacturer's specifications for the particular rack, cabinet, or furniture that is used. These exact specifications should be used when drawing lines in AutoCAD model space. Some manufacturers will provide AutoCAD renderings of their offerings, therefore eliminating the need to create AutoCAD drawings from scratch.

f. Indicate which portions of the room will be changed or affected by the installation. A legend shall be provided and described in sheet notes. The legend will indicate equipment that is already installed (existing), existing equipment that will be used by the project, new equipment that will be installed by the project governed by the IDP, and, if known, equipment that will be installed in the future by other projects.

g. Show all critical and essential dimensions needed to locate equipment in relation to other equipment, doors, power panels, etc. This information should be provided when there is a danger that installers could inadvertently fail to meet RED/BLACK criteria and National Electrical Code requirements.

h. Place an "f" on the floor plan just outside the front of each row of equipment bays. A legend note shall explain this symbol on the drawing.

i. Assign Row and Bay Numbers to all cabinets, racks, and modular furniture designed to house equipment. This includes cabinets that are provided with the equipment to be installed. Number the bays in each row consecutively. If empty floor space is available for future installation of additional bays, the bays should be numbered so that the sequence can be maintained without using negative integers or fractions. At a minimum, indicate the Bay Number of the first and last bays appearing in each floor plan row and on each elevation row. If the installation site has an established Row and Bay scheme, follow the scheme and number Rows and Bays accordingly.

j. Indicate the designation and type of power provided by each power panel. (For example, UPS Power, RED Technical Power Panel No. 1, Utility Power Panel.)

k. When appropriate, indicate the overall function of equipment bays appearing on the floor plan (for example, Crypto, EHF, Patch, LSTDM).

l. Indicate on the drawing whether each rack unit is occupied by equipment, covered with a blank panel, or empty. If blank panels hide an IDF or other items that render the space not suitable for equipment placement, this shall be indicated on the drawing.

m. Identify all equipment, panels, and fabricated and/or assembled items. This can be accomplished by using commercial designations, A/N nomenclatures, or descriptions. Equipment to be installed should be tied to the Drawing Parts List by the use of find numbers. Find numbers appear in a column on the Drawing Parts List. Use bubbles that surround the find numbers with an arrow to connect the bubble to the location of the items. The parts list should include hardware; for example, screws and washers that do not appear illustrated on the drawing, but are needed to install the equipment unless this mounting hardware is covered in the Mechanical Assembly and mounting details. In addition, equipment that appears or could appear in the future more than once should be assigned an equipment number, starting with #1 and continuing consecutively (for example, KIV-7 #1, KIV-7#2) or a functional description and number (e.g. INNER ROUTER #1, OUTER ROUTER #1) to distinguish between basically identical pieces of equipment. When more than one bay of identical equipment is installed and there is a possibility that additional identical equipment could be inserted in these bays, the equipment number shall be assigned by equipment name or nomenclature and a number that corresponds to the equipment bay number followed by a letter. (For example, RF PATCH PANEL #1A, RF PATCH PANEL #1B.) By using this method, the number of patch panels in a cabinet can be increased without needing to renumber identical patch panels in the next cabinet.

n. Show room numbers on the floor plan. The floor plan should also indicate key functional areas such as Fleet Center or Technical Control.

- **o.** Provide floor plans with a parts list that contains items required to complete the arrangement and layout of equipment and cabinetry used in the IDP. Drawing callouts (illustrated by a number within a bubble pointing to an item on the diagram) shall be used to connect items shown on the diagrams to the parts list.
- **p.** Indicate the direction of up or down for steps.
- **q.** Indicate the direction of north.

3.7 Antenna Layouts and Elevations (Drawing Category Code 050, Attachment 8)

These drawings do for antennas what floor plans and elevations do for cabinets. Antenna installations require an Antenna Layout depicting the locations of antennas, towers or platforms to be installed. If a Site Master Index has been established for a site, the Site Master Index shall be used as a basis for developing the Antenna Plot Plans and Elevations for any new installation. The As-Built drawing will become the most recent Antenna Plot Plan and Elevations for the Site Master Index. Any vital alignment information must be included on the Antenna Layouts and Elevations. A roof plan is an Antenna Layout for the roof of a building. It should also show the direction of North. Every Antenna Layouts drawing shall have a parts list. Parts list development requirements are similar in concept to the parts list requirements for floor plans. Antenna Layouts apply to ground as well as roof installations and should contain the following information and details if they apply. The layouts, when appropriate, should:

- **a.** Provide a graphic scale with a text description on each sheet used to show the location of an antenna. The actual scale for the full-size drawing should appear underneath the graphic scale.
- **b.** Use plane coordinates or a grid system on complex fields. Show the direction of North when not indicated by a coordinate or grid system.
- **c.** On complex antenna fields for dedicated Receiver and Transmitter Sites, number the antennas using an alphabetical coding and a numerical sequence. The alphabetical coding categorizes the antenna by type and frequency range. A legend explaining the coding method must be included on the drawing.
- **d.** Show dimensions needed to locate the antenna. Show general orientation of antennas.
- **e.** Show antenna structures such as ground screens, support poles, towers, and radiating elements that depict the antenna.
- **f.** Show footprints of antennas and other details that could affect the present and future antenna sightings and site preparation.
- **g.** Show antenna RF cableway routing.
- **h.** Provide a listing of parts required to complete the installation or reference a separate drawing that lists the required parts (such as, Antenna Mechanical Assembly and Mounting Details, Drawing Category Code 171).
- **i.** Clearly indicate which antennas will be installed by the project defined within the IDP.
- **j.** Maintain proper antenna separation in accordance with criteria contained in SPAWAR Instruction 0101,104.
- **k.** Show the location of key functional areas located below roofs.
- **l.** Reference the drawing providing detailed grounding instructions or provide detailed grounding instructions including a listing of all required parts and materials.
- **m.** Show or reference the drawing showing how lightning protection will be provided.

3.8 Simplified Block Diagrams (Drawing Category Code 060; Attachment 9)

Simplified Block diagrams illustrate how major pieces of equipment are interconnected and will provide high-level information about signal flow for individual circuits or groups of circuits. This may include local area, metropolitan area, or wide area networks (LAN/MAN/WAN). Simplified Block Diagrams shall reference the related Cable Block Diagram(s). Simplified Block Diagrams shall not have parts lists.

3.9 Cable Block Diagrams (Drawing Category Code 070; Attachment 10)

Cable Block Diagrams show all cables to be installed, modified, or upgraded. Cable Block Diagrams shall show cable types and cable numbers for all cables. Termination points shall be identified by the connector identification of the equipment jack or the terminal block that each cable connects to. The termination points shall be clearly identified. The names of the equipment involved shall be provided. Cable Block Diagrams shall reference related Circuit Diagrams, Labeling Details, and any related Cable Running Sheets. Note that drawings in this category require Cable Running Sheets, Drawing Category Code 080.

3.9.1 Tailoring of IRD Cable Block

The IRD may provide a variety of cable choices for a cable connection. The IDP developer shall choose the best of the alternatives offered in the IRD based on factors such as the local environmental conditions, required cable length, presence of rodents, etc. If none of the alternatives in the IRD is suitable, the IDP developer shall choose a suitable alternative, place a note on the drawing explaining the rationale behind the choice, and follow up with an IRD change request so that the IRD can be modified to address the needs of future similar installations.

3.9.2 Cable Block Diagram Engineering Considerations

The PE is responsible for ensuring that the engineering is sound and that standards are not violated.

3.9.2.1 Electrical Characteristics

When no IRD exists, Cable Block Diagram developers shall select cables and connectors with the most appropriate electrical characteristics. Depending on the circumstances, impedance, capacitance, inductance (rarely), attenuation, and other characteristics may need to be considered. This requires a knowledge and understanding of the electrical interface characteristics and their potential implications. PEs are responsible to ensure that any nominal impedance mismatches are justified on the drawings. PEs are also responsible to ensure that the electrical wiring factors explained in SIPH Appendix AC are fully considered so that voltage drop requirements are met and ampacity of the wires are not exceeded. Installation PEs are responsible for ensuring that sufficient shielding is provided to avoid electromagnetic interference or compromising emanations.

3.9.2.2 Optical Characteristics

The PE is responsible for considering the current and future bandwidth and wavelength requirements. In general, multimode fiber optic cable should not be used for outside plant installations and single mode cable should not be used for inside plant LAN drops.

3.9.2.3 Applicable Standards

PEs shall comply with applicable standards in Appendix AC and shall ensure that:

a. The cables chosen will meet NAVFAC and NEC requirements for fire resistance.

b. Cable lengths do not violate the 90 meter maximum length standard for horizontal cabling in TIA/EIA-568B.1.
c. Only twisted pair and fiber optic cables that are designed for outside plant use and meet the requirements for Outside Plant Cables in TIA-758-A are installed outside of buildings.
d. Only RF cable that is designed for outdoor use is installed outdoors.
e. All new OSP cable fiber optic cables contain at least 12 strands of single mode fiber as required by UFGS 33 82 00 (16711).

3.9.2.4 Characteristics of Available Tools and Installers

Cable Block Diagram developers are also responsible for choosing connector types that make the most efficient use of the available human resources and termination equipment and meet the applicable standards while at the same time producing a reliable product.

3.9.3 Identification of Cable Termination Points

Equipment with cable termination points shall be identified on the Cable Block Diagram using the same text used to identify the equipment on the Floor Plans and Elevations. This includes power panels. Termination point identification on the diagrams (typically a Jack Number) shall use the same text/method used to identify the Jack on the outside of the equipment. If no clear method of termination point identification is shown on the equipment when supplied by the manufacturer, the labeling detail drawing in the IDP shall provide a detailed plan for permanently labeling the equipment so that termination points will be clearly identified or the cable block shall contain a diagram of the equipment showing the identification of all cable and individual wire (for power and grounding) termination points. A durable or protected copy of this diagram shall be placed in the cabinet housing the equipment for future reference.

3.9.4 Identification of Connector Types

Whenever space is available, it is good practice to indicate connector and cable types by using local notes (e.g. the text “DB-25P” or RJ-45) with a leader pointing to a connector) as well as drawing callouts and parts list. The reason for this is to provide for identification of connector and cable types when the callouts on an old IDP are removed to prepare an IDP for a new installation. It also reduces the need for users to refer to the parts list.

3.9.5 Parts List

Cable Block Diagrams must be provided with a parts list that contains items required to complete the running, arranging, and terminating, of the cable and electrical wire to be installed. **Equipment (routers switches, receivers, etc.) can appear on the parts list only as a reference item (“REF” or “0” entered for quantity). Equipment quantities shall be specified on the Floor Plans and Elevations parts list.** The Cable Block Diagram Parts List shall include:

a. All new cable and cable to be removed except for RF cables covered by an RF Transmission Line Diagram (Drawing Category Code 183)
b. All new wires (typically power wiring, but also cross-connect wires) and wiring to be removed except for ground wires covered in the miscellaneous detail drawings
c. All new connector hardware ordered separately including backshells, retaining screws, and pins
d. All new cable mounting hardware (includes cable ties and mounts) not covered by a Mechanical Assembly and Mounting Detail drawing (Drawing Category 171)

- **e.** All new cable grounding hardware not covered by the Miscellaneous Installation Detail drawing (Drawing Category 180)
- **f.** All special tools (crimpers or punches) required for installing unusual connectors. (Notes or Remarks shall indicate the tool's application.)
- **g.** All consumable items required for cable termination (e.g. alcohol and rags for cleaning fiber optic cable and lubricant)
- **h.** All cable accessories and fittings (e.g., kellums grips, spooling devices, reels, and strain relief connectors) not covered in the miscellaneous installation details drawing in the IDP.
- **i.** All signal cable protective devices including gas tubes, carbon protector blocks and solid state protectors
- **j.** All power cable surge arrestors and similar protective devices.
- **k.** All electrical wire and circuit breakers.

3.9.5.1 Cable Descriptions

Descriptions of cable listed in the parts list or in the notes shall include:

- **a.** The NEC fire resistance rating for all signal cable rated better than General Purpose. For plenum rated cable state "Plenum" or give listed rating (e.g. CMP, MPP, CATVP, OFNP, NFLP, and FPLP). For Riser cable state "Riser" or give listed rating (e.g. CMR, CATVR, OFNR, etc.). For General purpose cable, the listed rating should also be stated (e.g. CMG or CATV CM). Limited use rated cable (e.g. CMX) shall not be used for SPAWAR installations.
- **b.** The cable type (e.g., Twinax, Coax, Heliax, UTP, ScTP, Fiber Optic, etc.) along with further information needed to specify the exact type within the category (RG-59/U, CAT-6, multimode 62.5/125μ, etc.)
- **c.** For twisted pair cables for which the shielding type is not obvious like it is for ScTP or UTP, the general type of shielding should be indicated (e.g. Overall Shield, Individually shielded, Combination OAS and ISP).
- **d.** For twisted pair cables, the number of twisted pairs (6 PR, 25 PR, etc.)
- **e.** For copper cables, the nominal impedance in ohms.
- **f.** For 10/100/100BaseT LAN cable, the cable category (CAT 5, CAT 6, etc.)

3.9.5.2 Connector Descriptions

Connector descriptions should clearly indicate the gender of the connector. For example, the description "CONNECTOR, DB-25" is inadequate. CONNECTOR, DB25, CRIMP SHELL, MALE, WITH PINS" is adequate. When it is not obvious, the connector description or a tool listing should indicate the type of tool needed to make the connector. In the above example, the reader can tell that a crimping tool is needed instead of a soldering iron to complete the DB-25 connector. "CONNECTOR, RJ-45" is not an adequate description. CONNECTOR, JACK, RJ-45, 110-PUNCHDOWN, CAT-5E" is adequate. The description of all RJ-45 hardware should indicate the (TIA/EIA-568 series of standards) performance category (CAT 3, CAT 5, CAT 5e, or CAT 6).

3.9.5.3 National Stock Numbers

National Stock Numbers shall be provided on parts lists for all parts known to have National Stock Numbers.

3.9.6 Cable Block Diagram Organization

The preferred method of organizing an interior Cable Block Diagram is to show a flow from the equipment side on the left to the line side on the right with circuits exiting the building on the right. Equipment and computer jacks of patch panels should appear on the left of blocks representing patch panels. Line and modem jacks of patch panels should appear on the right of blocks representing patch panels. Separate diagrams may be used to show electrical power wiring connections. Whenever practical:

- **a.** Crossing lines shall be avoided.
- **b.** RED and BLACK portions of the cabling diagram shall be clearly indicated and kept separated.
- **c.** The structure of the IRD Cable Block Diagram shall be reused.
- **d.** Cable Block Diagrams that span several sheets should be arranged so that the sheets can be placed next to each other to create a single coherent diagram.
- **e.** Cable numbers shall appear in a consistent sequence with the lower numbers appearing more towards the top and left of the sheet.

3.9.7 Network and Logical Information on Cable Block Diagrams

When installing network equipment, networking information should be added to the Cable Block Diagram to show how logical interfaces are mapped to physical ones to the extent practical without causing the IDP to become classified. This is useful for any diagram of a network showing how different routers, hubs, switches, VPN devices, firewalls, and other network hardware interconnect. When this information is provided on a separate diagram, the structure of this diagram, sometimes referred to as a Logical Block Diagram, will be similar to the structure of a traditional Cable Block Diagram so that relationship between the two is clear. The purpose of this diagram is to convey additional information that normally does not appear on traditional system Cable Block Diagrams. The Logical Block Diagram should show the bandwidth (data rate) of connections, the connection type (e.g., FDDI, ATM, T1, HDSL), port IP addresses, routing protocols, and other information needed to describe how the network is connected logically.

3.9.8 Special Requirements for Outside Plant Cable.

A Cable Block Diagram for an outside plant cable installation is basically the same as a Cable Block Diagram for inside plant cable. It provides additional details that are unique to outside plant cable installations. It shall identify key manholes and poles used so that the path of the cable can be determined. The first and last manholes in a straight underground run should be identified. Manholes or poles where loops of extra cable are stored (to reduce the number of splice boxes needed in case the cable breaks) shall be identified. Splice box locations shall be identified. The Cable Block Diagram shall list all hardware to be purchased to support the cable installation that is not covered by other drawings such as the Miscellaneous Installation Details and Cable Routing Layouts.

3.9.9 Special Requirements for 10/100/1000BaseT Cables

Cabling diagrams should indicate the cable category and whether the cabling is shielded or not (e.g. Cat 5e UTP /Cat 6 ScTP). It shall also indicate which 10/100/1000BaseT cables are crossover cables.

3.9.10 Cable Labeling

The cabling diagram shall contain a cable number for each cable to be installed. Notes should require the cable numbers to appear on labels attached to each end of each cable except for cables shorter than one meter with the entire length in easy view. The cabling diagram shall refer to the labeling detail drawing that contains the information needed to complete the cable labels. See the "Labeling Details" section of this document.

3.9.11 Cable Number Categories

Each command/site may have a different schema for identifying cables. This schema should be followed so as not to confuse the site's cable numbering sequence. If no schema exists and the site has no preference or the installation plan is to establish a new command/site, use the cable type codes in SE000-00-EIM-110 (or CDROM N000240003) if one applies. If not, then try to find an appropriate type code from Table 4 or Table 5 followed by a numerical value to create a unique cable number. For example, audio cables could be covered by the existing designators for Unclassified Voice (UV) and Classified Voice (CV) cables. If none of the type codes in these documents are applicable, the designer may contact SPAWAR 4.2 and request that an additional type code be assigned for their application. SPAWAR 4.2 will approve the use of new cable type codes as required and will add the new codes to the next revision of the SIPH. This will enable this handbook to keep pace with advances in technology.

3.9.12 IRD Cable Numbers

The cable designators in Appendix B of the IRD standard are identical to the first 19 rows of cable designators in Table 4 of this handbook except that each code the IRD standard is preceded by "R-". The "R-"does not need to be used on IDPs because of the small amount of space available on most cable labels. The cable numbers on IRDs will normally need to be changed to prevent conflicts with established practice and conflicts with the cable numbers on other systems installed at the site.

Sample Cable Numbers Showing Type Code	Type of Signal and/or Power Carried
ACP001-ACP999	AC Power Cable and Wire Groups
HY0001-HY9999	Hybrid Power and Communications
DCP001-DCP999	DC Power Cable and Wire Groups
R_0001-R_9999	Radio Frequency Cables, Coax and Heliax (Does NOT include coax LAN or CCTV cables) See Table 6 to fill in the "_".
LD0001-LD9999	Unclassified LAN Drop (Copper not Fiber Optic) (10BaseT, 100BaseT Drops, AUI, Point-to-Point Thinnet, ATM over Cat 5, etc.)
LB0001-LB9999	Unclassified LAN Backbone (Copper NOT Fiber Optic) (Includes Hub-To-Hub Connections)
CLD001-CLD999	Classified LAN Drop (Copper NOT Fiber Optic)
CLB001-CLB999	Classified LAN Backbone (Copper NOT Fiber Optic) (Includes Gigabit Ethernet over Cat 5, 100BaseT Backbone, Coax Cable Backbones (10Base2 and 10Base5))
DD00001-DD99999	Unclassified Digital Communications (RS-530, RS-232, V.35, RS-449, RS-422, etc.)
CTR001-CTR999	Control Circuits
CD0000-CD9999	Classified Digital Communications (RS-530, RS-232, etc.)
TE0001-TE9999	Cables Connected to the Telephone System (Includes ISDN, Switched 56 Kilobit, T1, and POTS (Plain Old Telephone Service))
UV0001-UV9999	Unclassified Voice Cables Not Connected to Phone System (Includes hard-wired Dedicated Point-to-Point circuits)
CV0001-CV9999	Classified Voice Cables (Includes Cables to RED Phones)
TC0001-TC9999	Television Video Cables (CCTV) (Does NOT include Cables to TV Antennas) (See Table 7 for other television cable designators.)
FM0001-FM9999 CFM0001-CFM9999	Fiber Optic Multi-Mode Classified Fiber Optic Multi Mode
FS0001-FS9999 CFS0001-CFS9999	Fiber Optic Single-Mode Classified Fiber Optic Multi Mode
FH0001-FH9999 CFH0001-CFH9999	Fiber Optic Hybrid Classified Fiber Optic Hybrid
AS0001-AS9999 RGB0001-RGB9999 CRGB0001-CRGB9999	Alarm Sensor Cables RGB Video Cables Classified RGB Video Cables

Table 4 - Shore Cable Number Type Codes (From IRD Standard)

Sample Cable Numbers Showing Type Code	Type of Signal and/or Power Carried
EXT001-EXT999	Dedicated Copper Twisted Pair Proprietary Extenders for Short Range Signals
Reserved for Future Use	
Reserved for Future Use	
Reserved for Future Use	

Table 5 - Shore Cable Number Type Codes (New Technology)

SE000-00-EIM-110 Circuit Designation and Sample Cable Numbers Showing Type Code	Type of Signal Carried
R-RA RA001-RA999	Radio antenna (including frequency meter
R-RB RB001-RB999	Radio entertainment receiving circuits
R-RC RC001-RC999	Radio channel selection
R-RD RD001-RD999	Radio direction finder circuits
R-RH RH001-RH999	Hicapcom
R-RN RN000-RN999	Radio navigation
R-RQ RQ001-RQ999	Combination radio receiver and transmitter
R-RR RR001-RR999	Radio receiving circuits including cables between units of a receiver set
R-RS RS001-RS999	Radio synchronization
R-RT RT001-RT999	Radio transmitter control (including cables between units of a transmitter set)
R-RX RX001-RX999	Radio facsimile

Table 6 - NAVSEA SE000-00-EIM-110 Radio Communications Cable Designators

SE000-00-EIM-110 Circuit Designation and Sample Cable Numbers Showing Type Code	Type of Signal Carried
R-KT KT0001-KT9999	Precision timing
R-TC TC0001-TC9999	Television, closed circuit (This is already covered in Table 4)
R-TM TM0001-TM9999	Television, monitoring
R-TV TV0001-TV9999	Television, entertainment

Table 7 - NAVSEA SE000-00-EIM-110 Television and Timing Cable Designators

3.9.13 Cable Number Prefixes and Suffixes

The use of cable number prefixes or suffixes is optional. When they are used, they must appear on the Cable Block Diagram, Cable Running Sheets, and on the cable labels. Prefixes shall appear before the cable number and can only be used to identify the system (e.g., ADNS, GCCS, 1NET) to which the cable belongs or the signal type carried (e.g., AMX control). They shall be limited to a maximum of 8 characters. However, they will typically be 3 or 4 characters. Prefixes shall be chosen from the standard set of prefixes provided in Table 8 whenever a standard prefix applies. Suffixes shall only be used to provide information about the construction of the cable. For example, the suffix “100PR” could be used to show that a cable contains 100 copper pairs and the suffix “24S/24M” could be used to indicate that a hybrid fiber optic cable contains 24 single mode strands and 24 multimode strands. The meanings of all of the prefixes and suffixes used shall be explained on the Labeling Details.

PREFIX CODE	PREFIX CODE DEFINITION
ADNS	Automated Digital Network System
AMX	AMX Control System
ATC	Automatic Tech Control
ATFP	Anti-Terrorism Force Protection
CDS	Clock Distribution System
CENTRIXS	Combined Enterprise Information Exchange System
COI	Community of Interest - P/O Public Safety Network
CUDIXS	Common User Digital Information Exchange System
DATMS	DISN Asynchronous Transfer Mode Services
DMS	Defense Message System
DREN	Defense Research and Engineering Network
DRSN	Defense Red Switched Network
EHF	EHF STATCOM (Extra High Frequency Satellite Communications)
GCCS-J	Global Command and Control System - Joint
GCCS-M	Global Command and Control System - Maritime
GPS	Global Positioning System
HITS	Hawaii Information Transfer System
IDNX	Integrated Data Network Exchange
JWICS	Joint Worldwide Intelligence Communication System
MARSAT	INMARSAT
NMCI	Navy Marine Corps Internet (Typically not installed by SPAWAR)
ONENET (or 1NET)	OCONUS Navy Enterprise Network
OTAM	HF Off-The-Air Monitor
OTICIXS	Officer In Tactical Command Information Transmission System
PSNET	Public Safety Network
SHF	SHF SATCOM (Super High Frequency Satellite Communications)
SRCS	HF Shore Remote Control System
SSIXS	Special Intelligence Submarine Satellite Information Exchange Subsystem
TADIXS	Tactical Data Information Exchange System
VDS	Visualization and Display Systems
VTC	Video Teleconferencing

Table 8 - Standard Cable Number Prefixes

3.10 Cable Running Sheets (Drawing Category Code 080, Attachment 11)

Cable Running Sheets list end-point connections, wire color, and signal names for all conductors in an installed cable. Cable Running Sheets are used to tell installers how each cable should be terminated and shall be provided in accordance with the format shown in Attachment 11. The end connections and parts required to run the cables are shown in the Cable Block Diagrams. Because this data is usually in tabulated form, Cable Running Sheets may be developed using word processing software such as Microsoft Word, unless there is an IRD for the system being installed. IRD cable running sheets are always in AutoCAD drawing format. When an IRD exists for a system being installed, the IRD cable running sheets shall be modified to create an AutoCAD version of the IDP cable running sheets. Cable Running Sheets are not required for every standard Ethernet LAN cable as long as the cable type and wiring are covered by the Circuit Diagrams and Cable Block Diagrams and there is a single cable running sheet that can be applied to multiple cables. The same principle applies to other cables with identical wiring. Cable Running Sheets shall contain the information required by Section 3.3.10 of the IRD Standard supplied as enclosure (3) of SPAWARINST 4720.5.

3.11 Cross Connect Records (Drawing Category Code 090, Attachment 12)

Cross-Connect Records, Drawing Category Code 090, are used to install and manage the wires used to connect the terminals on the cross-connect side of the terminal blocks installed in the distribution frames. They are required to be included in an IDP whenever an installation will connect cables to a new distribution frame. They are also required whenever an installation will require the installation of cables to a new terminal block on an existing distribution frame. They may also be provided in other cases where cross-connects are being installed or removed. In these situations where no new terminal blocks are being installed, site personnel should be able to use the information on the As-Built drawings to update their Cross-Connect Records. Because this data is usually in tabulated form, Cross-Connect Records may be developed using word processing software such as Microsoft Word or database software such as Microsoft Access.

3.12 Distribution Frame/Junction Box Layouts (Drawing Category Code 100, Attachment 13)

Distribution frame layouts show installers where terminal blocks are located within a distribution frame. Terminal blocks are normally shown to reveal how individual cables are terminated on one side of the terminal block. The other side is normally used for cross-connects. The drawing should identify the type of terminals used (for example, wire wrap). Junction box layouts show where terminal blocks are located within a junction box. If distribution frames, junction boxes or terminal blocks will be added as part of an installation, the parts required for this installation will be listed in either the Miscellaneous Installation Details drawing or the Mechanical Assembly and Mounting Details Drawing.

Attachment 13 shows an example of a distribution frame layout for a single-sided distribution frame. The distribution frame layout shall identify the specific Distribution Frame represented. An example of this identification is a Main Distribution Frame. A number followed by a letter identifies the terminal blocks in a single-sided distribution frame. The number identifies the vertical column position and the letter identifies the horizontal row position. The letter “A” is supposed to identify the lowest horizontal row position. The reason for this is that the lowest row of terminal blocks is normally near the floor and the only way to increase the number of rows is to

add additional rows above the top row of terminal blocks. If the top row is already called the "A" row, adding more rows above it will mean the lettering scheme of the rows will become out of sequence. When the distribution frame is laid out, the designers should keep the possibility of future expansion in mind when assigning numbers and letters to the columns and rows that make up the distribution frame. However, once the labeling scheme of the distribution frame has been established at an existing site, the designer should make the design consistent with the existing scheme to prevent confusion at the site. In a double-sided frame the letters "F" (for Front of frame) and "B" (for Back of frame) shall precede the alphanumeric designation of the terminal block. The Design Engineer shall specify on the layout drawing whether the drawing represents a view of the front or back of the distribution frame. The front of the distribution frame shall be identified on the floor plan.

3.12.1 Junction Box Layout

A junction box is a type of distribution frame. It serves only as a tie point for cables within a room. Normally, within the junction box, short individual cables from different pieces of equipment (or even one piece of equipment) are terminated on one side of a terminal block. A larger multiconductor cable is terminated on the other side of the terminal block and extended to a distribution frame where the equipment can be cross-connected to other equipment. Cross-connect sheets for junction box wiring may be required. This installation method can be used to reduce the volume of cable in ducts and in cable trays and to reduce the number of cables that need to be installed at the site. The short cables from the equipment to the junction box are often located within the same cabinet. The terminal blocks in a junction box should be identified with two letters, the first representing the vertical row and the second representing the horizontal row.

3.12.2 Distribution Frame and Junction Box Layout Data

All layouts should contain the following information, when it is available:

- **a.** The number of terminal blocks/spaces in each vertical and horizontal row.
- **b.** The location of the distribution frame/junction box, such as the room, the row, and the bay number.
- **c.** The size of the terminal blocks, such as 5 x 26, 7 x 26, 10 x 26.
- **d.** A title, in parenthesis, for each terminal block.
- **e.** A legend to distinguish between new and existing terminal blocks, and blank spaces where future terminal blocks could be installed.

3.12.3 Terminal Block Layouts

Sheet 2 of Attachment 13 shows a Terminal Block Layout drawing. Normally, the inner two columns of terminals are permanently wired to a ground bus and these columns are used to terminate the shields of cables. Heavy lines (polylines, traces) are used to separate the wiring for different cables. The cable number and distant-end termination point is listed for each cable.

3.13 Circuit Diagrams (Drawing Category Code 110, Attachment 14)

The degree of detail provided in the circuit diagrams shall be sufficient to render these drawings useful for training and general maintenance. Placing color-code, pairing, and unused wire information on the circuit diagram is not mandatory if the IDP is not based on an IRD that contains circuit diagrams with this information. However, it is very strongly encouraged. This information is contained in Cable Running Sheets so it can still be found if it does not appear on the circuit

diagrams. However, placing this information on circuit diagrams is encouraged because it can be very helpful during troubleshooting. The following information is required on circuit diagrams:

- **a.** The cable number for all cables.
- **b.** The jack number of the equipment connector attached to a cable.
- **c.** The identity of each piece of equipment that is attached to a connector (e.g., RED MCPP #3).
- **d.** Any relevant information provided on an IRD circuit diagram for the system being installed
- **e.** Row and bay numbers of bays (cabinets or racks) housing the equipment
- **f.** If the circuit transitions through different rooms or buildings, dashed lines shall be used to identify in which rooms or buildings the parts of the circuit are located
- **g.** RED (classified) and BLACK (unclassified) areas of the diagram. If several areas of classification are involved (e.g. (SECRET, TOP SECRET, etc.)) each separate area should be clearly identified.

3.13.1 Tailoring of IRD Circuit Diagrams

IRD circuit diagrams are designed to handle a wide variety of potential site conditions. If an IRD is available for the system being installed, the IDP developer shall use the information in the IRD and site survey information to create the IDP. Relevant information on the IRD (e.g. colors of wires and pair arrows and numbers) shall not be removed when the IDP circuit diagram is created. Cable number information will be entered for the site.

3.13.2 Treatment of Wires

Every wire in the cable carrying a signal must be shown as a separate line unless the cable has more than sixteen pairs and is shared by other systems besides the one being installed or the cable has more than six unused pairs. Otherwise, one line shall not be used to indicate two or more wires. The function of every wire (for example, SEND DATA (+)) carrying a signal or signal ground should be clearly indicated. Arrows shall be used to indicate the direction of signal flow. Pins and terminals used to terminate all wire ends shall be identified. (Show pin numbers.)

3.13.3 Terminal Identification

The circuit diagram should also indicate the identification number and type (e.g. 110 punch, 66 punch, solder wrap, wire wrap) of terminals (wire termination points) used to terminate cables and cross-connect wires on terminal blocks. When fiber-optic cable is used, the type of fiber-optic strand should be specified. For example, 62.5/125 micron multi-mode is a common type of fiber strand. This will allow station personnel to choose the correct equipment for troubleshooting the circuit. Otherwise, fiber-optic cables shall be depicted in the same manner as copper cables.

3.13.4 Power Circuits

Power circuit diagrams are usually not required because power wiring is be covered by the Cable Block Diagrams that show individual wires.

3.13.5 10/100/1000BaseT Circuit Diagrams

Only one circuit diagram with detailed wiring is required for each type of 10/100/1000 BaseT horizontal wiring scheme used. Horizontal cable wiring shall be in accordance with TIA/EIA-568.B.1 Section 6.2.1 (Same as TIA/EIA-568.B.2 Section 4.5.) (Method T568A is preferred see SIPH appendix AC for more information.). Pre-manufactured (purchased not made by the installing

activity) Cat 5/5e/6 jumpers and patchcords do not require circuit diagrams as long as the type of patchcord or jumper (crossover or straight-through) is shown on the Cable Block Diagram. If Power over Ethernet is used, a circuit diagram showing the pins supplying power shall be provided. Circuit diagrams shall clearly indicate the type of shielding for twisted pair cable (individually shielded, overall, or combination). Circuit diagrams shall indicate the direction and type of all signals in use.

3.13.6 Circuit Diagrams for Other Sets of Cables Wired Identically

Only one circuit diagram is required for each type of repetitive wiring scheme used as long as the diagram clearly shows which cables use each standard scheme.

3.14 Labeling Details (Drawing Category Code 120; Attachment 15)

Labeling details shall be provided for equipment, cables, patch panels, power panels, equipment racks or cabinets, distribution frames, junction boxes, warning signs, manholes, handholes, utility poles, LAN drop outlet covers, major ground bars and telecommunications grounding and bonding conductors (See J-STD-607A). **The use of handwritten labels for permanent labeling is prohibited** by TIA/EIA-606A, Sections 10.2 and A.4. (TIA/EIA-606A does not apply to Power Panels but does apply to most of what SPAWAR installs.) Labeling of panelboards (electrical power panels) is required by article 408.4 of the NEC and labeling of all electrical disconnecting means is required by article 110.22 of the NEC. Article 408.4 states “Every circuit and circuit modification shall be legibly identified as to its clear, evident, and specific purpose or use. The identification shall include sufficient detail to allow each circuit to be distinguished from all others.”

3.14.1 Consistency and Coordination

The labeling scheme contained in the Labeling Details should be as consistent as is practical. Identifiers used on labels need to be consistent with the identifiers used in the IDP and the identifiers used on other labels. For example, if the labels beneath the AN/FCC-100s read “LSTDM #1, LSTDM #2,” then the cable labels should read “LSTDM” instead of “FCC-100.” When a large plastic label beneath the PairGain DSU reads “PairGain #1,” then the cable label should read “PairGain #1”, not “DSU #1.” If the word “PairGain” will not fit on the cable label, then the developer of the IDP should consider labeling the PairGain DSUs as DSU #1, DSU #2, etc. The labeling scheme in the IDP also should be coordinated with the existing scheme at the site at the scheme being used by other ongoing installations. Of course, if the site is using ten different labeling schemes, keeping everything coordinated will be impossible. In some cases, it may be worthwhile to redo the labels for an existing installation to achieve consistency.

3.14.2 Engineering Considerations

All labels and label attaching techniques shall be designed to last for the life of the installation. The size, color, and contrast of all labels should be selected to ensure that the identifiers are easily read. Labels should be visible during the installation of and normal maintenance of the infrastructure. Labels should be resistant to the environmental conditions at the point of installation (such as moisture, heat, or ultraviolet light), and should have a design life equal to or greater than that of the labeled component.

3.14.3 Parts List

Labeling detail drawings shall have an integrated parts list that appears on the first sheet and lists all materials that form part of the labels used in the installation or are required to attach or protect the labels. The parts list shall also list any consumable items (e.g., ink cartridges) needed to make the labels.

3.14.4 Cabinet Labeling

The upper front of cabinets and equipment racks shall be labeled with an identifier unique to the rack using bold lettering no smaller than 12 millimeters high. These labels typically should show the row and bay number, but must be labeled to follow the convention established at the installation site. The identifier that appears on the rack shall be used at power panels to indicate the use of circuit breakers. Cabinets should ideally also have a separate label at the front indicating the power panel(s) and circuit breaker(s) supplying power to the cabinet. (Power strip labeling is discussed later.)

3.14.5 Cable Labeling

Cable labels shall contain three pieces of information. The first piece of information that must be provided is the cable number. This number must be in accordance with the requirements specified in Cable Block Diagrams. The second piece of information that must be provided is the termination point of the near end of the cable. This will be referred to as the “from” end. The third piece of information that must be provided is the termination point of the far end of the cable. This will be referred to as the “to” end. Typically, the termination point information will include the row number, bay number, equipment type, and jack number of the terminating equipment. Some cables are not typical; for example, cables to antennas almost never terminate in a row and bay. Non-typical cables should indicate termination points like a distribution frame (for example, Main Distribution Frame, TB-F1B) or an antenna number. Power cables will normally have one end terminated at a circuit breaker panel. When the far end of the cable is terminated in another room, the room number or name shall be included to prevent confusion. The row number shall be preceded by the letter “R”, the bay number by the letter “B”, and the jack number by the letter “J”. For example, a cable from Row 1/Bay 5/Patch Panel A/Jack 5 to Row 3/Bay 3/AN/FCC-100 #1/Jack 5 would use labels similar to ones shown in Figure 1.

DD00555 R1B5, PP-AJ5 to R3B3, FCC-100#1J5	**DD00555 R3B3, FCC-100#1J5 to R1B5, PP-AJ5**

Figure 1 - Cable Label Example

3.14.5.1 Cable Label Abbreviations

The following abbreviations shall be used when cables are labeled:

B	Bay
R	Row
PP	Patch Panel
J	Jack
ANT	Antenna
MDF	Main Distribution Frame
IDF	Intermediate Distribution Frame (If not in a Row/Bay)
JB	Junction Box
E	Equipment Jack on Patch Panel
L	Line Jack on Patch Panel
C	Computer Jack on Patch Panel
M	Modem Jack on Patch Panel
RM	Room (only if required to prevent confusion)

3.14.5.2 Cable Number Prefixes and Suffixes on Labels

The use of cable number prefixes or suffixes is optional on cable labels. When they are used, they must appear on the labeling details, cable running sheets, and on the Cable Block Diagrams. See Section 3.9.13 for more information on these prefixes and suffixes. The meanings of all of the prefixes and suffixes used shall be explained on the labeling details. Cable Number Prefixes may appear on separate labels that are attached to the cable on the side of the main Cable Number Label that is farthest from the near end.

3.14.5.3 Outside Plant Cable Labeling

Outside plant cable shall be labeled at each end and at every manhole and hand hole using permanent, waterproof, ultraviolet light resistant methods. Cable labels and cable ties designed for indoor use only are prohibited.

3.14.5.4 Inside Plant Cable Labeling

Other than the exceptions provided at the end of this section, the cable labeling method must meet the following requirements:

- **a.** Labels must be attached to the cable so that they will remain in place unless deliberately moved.
- **b.** A person of average strength should be able to move the labels with a moderate effort so that they can be easily read both when the cables are connected and when the cables are disconnected.
- **c.** The ink must not smear or come off when rubbed by fingers or when the label is cleaned using a mild detergent.
- **d.** The ink must not bleed into the adhesive used in a self-laminating label.
- **e.** Each end of each horizontal LAN cable labeled shall be labeled within 300 mm (12 in) of the end of the cable jacket according to TIA/EIA-606-A Section 5.1.2.

3.14.5.5 Permanent Label Preparation

Installations should be planned so that the installation crew can arrive on-site with pre-prepared labels. Installation crews must be provided with the means necessary to prepare additional labels as required because of human errors and other factors. Normally, this will include spare sheets of labels, a computer with a template, and a label printing device. The Project Engineer is responsible for ensuring that at least one member of the installation crew has the training required to prepare the labels.

3.14.5.6 Temporary Labels

Temporary Labels should be used when cables are first pulled in and on other occasions where temporary labels are useful. Permanent labels shall replace all temporary labels prior to installation completion.

3.14.6 Equipment Labeling

All newly installed equipment will be labeled (for example, KG-84A #99). The labeling method shall be specified in the labeling details. In addition, equipment that appears or could appear in the future more than once should be assigned an equipment number, starting with #1 and continuing consecutively (for example, KIV-7 #1, KIV-7#2) or a functional description and number (CISCO 2924 INNER VPN SWITCH #1, CISCO 2924 OUTER VPN SWITCH #1 to distinguish between basically identical pieces of equipment. When more than one bay of identical equipment is installed and there is a possibility that additional identical equipment could be inserted in these bays, the equipment number shall be assigned by equipment name or nomenclature and a number that corresponds to the equipment bay number followed by a letter. (For example, RF PATCH PANEL #1A, RF PATCH PANEL #1B.) By using this method, the number of patch panels in a cabinet can be increased without needing to renumber identical patch panels in the next cabinet. This is a repeat of guidance provided in Section 3.5.10. Each installation activity should develop a standard method of equipment labeling or labeling guidelines to improve the consistency and quality of equipment labeling from project to project and from site to site. Having standard parts, drawings, and guidance should also reduce the cost of future installations.

3.14.6.1 Existing Facilities

When equipment is installed at existing facilities, every reasonable attempt shall be made to match the predominant existing equipment labeling scheme as long as there is a predominant coherent scheme. The existing predominant labeling methods should also be followed if those methods meet requirements and present a professional appearance.

3.14.6.2 New Facilities

New facilities shall use labels with an adhesive backing (or double-sided tape) to label equipment. In most circumstances, it is preferable that labels be placed on blank panels located below the equipment. Labels that identify equipment that process classified data (RED Equipment) should have a red surface with white lettering. Labels that identify equipment that do not process classified data (BLACK Equipment) should have a black surface with white lettering.

3.14.7 Patch Panel Labeling

Patch panels are normally labeled using small cardboard strips or photo-etched aluminum. Labeling detail drawings specify the type and size of labels to be used for an installation. See Attachment 15

for an example. If network terminations are color coded, the color coding scheme shown in Table 2 and Figure 2 of TIA/EIA-606-A shall be used. (e.g., Terminations to LAN drops shall have blue labels.) Position A and B labeling of 568SC and other fiber optic duplex connectors is required by TIA/EIA-568-B.3, Section 5.2.4.

3.14.8 Power Strip Labeling

Section 5.11.7 of TIA-942 requires in Section 5.11.7.7 that "Power strips shall be labeled with the PDU/panel identifier and circuit breaker number." If there is only one power strip in a cabinet, a label placed at the top of the back of the cabinet will suffice as long as it is clearly visible when the power strip is in view.

3.14.9 Firestop Location Labeling

Firestop location labeling shall follow the guidance in TIA/EIA-606-A (See Section 6.2.5 and Figure 6.) to produce a label similar to the one in Figure 2.

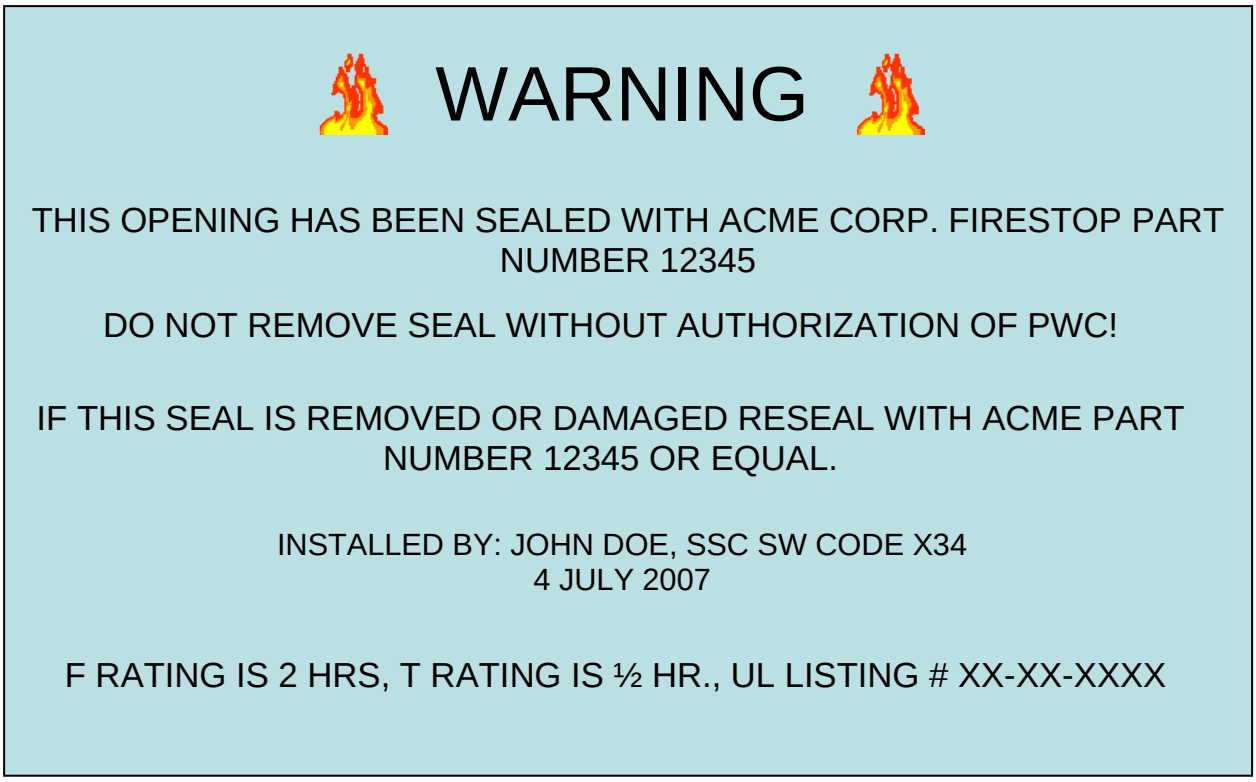


Figure 2 - Firestop Location Label Example

3.15 Patch Panel Layouts (Drawing Category Code 130, Attachment 16)

Patch panel layouts will be provided for all installations that require a connection to a patch panel. The layouts should indicate the patch panel either by military nomenclature or by manufacturer and part number. The layouts should also indicate the name used to refer to the patch panel on the rest of the drawing package and labels; for example, RED MULTICIRCUIT PATCH PANEL # 1. The short form of the name should also be provided (RED MCP #1). This will enable installers to relate

information provided on the patch panel layout and on cable labels to information provided in the rest of the IDP. When the designer is developing digital data patch panel layouts, he or she should plan to use a number of patch panel jacks for breakout box and loop back purposes. The labeling of jack rows and columns on the patch panel layout should be the same as the labeling of the patch panel. Patch panel layouts should also indicate the circuit designations of active and on-call circuits that pass through the panel. If a site uses patch panels, the Site Master Index shall include the most recent set of patch panel layouts. Patch panel layouts shall not have Parts Lists. Labeling parts are listed in the Labeling Details drawings, and patch panel chassis and modules are listed in the System Elevations and referenced in the Cable Block Diagrams.

3.16 Power Distribution Drawings (Drawing Category Code 140, Attachment 17)

These drawings will show the layouts of the power panels used by the project. They also contain information about the power panels. A power distribution drawing is necessary for any installation that connects cables or wires to a circuit breaker or fuse panel. If Master As-Builts exist for any system using that power panel, the power distribution drawings in those drawings may be used as a basis to begin the installation power distribution drawings. If an IRD exists, the content of any Power Distribution Diagram in the IRD needs to be carefully examined before being moved to an IDP drawing. The reason for this is that IRD power distribution diagrams are load balanced assuming that a new dedicated power panel will be installed for the system covered by the IRD, that the panel will not be shared with other systems, and that the cabinet configurations will remain as shown in the IRD. However, installations usually use existing power panels with existing systems already connected to them. **The IDP developer must be familiar with the guidance provided in SIPH Appendix AC, Section 3,** and shall ensure that a proper load distribution is used, that wires have adequate ampacity, and that voltage drop requirements are met. Because every site is different, determination of the proper wire sizes needs to be done for every site. If there is an IRD, the IRD should make this task easier (by eliminating some of the math) if the cabinet hardware configurations used in the IDP and IRD are the same.

3.16.1 AC Power Distribution

AC power distribution drawings show power panel details and cabinet breaker assignments. They identify the frequency of the power supplied and the voltages available at the power panel. They identify the equipment that is powered by each circuit breaker, the type and size of the wires connected to the breaker, and the amount of electrical current drawn. For two or three phase AC power distribution, the IDP developer should know the existing current draw on each phase and pick breaker positions that will minimize the amount of phase imbalance.

3.16.2 DC Power Distribution

Telecommunications equipment is often designed to use DC power. DC power distribution drawings shall list all of the fuses and circuit breakers on the DC power panels and otherwise provide the same kind of information (except phase information) provided on the AC power distribution drawings. In addition, these drawings can describe the wiring connections to converters (rectifiers) and/or batteries.

3.16.3 Parts Lists

Power Distribution Diagrams do not have parts lists. In most cases, the parts and material necessary to install AC or DC power, are listed in the Cable Block Diagram parts list (typically

wire, circuit breakers, and receptacles) and the Cable Routing Layouts parts list (conduit and associated fittings)**.** In cases where new power panels are required, some of the parts required to supply electrical power may be included in either the Miscellaneous Installation Details or (more often) the Mechanical Assembly and Mounting Details.

3.17 Cable Routing Layouts (Drawing Category Code 160, Attachments 18A & 18B)

These drawings shall identify the locations and types of cable trays, ducts, conduits, and other fixed hardware used to route and protect cables and wires inside of buildings. They should be provided for most installations. This document uses the word "cableway" to cover a wide range of cable pathways from cable hooks to steel conduit. The cableway layout should contain helpful notes indicating whether the cableways are full or whether any cableways are in a plenum. Cableways that are installed as part of a new installation shall be sized to accommodate future expansion whenever future expansion is expected or anticipated by the PE or the site's head maintenance personnel. Existing cable pathways that are at or beyond their allowable capacity shall not be used – a new pathway shall be installed instead. Upon completion of the installation, the As-Built drawing final draft will remove the legend items used to distinguish between the new installation and the existing items, find number indications, and parts lists. The resulting drawing will become the new Cable Routing Layouts drawing for the Site Master Index.

3.17.1 SPAWAR Policy

All SPAWAR installations shall provide a suitable means for supporting cables. Cables shall not be laid directly on ceiling tiles or rails (TIA-569B Section 8.4.1.2 violation) or attached to other systems (electrical conduit (NEC violation), water pipes, sprinklers, etc.) as a means of support. **SPAWAR policy is that cables shall not be laid directly on floors** including floors beneath computer decking or raised access floors. Cables shall not be stapled to walls or hung out of windows. Cable trays, duct, conduit, or cable ladders or other suitable means shall be used. This is to lessen the chance that cables will be damaged and to provide a method of physical management for major runs as required by Section 8.5.4.3 of TIA-569-B. TIA-942 Section 7.5.2 requires that "telecommunications cabling under the access floor shall be in ventilated cable trays that do not block air flow." If non-ventilated trays or ducts are used, the placement of pathways must be designed to avoid blocking the flow of cool air to the front of cabinets. If the existing situation at a site is such that installing cable trays or another suitable means of cable management under the floor at the site is not practical (because of the quantity of existing cables on the floor or other reasons), the installation of overhead trays and/or conduits shall be considered.

3.17.2 Required Information for New Installations

If new conduit or other raceway is needed, the Cable Routing Layouts (Drawing Category Code 160) in the IDP drawings shall show their location and shall also include details or notes stating how the raceway will be supported when appropriate. (Details or notes stating how the raceway will be supported are not needed for self-adhesive surface raceway, but the description of the raceway in the parts list must state that it is self-adhesive.) The drawings shall indicate the locations of all fittings and other parts used to form and support the pathway and include all of these items in the parts list. (The NEC requirements in the area of support are legal minimums. The Project Engineer shall specify stricter support requirements if needed.) The drawings shall include elevation drawings for any vertical pathways.

3.17.3 Indoor Cable Route Planning Considerations

Cable pathways must be large enough to safely accommodate the quantity of cables being installed and shall include a reasonable allowance for future growth when future growth is anticipated. The cable pathways shall also provide an appropriate degree of protection for the cables to be installed inside the pathway. Engineers designing cable pathways need to be thoroughly familiar with the various standards that apply to the type of pathway being installed. The following paragraphs touch on some of the more important requirements in these standards. It is not a complete list of all requirements. IDP developers are responsible for researching the standards as required to ensure that their installations comply.

3.17.3.1 Firestopping

Firestop locations required by the NEC, building codes, TIA standards, etc. shall be indicated on the IDP Cable Routing Layouts to fulfill the requirement of TIA/EIA-606-A Section 6.2.5. These drawings shall include:

- **a.** Firestopping location identifier.
- **b.** Location of the firestopping installation shown on a floor plan with a leader going from the firestop identifier to the location of the penetration.
- **c.** Type and manufacturer for all firestopping parts and materials included on the parts list and called out in notes or by find numbers.
- **d.** Date of the firestopping installation (only required on As-Built drawings -- includes replacement dates for firestops that had to be removed and replaced as a result of the installation.)
- **e.** Name of the installer of firestopping (only required on As-Built drawings).

3.17.3.2 National Electrical Code Requirements

NEC Chapter 9 Table 1 shows the maximum “Percent of Cross Section of Conduit and Tubing for Conductors.” Electrical wiring is not allowed to exceed these minimums except that conduit or tubing nipples twenty-four inches or less in length can have a conduit fill of up to 60 per cent per note 4 of the Notes to Tables in this chapter. The NEC provides additional tables in Annex C that make it simple to determine the maximum number of wires that different sizes of conduit can accommodate. These tables can be used to determine the minimum size of conduit needed. (According to an exception in Article 800.110 of the 2005 NEC, Conduit fill restrictions do not apply to raceways for Communications Wires and Cables.) The NEC also provides minimum standards for the support of conduit and other raceway. These requirements must be reflected in the drawings and not assumed to be known by installers. Article 800.133(A) of the NEC is very important and governs the separation of Communications Circuits from other conductors. IDP developers also need to be aware that the NEC no longer permits the use of liquidtight flexible metal conduit (LFMC) within “other spaces used for environmental air" like the typical pressurized space beneath computer decks. Electrical outlets for SPAWAR C4ISR equipment shall not be installed below raised floors or above ceilings when these spaces are used for environmental air handling (are pressurized). See SIPH Appendix AC’s discussion of the NEC and the NEC itself for additional information.

3.17.3.3 TIA-569-B Requirements

TIA-569-B is the “Commercial Building Standard for Telecommunications Pathways and Spaces”. When planning new cable trays, you should size the trays so that at least ½ of the tray is left unused

at the completion of your installation. Section 8.6.1.1 of TIA-569-B states that "Cable trays shall be designed to accommodate a maximum calculated fill ratio of 50% to a maximum of 150 mm (6 in) inside depth. For planning cable tray pathways, the maximum pathway fill should be 25%". The standard goes on to explain that a calculated fill ratio of 50% essentially fills the tray due air space between the randomly placed cables. An example for determining the minimum cable tray width is provided in Section 8.6.1.1. Section 8.8.2.1 states that "No section of conduit shall be longer than 30 m (100 ft) between pull points." Section 8.8.2.2 states that "No section of conduit shall contain more than two 90-degree bends, or equivalent … between pull points (e.g. outlet boxes, telecommunications rooms, pull boxes)." TIA-569-B, Section 8.8.1 limits flex metal conduit runs to 20 feet. TIA-569-B also addresses conduit bend radii and conduit sizing. See SIPH Appendix AC's discussion of this standard and the standard itself for additional information.

3.17.3.4 RED/BLACK Separation Requirements

NSTISSAM TEMPEST/2-95 with 2-95A states in each of their recommendations that RED and BLACK wire lines should not use a common distribution vehicle. SPAWAR policy is that RED and BLACK copper cable distribution vehicles (conduits, trays, and ducts) shall be separated to ensure that the separation distances recommended by the NSTISSAM document are met and to prevent the inadvertent connection of BLACK cables to RED equipment and electrical coupling between the cables. NSTISSAM TEMPEST/2-95 with 2-95A does allow RED and BLACK optical fiber lines to share a distribution vehicle under certain conditions, but this situation should be avoided when it is economically feasible. NSTISSAM TEMPEST/2-95 with 2-95A requires that the CTTA be consulted in the initial planning phases for facilities that will process classified information.

3.17.3.5 NEMA VE-2-2006

The National Electrical Manufacturers Association (NEMA) publishes guidelines that can be of great use to design engineers and installers. These documents are periodically updated. The latest documents can be obtained from the NEMA website at http://www.nema.org/stds/. VE-2-2006 contains very clear and easy to understand guidance for installing cable trays. (It could have been called "Cable Tray Installation for Beginners".) IDPs should ensure that the clearance guidance in this document is followed especially when cable trays (and ducts) are installed close to ceilings. It states in section 4 that "If possible, 300 mm (12 inches) minimum clearance should be left above or between installed systems to allow for cable installation and maintenance." VE-2-2006 also discusses details such as fastener torque and cable tray support locations. PEs whose projects require cable tray installations should download the most recent version of this document, incorporate its guidance into their IDPs, and use it to monitor the practices of their installers.

3.17.3.6 Use of Electroplated Galvanized Steel

The use of electroplated galvanized steel products in communications equipment rooms should be minimized. The use of electroplated galvanized access floor tiles has caused well documented problems with zinc whiskers growing (usually over several years) on the plated zinc surface. The whiskers can become airborne when disturbed and cause electrical shorts. This has not been a problem with hot dip galvanized products so far.

3.17.4 Outdoor Cable Route Design and Drawing Requirements

The design of new outside plant cable routes should be assigned to experience personnel with an in-depth knowledge of the field because of the expense involved. New pathways often cost over $100 per foot. New trenched pathways should be designed to prevent any need for the Navy to trench through the same area for the foreseeable future and should always provide for a spare or maintenance conduit. Cable Routing Layouts superimposed on site maps showing all manholes, handholes, utility poles, cable locations, conduit locations, innerduct runs, building entrance locations, building locations, riser locations (e.g. Pier risers), trenching locations and notes (encased or non-encased etc.) , distances between access points (manholes, handholes, buildings), and cable numbers. Leaders pointing to conduit or aerial runs shall be used to indicate which notes apply to the particular run. Attachment 18B shows part of an outdoor or Outside Plant (OSP) cable route design.

3.17.4.1 Manhole Layout Diagrams (Butterfly Drawings or Foldouts)

Installations involving the use of or the installation of manholes or handholes shall provide Manhole Layout Diagrams (also known as butterfly drawings or foldouts) for all manholes and handholes affected by the installation. Butterfly drawings shall identify vacant ducts, innerduct locations, and vacant innerducts. The cable route drawings shall reflect a design that complies with the requirements of the following standards. In general, new cable should be installed underground, especially in areas subject to violent wind storms. An example of this kind of diagram is provided in Attachment 18B.

3.17.4.2 ANSI/TIA-758-A-2004

ANSI/TIA-758-A-2004, "Customer-owned Outside Plant Telecommunications Infrastructure Standard" provides guidance for planning for outside plant cable pathways. The following TIA-758-A requirements and recommendations should be known by all PEs responsible for developing drawings for OSP installations involving new underground conduit installations.

- **a.** "The section length of conduit shall not exceed 183 m (600 ft) between pull points." (See Section 4.1.1.2.3.)
- **b.** "Where bends are required, manufactured bends should be used whenever possible." (See Section 4.1.1.2.4) These manufactured bends shall appear on the Parts List with a full description, manufacturer, and part number. (See also TIA-569-B, Section 8.8.2.2, for guidance on bends.)
- **c.** "There shall not be more than the equivalent of two (2) 90-degree bends, or equivalent between pull points (e.g. handholes, maintenance holes, and vaults). If there is a reverse bend in the section, a pull box shall be installed. Back-to-back 90-degree bends shall be avoided." (See Section 4.1.1.2.5.)
- **d.** "Underground conduit should be installed such that a slope exists at all points of the run to allow drainage and prevent the accumulation of water. A drain slope of no less than 10 mm per meter (.125 per foot) is desirable when extending conduit away from building structures. Where conduit extends between maintenance holes, a slope of 10 mm per meter (.125 per foot) should extend from the middle of the span to each maintenance hole." (See Section 4.1.1.2.6.)
- **e.** "Ducts shall be sealed to resist liquid and gas infiltration at all maintenance holes and building entrance point locations." (See Section 4.1.1.2.8.)

- **f.** "Nonmetallic conduits shall be encased in concrete of minimum 17225 kPa (2500 lb/in^2) compressive strength where vehicular traffic (i.e., automotive, railway) is above the pathway or where a bend or sweep is placed." (See Section 4.1.1.2.2.)
- **g.** "Where maintenance holes are installed in roadways, the lid shall support heavy vehicular traffic." (See Section 4.3.1.1.) Note: The NESC, discussed below, provides additional guidance in this area.
- **h.** "Maintenance holes shall be provided with corrosion resistant pulling irons and cable racks, that are grounded, and a sump for drainage. Telecommunications maintenance holes shall not be shared with electrical installations other than those needed for telecommunications equipment." (See Section 4.2.1.1.)
- **i.** "A handhole shall not be used in place of a maintenance hole or in a main conduit system. Handholes shall not be used for splicing cables together. Handholes shall have provisions for drainage … Telecommunications handholes shall not be shared with electrical installations other than those needed for telecommunications equipment." (See Section 4.2.2.1.)
- **j.** "A handhole shall not exceed 1.2 m (4 ft) in length by 1.2 m (4 ft) in width by 1.2 m (4 ft) depth and should not be used in runs of more than three 103 (4) trade size conduits." (See Section 4.2.2.3.)

3.17.4.3 NEMA VE-2-2006

NEMA Bulletin No. TCB-2-2000 contains very clear and easy to understand guidance for installing underground conduits and covers some of the finest installation details. PEs whose projects require underground conduit installation should download the most recent version of this document and incorporate appropriate portions of its guidance into their IDPs. It can also be used to monitor the installation practices of contractors. (Information is updated from SIPH Appendix AC, Section 2.)

3.17.4.4 National Electrical Safety Code

Those familiar with the National Electrical Code (NEC) but unfamiliar with the NESC can think of the NESC, for introductory purposes, as the outdoor version of the NEC. TIA-758-A, Section 4.1.1.1, states "In the absence of applicable codes, follow the most current version of the NESC". The abstract of the 2007 edition of the NESC states that "This standard covers basic provisions for safeguarding of persons from hazards arising from the installation, operation, or maintenance of (1) conductors and equipment in electric supply stations, and (2) overhead and underground supply and communication lines."

3.17.4.5 Aerial Cable Installation

Part 2 of the NESC contains "Safety Rules for the Installation and Maintenance of Overhead Electric Supply and Communications Lines". Section 23 (part of part 2) addresses clearances. Those planning to install aerial cable need to review this document, identify areas where there could be potential for clearance violations, and include in the IDP specific plans (drawings with dimensions) and instructions (in the notes) for avoiding these potential violations. This does not change the fact that aerial cable installation is not recommended for most outside plant cable installations.

3.17.4.6 Underground Cable Installation

Part 3 of the NESC contains "Safety Rules for the Installation and Maintenance of Underground Electric Supply and Communication Lines". Rule 32 addresses "Underground conduit systems". Rule 323 contains detailed requirements for manholes, handholes, and vaults. Rule 34 addresses "Cable in underground structures", and Rule 35 addresses direct buried cable.

3.17.4.7 Riser Requirements

Risers subject to hazards should be galvanized steel or sun-resistant schedule 80 PVC. This includes all risers between a foot below ground level and eight feet above ground level.

3.17.4.8 Trenching Requirements

Notes and details on cable routing layouts requiring trenching shall address the restoration of roadways, parking lots, grass, and other surfaces disturbed by trenching. Details shall also address soil compaction and details for concrete encasement when encasement is required. The drawing shall also provide notes to ensure that trenches are shored and covered as required by EM 385-1-1 to ensure safety. Details showing trench depth(s) and conduit arrangements shall be included.

3.17.5 Parts Lists

When new cableways are to be installed, a complete list of the parts required to assemble the new cableway shall be provided on the Cable Routing Layout drawing. Sufficient drawing callouts shall be provided on the drawing to enable installers to check the list of parts against the drawing. The method used to attach the cableway to walls, floors and ceilings shall be clearly specified and the mounting parts (for example, wall anchors, straps, clamps) shall be included on the parts list. When appropriate, grounding details shall be provided and the parts required for the grounding listed. Parts list for new underground outside plant conduit cable pathways shall include items such as conduit, conduit fittings, sealing devices, manholes, handholes, etc. Parts lists for aerial cable pathways shall include pole mounting hardware, messenger wire (if not part of the cable), utility poles (it needed), etc.

3.17.6 Fabrication

When a new cableway is to be fabricated in accordance with designs developed by the IA, the cableway layout should reference the drawings that define the fabricated parts and these drawings must be provided as part of the IDP in the Miscellaneous Details Section.

3.17.7 Identification

When a new cableway is to be installed or old cableway removed as part of an installation affecting an existing cable pathway, a legend shall be used to indicate what already exists, what is to be installed and what is to be removed.

3.18 Mechanical Assembly and Mounting Details (Drawing Category Code 171, Attachment 19)

Mechanical Assembly and Mounting Details shall be provided when required to accomplish the installation. Mechanical assembly and mounting details show how cabinets, slides, shelves, panels, support brackets, and various types of equipment are assembled or modified, subsequently mounted, and aligned. For example, antenna mounting and alignment details contain instructions for items such as the fabrication and assembly of mounting brackets, marking of alignment points,

azimuth and elevations for directional antennas, alignment procedures, and other miscellaneous details related to the mounting, and alignment of antennas. Mechanical assembly and mounting details drawing will include a parts list. The Mechanical Assembly and Mounting Detail drawing should generally follow the illustration shown in Attachment 19.

Note: Before the SPAWAR IRD Standard was published, the drawing category code for Mechanical Assembly and mounting details was 170. The IRD standard assigned drawing category code 170 to Outline and Installation Drawings, so the drawing category code for Mechanical Assembly and Mounting Detail Drawings has been changed to 171.

3.19 Miscellaneous Installation Details (Drawing Category Code 180, Attachment 20)

Miscellaneous Installation Details shall be provided when required to accomplish the installation. They explain details such as how cabinets and equipment will be grounded, how foundations will be made, and any other details needed to ensure a quality installation is performed. Miscellaneous installation detail drawings shall include a parts list.

3.19.1 Installing Activity Detail Standardization

Installing activities should develop standard details that can be used over and over to improve the efficiency, quality, and consistency of their operations.

3.19.2 Required Miscellaneous Installation Details

Installations that install new cabinets or equipment shall include a miscellaneous detail drawing showing how the cabinet or equipment to be installed will be grounded. Installations that require the fabrication of special enclosures, panels, assemblies, and adapters shall include a miscellaneous detail drawing detailing the parts and methods needed to create the fabricated items. Miscellaneous Detail drawings provided in an IRD for the system being installed shall be used to form the basis of the Miscellaneous Details drawings in the IDP. Details should also be provided for connector assembly and grounding. Miscellaneous Installation Detail drawings shall provide a parts list listing all parts and materials shown or required to complete the details depicted.

3.19.3 Engineering Considerations for Grounding Details

Those responsible for developing grounding detail designs for military communications and electronics facilities, need to have a good understanding of the parts of the National Electrical Code that pertain to grounding, the basic theory of grounding contained in Volume 1 of MIL-HDBK-419A, the practical guidance for grounding in Volume 2 of MIL-HDBK-419A, and the requirements of MIL-STD-188-114B. Those responsible for designing grounding details for Administrative Buildings, barracks, dining facilities, warehouse and non communications facilities also need to be familiar with J-STD-607A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications. It applies at sites where MIL-STD-188-124B does not apply. Those designing grounding details for lightning protection systems (and antennas) need to be familiar with the requirements in NFPA 780. Designers should also be aware of the grounding requirements in TIA-942 G.5.1.6 through G.5.1.8 but should be aware that at US Navy data centers MIL-STD-188-124 is the governing standard.

3.19.3.1 Cabinet Grounding Details for Communications and Electronics (CE) Facilities

Designers need to thoroughly review Section 4.4 of SIPH Appendix AC and the referenced sections of the MIL-HDBK before developing cabinet grounding details in order to ensure that the

developed detail meets all the requirements of MIL-STD-188-124B as much as is reasonably possible and that all deviations from the standard are justified and used to develop a STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL for the MIL-STD. Cabinet grounding details should include details for the installation of a cabinet ground bus, the cabinet penetration and connections to the equipotential ground plane.

3.19.3.2 Cabinet and Equipment Grounding Details for Non-CE Facilities

J-STD-607A, *Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications* is used at sites where MIL-STD-188-124B does not apply. Grounding details for installations at these sites only need to meet J-STD-607 requirements.

3.19.3.3 Equipment Grounding Details for Communications and Electronics (CE) Facilities

Designers need to thoroughly review Section 4.5 of SIPH Appendix AC and the referenced sections of the MIL-HDBK before developing equipment grounding details at CE facilities to ensure that the developed detail meets all the requirements of MIL-STD-188-124B.

3.19.3.4 Outside Plant Grounding Details

When shielded cables, armored cables, copper cables, antennas, waveguide, metal towers, and manholes are to be installed outside of buildings, the Miscellaneous Installation Details shall provide details showing how these items are to be grounded and listing all required hardware.

3.19.3.5 Cabinet, Rack, and Foundation Mounting Details

Miscellaneous Installation Details for installations requiring the mounting of equipment cabinets or racks shall provide details showing exactly how the cabinets or racks are to be mounted. Instructions shall include information such as the proper size drill bits required to drill holes for anchors and the optimum hole depth for concrete anchors.

3.20 Auxiliary Cooling Diagram (Drawing Category Code 181, No Attachment)

Section 3.3.20 of the IRD standard explains the detail required for this drawing type. This type of drawing is required for installation of chilled water systems dedicated to cooling specific equipment or racks/cabinets of equipment. (Chilled water cooling is making an appearance in some commercial server farms and is becoming more common) These drawings shall have a parts list.

3.21 Auxiliary Dry Gas Diagram (Drawing Category Code 182, No Attachment)

Section 3.3.21 of the IRD standard explains the detail required for this drawing type. This type of drawing is required for installation of dry gas systems. RF transmission lines (waveguide and heliax) and antennas are often pressurized with dry air or nitrogen to eliminate arcing and minimize corrosion caused by moisture. These drawings shall have a parts list.

3.21.1 Engineering Considerations

The use of foam dielectric helical waveguide is often a better option than pressurized waveguide that requires a dry gas system. The use of the foam dielectric eliminates the need to purchase and install dehydrators and associated components. A dry gas system can be noisy and require periodic maintenance. An air dielectric waveguide system will incorporate a pressurizing source that provides dry gas on demand. It can be a regulated nitrogen tank or an automatic dehydrator. Both units are connected to the transmission line and charge it to a preset positive pressure as required to

compensate for leakage losses. Proper sizing of the dehydrator is important to its reliability and ability to provide dry air. A dehydrator that is too small will operate at a high duty cycle and require compressor overhaul in less calendar time. For the manually regenerative units, a desiccant change is needed more frequently, thus increasing costs. A dehydrator that is too large will, in the case of the pressure swing system, short cycle, saturating the antenna towers. Fully automatic membrane dehydrators are recommended for new installations. Older "pressure swing" automatic dehydrators perform a similar function, but they do not provide the same trouble-free performance, low noise and vibration, and continuous drying capability the membrane units do.

3.22 Radio Frequency (RF) Transmission Line Diagram (Drawing Category Code 183, No Attachment)

The RF Transmission Line Diagram is required when waveguide or rigid coaxial transmission line is used. Section 3.3.22 of the IRD standard explains the detail required for this drawing type for IRDs. The requirements for IDP are very similar. The drawing shall identify the following items as required with bubble callouts or local notes on the diagram:

- **a.** Types of waveguide or rigid coaxial transmission lines
- **b.** Individual waveguide bends, twists, flexible sections, adapters, flanges, inner connectors, gaskets, alignment pins, and hardware (as approved by the command or agency concerned) identified by National Stock Number if available and by commercial part number when items will be obtained from a commercial source or when the NSN has just one commercial source
- **c.** Connecting flanges on units connected by transmission line(s), identified by National Stock Number if available and by commercial part number when items will be obtained from a commercial source or when the NSN has just one commercial source
- **d.** Entrances of dry air lines and purge lines, when dry air is used
- **e.** Pressure fittings and waveguide pressure windows when required
- **f.** Notes indicating the calculated maximum loss of each transmission line
- **g.** A note or notes indicating how wall penetrations will be made and resealed including directions for any required waveguide grounding and firestopping. (Grounding note should typically refer to Miscellaneous Installation Details)
- **h.** Waveguide supports locations and instructions for maximum spacing of supports and the placement of supports near fittings
- **i.** Preservation/painting instructions and materials
- **j.** The installation of guards at locations where the waveguide could be subject to damage.

3.22.1 Engineering Considerations

IRDs will typically have notes indicating the maximum lengths for certain waveguide types and/or allowable attenuation for the RF link. The IRD may require the choice of waveguide used to be one of several options with the lowest loss (and most expensive) waveguide reserved for the longest links. If there is no IRD, the choice of waveguide and fittings will depend on the loss budget of the link from the antenna to the receiver or transmitter. The installation designer should try to locate RF transmitters and receivers at a location that will reduce the length of the RF link as much as is practical, while at the same time allowing for the most convenient operation and maintenance of the equipment. Sometimes these two objectives are in conflict and operational needs will dictate a longer than optimum run. This may require the incorporation of lower loss wave guide into the design. The IDP developer should also try to minimize the number of bends in any run.

3.23 Synchro Data Transmission Drawing (Drawing Category Code 184, No Attachment)

Section 3.3.23 of the IRD standard explains the detail required for this drawing type for IRDs. This type of drawing is rarely required for shore installations.

3.24 Miscellaneous System Configuration Details (Drawing Category Code 190; Attachment 21)

A Miscellaneous System Configuration Details drawing shall be provided when the system to be installed requires a specific configuration of hardware jumpers, switches and/or specific software settings that are different from the factory default settings. When an IRD is available, information supplied in the IRD can form the basis for this drawing. If no IRD is available and the information is not held by the IA, because the configuration of the hardware and software has not been provided by those responsible for the system configuration then this drawing shall identify the organization responsible for the configuration. Software configuration data should be provided as a convenient way to record how routers, ATM switches, codecs, and other complex hardware are to be configured at a site.

4. Installation Standards

Installation standards are covered by Appendix AC of the SIPH. It is very important that IDP developers be familiar with the contents of appendix AC and the standards it discusses. The methods and configuration shown in the IDP should be described in enough detail to ensure that requirements of standards can be met without the need for an installer to conduct any research into a standard.

5. Drawing Standards

The templates included with the IRD standard and this appendix reflects the SPAWAR enterprises effort to be in substantial compliance with the ASME Drafting standards and the previously discussed IDEA standard. IDP developers who comply with this appendix and the IDEA standard should rarely if ever need to research a drafting standard. The most important drafting standards are discussed in the following paragraphs.

5.1 IDEA CAD Standards (Revision B: 07 February 2005)

The original purpose of this document was to provide basic guidance for developing Ship Installation Drawings (SIDs) utilizing AutoCAD 2000 and later versions of AutoCAD to promote the exchange and reuse of drawing files between three major shipyards performing installations for the US Navy. The IRD standard templates were developed in accordance with the IDEA standards so that IRDs could be easily used by these same shipyards to created SIDs, which are the afloat equivalent of IDPs. The IRDs are the standard installation planning documents for both ship and shore installations. Therefore, to ensure that IDP and IRD requirements are compatible, this appendix encourages the use of the IDEA standard for IDPs as discussed previously in Section 1.2.

5.2 ASME Drawing Standards

MIL-STD-100G, *Department of Defense Standard Practice for Engineering Drawings* dated 9 June 1997 was cancelled by MIL-STD-100G Notice 1 dated 14 December 2001. The notice states that "Future requirements for engineering drawings should refer to the following American Society of Mechanical Engineers (ASME) standards."

5.2.1 ASME Y14.38-2007, Abbreviations and Acronyms.

The full title of this document is *Abbreviations and Acronyms for Use on Drawings and Related Documents*. The document is available from .

5.2.2 ASME Y14.100-2004, Engineering Drawing Practices.

This is the preferred standard for engineering drawing practices. All drafting departments should hold a copy of this document. This document has been mentioned previously in this appendix on several occasions and incorporates its most important guidance with minor modifications.

5.2.3 ASME Y14.24-1999 (Reaffirmed 2004), Types and Applications of Engineering Drawings.

This document defines the types of engineering drawings most often used to establish engineering requirements. Its Section 13.1 explains how a wiring harness drawing should be made and its Section 13.2 provides requirements for a Cable Assembly drawing. These are special application drawings that have occasionally been needed for IDPs even though nowadays most wiring harnesses and cable assemblies are constructed prior to the installation effort.

5.2.4 ASME Y14.34M-1996 (Reaffirmed 2002), Associated Lists.

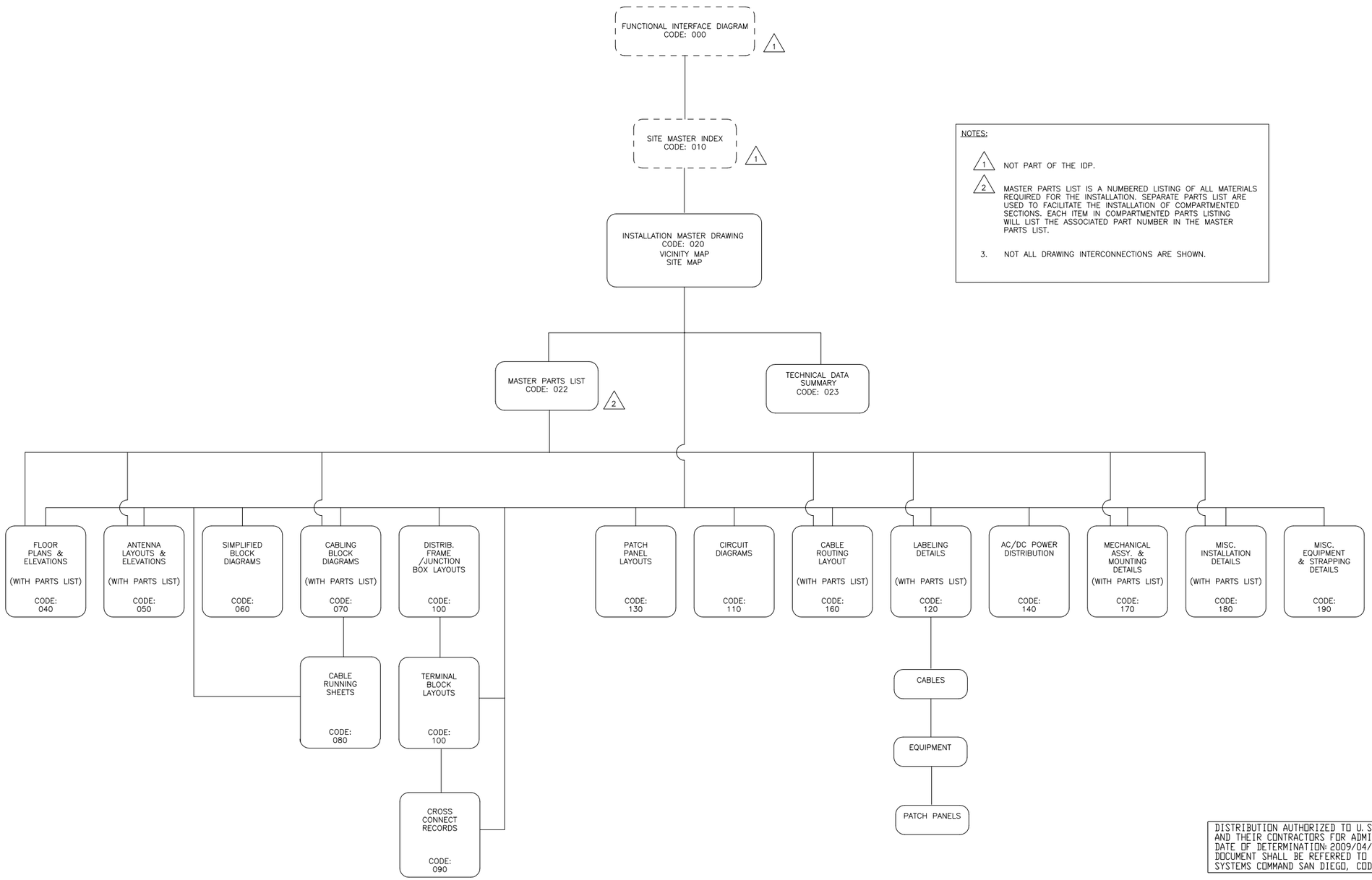
This document contains the minimum requirements for preparing and revising parts lists, data lists and index lists. This document also presents options that can be incorporated into these lists. IDP developers will seldom, if ever, need to refer to this document.

5.2.5 ASME Y14.35M-1997, Revision of Engineering Drawings and Associated Documents.

This document defines the practices for revising drawings and associated documents. It establishes ways to identify and record revisions. It provides several different options for tracking revisions. One option was chosen for IDPs and is reflected in Section 1.10.1.8.

5.3 National CAD Standard (NCS)

The NCS covers all aspects of building construction as discussed in Section 1.16.1.



NOTES:

1. NOT PART OF THE IDP.
2. MASTER PARTS LIST IS A NUMBERED LISTING OF ALL MATERIALS REQUIRED FOR THE INSTALLATION. SEPARATE PARTS LIST ARE USED TO FACILITATE THE INSTALLATION OF COMPARTMENTED SECTIONS. EACH ITEM IN COMPARTMENTED PARTS LISTING WILL LIST THE ASSOCIATED PART NUMBER IN THE MASTER PARTS LIST.
3. NOT ALL DRAWING INTERCONNECTIONS ARE SHOWN.

DISTRIBUTION AUTHORIZED TO U. S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: 2009/04/01. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO, CODE 4.2 OR PEO C4I AND SPACE.

INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
1		

REFERENCE DRAWING(S)

UNLESS OTHERWISE NOTED, DIMENSION UNITSS ARE ARCHITECTURAL (IN INCHES OR FEET AND INCHES).

TOLERANCES ARE +/- 1/4" FOR VERTICAL POSITIONING OF DUCTS, AND +/- 1/8" FOR HORIZONTAL POSITIONING OF DUCTS AND CONDUITS.

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000

DEVELOPING AGENT
ADDRESS
ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

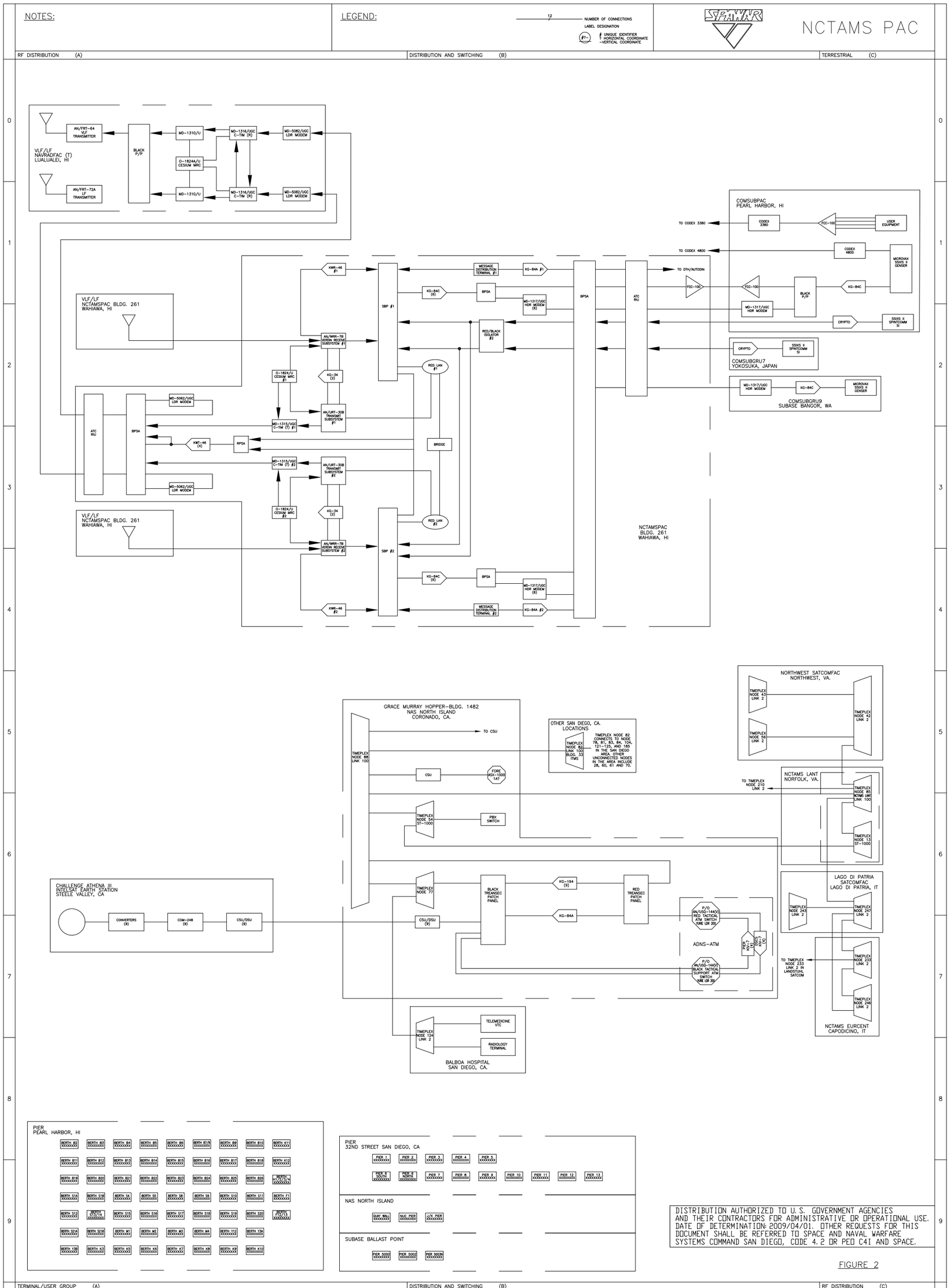
COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
DRAWING TREE

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	N/A-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 1

DRAWING TREE
(DRAWING TYPE CODE N/A)

ATTACHMENT 1
(SHEET 1 OF 1)



ATTACHMENT 2
(SHEET 1 OF 1)

FUNCTIONAL INTERFACE DIAGRAM
(DRAWING TYPE CODE 000)

SHEET INDEX			
CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST	1	28687-080000-A010-000-2080000-000-	-

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED

SYSTEM	INSTALLATION MASTER DRAWING VICINITY MAP SITE MAP BUILDING KEY PLAN	MASTER PARTS LIST	TECHNICAL DATA SUMMARY	FLOOR PLANS & ELEVATIONS PARTS LIST	ANTENNA LAYOUTS & ELEVATIONS PARTS LIST	SIMPLIFIED BLOCK WIRING DIAGRAMS	CABLING BLOCK DIAGRAMS PARTS LIST CABLE RUNNING SHEETS	DISTRIB. FRAME/JUNCTION BOX LAYOUT PARTS LIST CROSS CONNECT RECORDS CABLE RUNNING SHEETS	TERMINAL BLOCK LAYOUTS	PATCH PANEL LAYOUTS	CIRCUIT DIAGRAMS	CABLE ROUTING LAYOUT PARTS LIST	LABELING DETAILS CABLES EQUIPMENT PATCH PANELS PARTS LIST	AC/DC POWER DISTRIBUTION PARTS LIST	MECHANICAL ASSY. & MOUNTING DETAILS PARTS LIST	MISC. INSTALLATION DETAILS PARTS LIST	MISC. EQUIPMENT & STRAPPING DETAILS
AUTOMATED DIGITAL NETWORK SYSTEM (ADNS)	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX	XXX-XXX-XXXXXXX
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DISTRIBUTION AUTHORIZED TO U. S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: 2009/04/01. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO, CODE 4.2 OR PEO C4I AND SPACE.

INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
3		
2		
1		

REFERENCE DRAWING(S)

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000
DEVELOPING AGENT
ADDRESS
ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBGRU 10 KINGS BAY, GA
SITE
MASTER INDEX

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	010-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 1

SITE MASTER INDEX
(DRAWING TYPE CODE 010)

ATTACHMENT 3
(SHEET 1 OF 1)

GENERAL NOTES:

1. THIS DRAWING IS AVAILABLE FROM THE SPAWAR DOCUMENTUM REPOSITORY AT HTTPS://HIDE.NMCI.NAVY.MIL/SHOREINSTALL. (THIS IS NOT A REAL IDP, BUT IF IT WERE THERE WOULD BE A NOTE SIMILAR TO THE ABOVE STATEMENT.)

2. USERS WHO WISH TO RECOMMEND DRAWING CHANGES TO THIS IDP SHALL CONTACT ENGINEER_FOR_THIS@NAVY.MIL (A REAL IDP MUST IDENTIFY THE ENGINEER RESPONSIBLE FOR UPLOADING THE IDP INTO THE REPOSITORY.)

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, DRAWING REFERENCES, SHEET INDEX, AND GENERAL NOTES	1	28687-080000-A160-000-2080000-000-	-
VICINITY MAP	2	"	-
SITE MAP	3	"	-
SUBSURF HQ BUILDING PLAN SHOWING FLOORS 2 AND 3	4	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

PROJECT LOCATION:

THIS PROJECT SHALL TAKE PLACE AT SUBSURF HEADQUARTERS (SUBSURF HQ) NORFOLK, VIRGINIA.

PROJECT IDENTIFICATION NUMBER:

THIS PROJECT HAS BEEN ASSIGNED THE PROJECT ID OF 08-0000 BY SPAWAR.

PROJECT ABSTRACT:

THIS INSTALLATION WILL INSTALL IMAGINARY NETWORK COMMAND SERVER AND VIDEO EQUIPMENT IN THREE SEPARATE ROOM AT THE NEW HQ. THREE EQUIPMENT RACKS, TWO WORKSTATIONS, AND TWO PLASMA SCREENS WILL BE INSTALLED IN EACH AREA. A NEW CABLE PATHWAY NETWORK WILL BE INSTALLED TO CONNECT THE THREE AREAS.

REFERENCE INDEX

NO.	DRAWING TITLE	CAGE	IA CODE	DOC. OR DWG. NO.	
16	TYCO ELECTRONICS APPLICATION SPECIFICATION 114-22008, EMT MODULAR PLUG CONNECTORS	3DSR9	N/A	114-22008	-
15	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA MISCELLANEOUS SYSTEM CONFIGURATION DETAILS	28687	A	170-000-2080000	-
14	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA MISCELLANEOUS INSTALLATION DETAILS	28687	A	180-000-2080000	-
13	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA MECHANICAL ASSEMBLY AND MOUNTING DETAILS	28687	A	171-000-2080000	-
12	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA CABLE ROUTING LAYOUTS	28687	A	160-000-2080000	-
11	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA POWER DISTRIBUTION	28687	A	140-000-2080000	-
10	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA PATCH PANEL LAYOUTS	28687	A	130-000-2080000	-
9	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA LABELING DETAISS	28687	A	120-000-2080000	-
8	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA CIRCUIT DIAGRAMS	28687	A	110-000-2080000	-
7	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA CABLE RUNNING SHEETS	28687	A	080-000-2080000	-
6	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA CABLING BLOCK DIAGRAMS	28687	A	070-000-2080000	-
5	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA SIMPLIFIED BLOCK DIAGRAMS	28687	A	060-000-2080000	-
4	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA ANTENNA LAYOUTS AND ELEVATIONS	28687	A	050-000-2080000	-
3	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA FLOOR PLANS AND ELEVATIONS	28687	A	040-000-2080000	-
2	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA TECHNICAL DATA SUMMARY	28687	A	023-000-2080000	-
1	IMAGINARY NETWORK INSTALLATION, SUBSURF HQ NORFOLK, VA MASTER PARTS LIST	28687	A	022-000-2080000	-

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INSTALLATION DESIGN PLAN

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE XXXXX
SPAWAR SYSTEMS CENTER
53560 HULL STREET
SAN DIEGO, CA 92152-5001

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

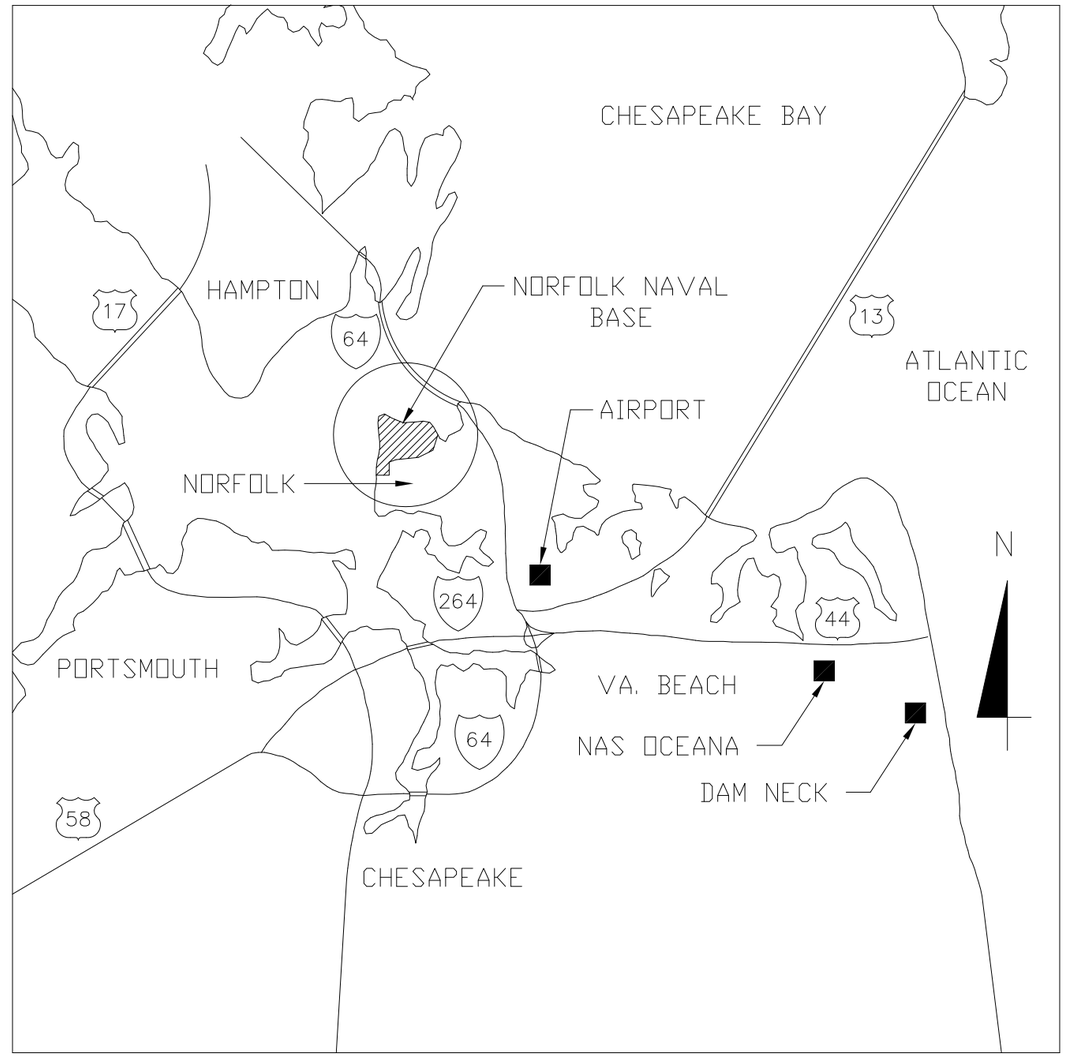
SUBSURF HEADQUARTERS NORFOLK, VA
IMAGINARY NETWORK INSTALLATION
INSTALLATION MASTER DRAWING

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	B	020-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 4

ATTACHMENT 4 (SHEET 1 OF 4)

INSTALLATION MASTER DRAWING (DRAWING TYPE CODE 020)



VICINITY MAP
N.T.S.

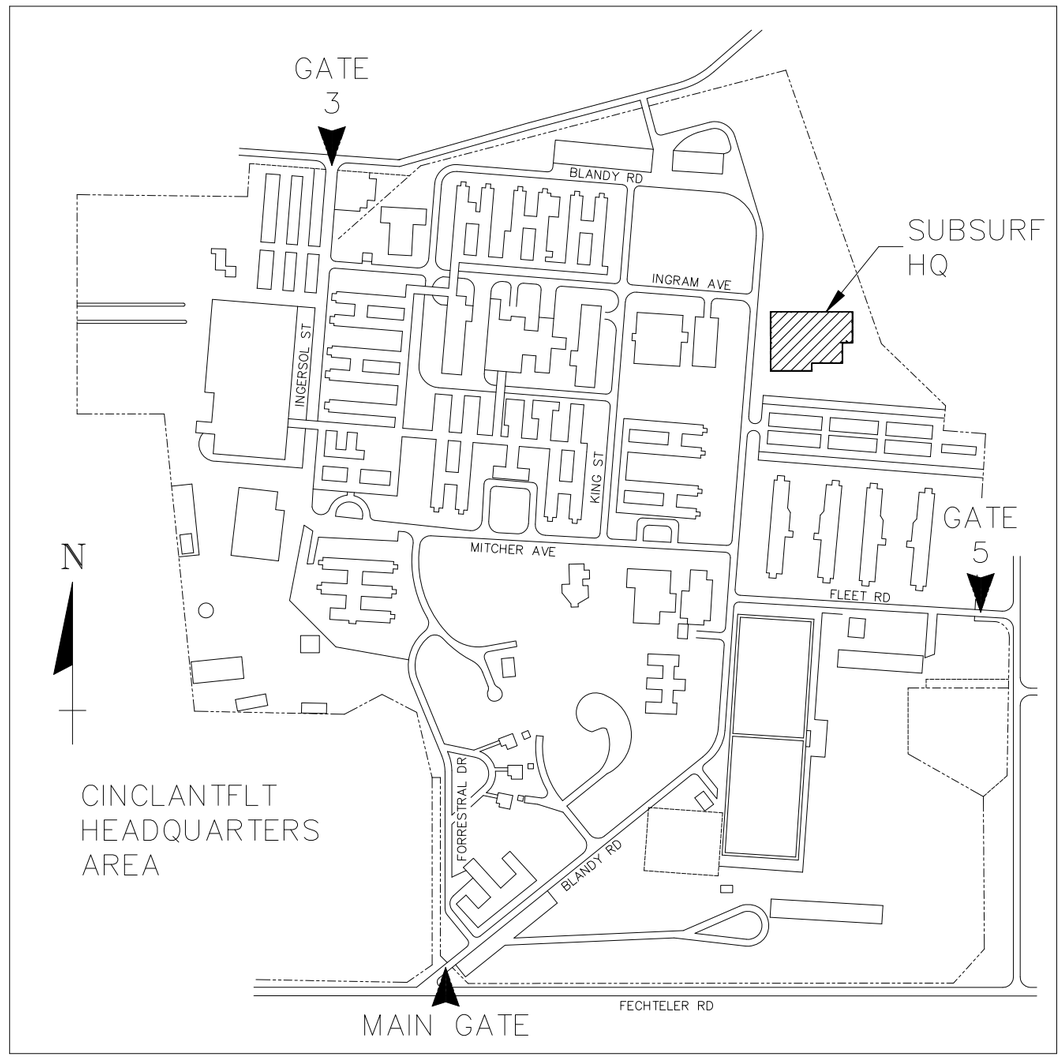
INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	020-000-2080000	–

SCALE: NONE SHEET 2

ATTACHMENT 4
(SHEET 2 OF 4)

INSTALLATION MASTER DRAWING
(DRAWING TYPE CODE 020)



SITE MAP
N.T.S.

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	040-000-2080000	-

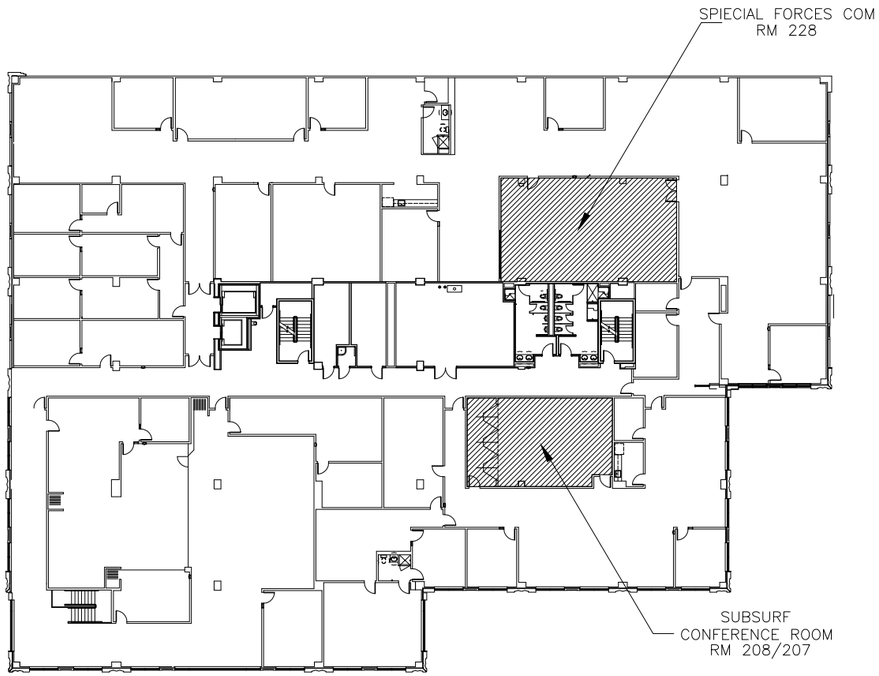
SCALE: NONE SHEET 3

ATTACHMENT 4
(SHEET 3 OF 4)

INSTALLATION MASTER DRAWING
(DRAWING TYPE CODE 020)

NOTES:

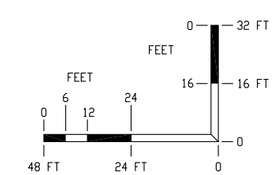
A. THIS BUILDING DOES NOT EXIST. IT IS AN EXAMPLE MADE FOR THE SHORE INSTALLATION PROCESS HANDBOOK.



SECOND FLOOR

N

THIRD FLOOR



GRAPHIC SCALE
1/16' = 1'

SUBSURF HQ BUILDING PLAN
FLOORS 2 AND 3

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	IA	AS-BUILT ID	DRAWING NO.	REV
F	28687	A	080000	020-000-2080000	–

SCALE: 1/192 SHEET 4

ATTACHMENT 4 (SHEET 4 OF 4)

INSTALLATION MASTER DRAWING (DRAWING TYPE CODE 020)

GENERAL NOTES:

1. THIS EXAMPLE DRAWING FOR SIPH APPENDIX Q IS BASED ON AN ACTUAL DRAWING BUT IS NOT A TRUE IDP DRAWING.
2. POC FOR ON-SITE STORAGE IS ENSIGN PULVER AT 1-866-555-0987.

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, DRAWING REFERENCES, SHEET INDEX, AND GENERAL NOTES	1	28687-080000-A022-000-2080000-000-	-
MASTER PARTS LIST ITEMS 1-50	2	"	-
MASTER PARTS LIST ITEMS 51-100	3	"	-
MASTER PARTS LIST ITEMS 101-150	4	"	-
MASTER PARTS LIST ITEMS 151-200	5	"	-
MASTER PARTS LIST ITEMS 201-250	6	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

LEGEND:

* - TO BE DETERMINED BY THE INSTALLING ACTIVITY
U/W - USED WITH
U/M - UNIT OF MEASURE
A/R - AS REQUIRED
F/W - FURNISHED WITH
G/H - GROUNDING HARDWARE
M/H - MOUNTING HARDWARE
M/W - MATES WITH
SWE - SUPPLIED WITH EQUIPMENT
NSWE - NOT SUPPLIED WITH EQUIPMENT
IAF - INSTALLING ACTIVITY FURNISHED
GFE - GOVERNMENT FURNISHED EQUIPMENT
P/O - PART OF

REFERENCE DRAWING(S)

NO.	DRAWING TITLE	DWG NO.
6	SUBOPAUTH SMG INSTALLATION, COMSUBLANT NORFOLK, VA MISCELLANEOUS INSTALLATION DETAILS	180-000-2080000
5	SUBOPAUTH SMG INSTALLATION, COMSUBLANT NORFOLK, VA MECHANICAL ASSEMBLY AND MOUNTING DETAILS	171-000-2080000
4	SUBOPAUTH SMG INSTALLATION, COMSUBLANT NORFOLK, VA LABELING DETAILS	120-000-2080000
3	SUBOPAUTH SMG INSTALLATION, COMSUBLANT NORFOLK, VA CABLE BLOCK DIAGRAM	070-000-2080000
2	SUBOPAUTH SMG INSTALLATION, COMSUBLANT NORFOLK, VA SYSTEM ELEVATIONS	040-000-2080000
1	SUBOPAUTH SMG INSTALLATION, COMSUBLANT NORFOLK, VA INSTALLATION MASTER DRAWING	020-000-2080000

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INSTALLATION DESIGN PLAN

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 55910
SPAWAR SYSTEMS CENTER
53560 HULL STREET
SAN DIEGO, CA 92152-5001

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBLANT NORFOLK, VA
SUBOPAUTH SMG INSTALLATION
MASTER PARTS LIST

SIZE	CAGE CODE	IA CODE	AS-BUILT ID	DRAWING NO.	REV
F	28687	B	080000	022-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 6

ATTACHMENT 5
(SHEET 1 OF 2)

MASTER PARTS LIST
(DRAWING TYPE CODE 022)

NOTES:

A. THIS IS NOT A TRUE IDP DRAWING. IT IS AN EXAMPLE PROVIDED TO SHOW THE FORMAT AND TYPE OF CONTENT THAT A MASTER PARTS LIST WOULD HAVE. AN ACTUAL MASTER PARTS LIST WOULD PROBABLY HAVE MORE PARTS LISTED.

B. "REF" IN A QUANTITY COLUMN INDICATES THAT THE ITEM IS INCLUDED ON THE DRAWING PARTS LIST AS A REFERENCE ITEM WITH NO QUANTITY LISTED.

ITEM	DESCRIPTION	DRAWING 040-000-2080000 FIND	QTY	DRAWING 070-000-2080000 FIND	QTY	DRAWING 120-000-2080000 FIND	QTY	DRAWING 171-000-2080000 FIND	QTY	DRAWING 180-000-2080000 FIND	QTY		SOURCE	TOTAL QTY	U/M	NSN	SUPPLIER OR MFGR.	PART NUMBER	REMARKS
1	BLANK PANEL, 1U (1.75") SIZE, BLACK	1	4	-	-	-	-	-	-	-	-		SWE	4	EA	-	DELL	4210	-
2	BLANK PANEL, 2U (3.5") SIZE, BLACK	2	18	-	-	-	-	-	-	-	-		SWE	18	EA	-	WRIGHT LINE LLC	PS18202T	-
3	BLANK PANEL, 3U (5.25") SIZE, BLACK	3	4	-	-	-	-	-	-	-	-		SWE	4	EA	-	DELL	15FP	-
4	BLANK PANEL, 4U (7.0") SIZE, BLACK	4	10	-	-	-	-	-	-	-	-		SWE	10	EA	-	DELL	NREMS PE 2850	-
5	BLANK PANEL, 5U (8.75") SIZE, BLACK	5	10	-	-	-	-	-	-	-	-		SWE	10	EA	-	DELL	NREMS PE 6850	-
6	BLANK PANEL, 8U (14.0") SIZE, BLACK	6	4	-	-	-	-	-	-	-	-		SWE	4	EA	-	DELL	10/100/1000 NIC	-
7	EQUIPMENT SHELF, RACK MOUNT, FIXED, BLACK	7	20	-	-	-	-	-	-	-	-		SWE	20	EA	-	DELL	NREMS PE 1850	-
8	I/P TO SERIAL CONVERTER	8	1	-	-	-	-	-	-	-	-		SWE	1	EA	-	CISCO	WS-6513-1	-
9	SWITCH, MATRIX, KVM, 16 X 64	9	2	-	-	-	-	-	-	-	-		SWE	2	EA	-	CISCO	WS-SUP720-3BXL	-
10	SWITCH, MANUAL, KVM, 1 X 8	10	1	-	-	-	-	-	-	-	-		SWE	1	EA	-	CISCO	WS-C6K-13SLT-FAN2	-
11	KVM USER STATION W/AUTO SKEW COMPENSATION	11	2	-	-	-	-	-	-	-	-		SWE	2	EA	-	CISCO	WS-SVC-FWM-1-K9	-
12	STABILIZING FOOT KIT	12	4	-	-	-	-	-	-	-	-		SWE	4	EA	-	CISCO	WS-X6548-GE-TX	-
13	MOUSE, OPTICAL WHEEL	13	2	-	-	-	-	-	-	-	-		SWE	2	EA	-	CISCO	WS-CAC-6000W	-
14	COMPUTER, RACK MOUNT, BLACK	14	6	-	-	-	-	-	-	-	-		SWE	6	EA	-	DELL	POWERVAULT 220S	-
15	DRIVE, MOBILE, 30G	15	12	-	-	-	-	-	-	-	-		SWE	12	EA	-	DELL	NREMS DELL PV EMM	-
16	MOBILE DRIVE STATION, INTERNAL	16	9	-	-	-	-	-	-	-	-		SWE	9	EA	-	DELL	NREMS DELL SCSI CARD	-
17	MOUSE, 3-BUTTON, P/S2	17	-	1	1093	-	-	-	-	-	-		IAF	1093	FT	-	BELDEN	1701A	-
18	PATCH PANEL, AUDIO, BANTAM	18	-	2	348	-	-	-	-	-	-		IAF	4	EA	-	DELL	4210	-
19	DESIGNATION STRIP PANEL	19	REF	-	-	-	-	1	2	1	1		IAF	3	HD	5305-00-059-3659	-	-	-
20	CHASSIS, ISOLATOR, 20 SLOT	20	REF	-	-	-	-	2	2	2	1		IAF	3	HD	5310-00-167-0812	-	-	-
21	FIBER OPTIC MODEM, TX	21	REF	-	-	-	-	3	2	3	1		IAF	3	HD	5310-00-933-8120	-	-	-
22	FIBER OPTIC MODEM, RX	22	-	-	-	-	-	-	-	4	6		IAF	12	EA	-	THOMAS & BETTS	54205	-
23	VERTICAL END TRIM FOR CORE	23	-	-	-	-	-	-	-	5	A/R		IAF	A/R	FT	-	DELL	NREMS 10/100/1000 NIC	-
24	COMPUTER, INTEL PENT 4, 2.8 GHZ, 800 MHZ FSB	24	-	-	-	-	-	-	-	6	A/R		IAF	A/R	FT	-	DELL	NREMS PE 1850	-
25	PATCH PANEL, MULTI-CKT, 16 JF, MALE/FEMALE	25	-	-	-	1	2	-	-	-	-		IAF	2	RO	-	PANDUIT	H050X044H1T	-
26	SWITCH, 8 POSITIONS	26	-	-	-	-	-	-	-	7	80		IAF	80	EA	-	PANDUIT	HLTP21-XO	-
27	SERVER, 2.8 GHZ, 512 K, 533 MHZ FSB	27	-	-	-	-	-	-	-	8	40		IAF	40	EA	-	PANDUIT	HLTP31-XO	-
28	48" WIDE X 16 HIGH PROFILE FPD WALL, SINGLE SIDED	28	-	-	-	-	-	-	-	9	50		IAF	50	EA	-	PANDUIT	ABMT-S6-C69	-
29	MONITOR, LCD, 21"	29	-	-	-	2	1	-	-	-	-		IAF	1	RO	9320-00-449-0809	-	-	-
30	KEYBOARD SHELF	30	2	-	-	3	1	-	-	-	-		IAF	1	PG	-	FABRICATE	I180-0000001-1	WWW.CUSTOMPLATE.COM
31	KEYBOARD W/TOUCHPAD, BLACK	31	10	-	-	-	-	-	-	-	-		IAF	10	EA	5975-00-685-9544	-	-	OR EQUIVALENT
32	KEYBOARD, BLACK	32	6	-	-	-	-	-	-	-	-		IAF	6	EA	5975-00-685-9545	-	-	OR EQUIVALENT
33	SPEAKER, PC, PAIR	33	6	-	-	-	-	-	-	-	-		IAF	6	PG	5975-00-086-1383	-	-	OR EQUIVALENT
34	PROFILE PRIVACY SCREEN, LEFT, SINGLE FOR TIER 2	34	6	-	-	-	-												
35	PROFILE, FULL DEPTH, LH UPRIGHT, 30"	35	-	-	-	-	-	-	-	9	50		IAF	50	EA	-	PANDUIT	ABMT-S6-C69	-
36	48" PROFILE CORE, SINGLE SIDED, WITH BACK SKINS	36	-	-	-	2	1	-	-	-	-		IAF	1	RO	9320-00-449-0809	-	-	-
37	45D CONCAVE WEDGE CONNECTOR FOR TIER 1 (12)	37	2	-	-	3	1	-	-	-	-		IAF	1	PG	-	FABRICATE	I180-0000001-1	WWW.CUSTOMPLATE.COM
38	VERTICAL WALL TRIM/TIER 1 TRANSITION	38	10	-	-	-	-	-	-	-	-		IAF	10	EA	5975-00-685-9544	-	-	OR EQUIVALENT
39	PROFILE FULL DEPTH RH UPRIGHT, 30"	39	6	-	-	-	-	-	-	-	-		IAF	6	EA	5975-00-685-9545	-	-	OR EQUIVALENT
40	PROFILE PRIVACY SCREEN, RIGHT, SINGLE, FOR TIER 2	40	6	-	-	-	-	-	-	-	-		IAF	6	PG	5975-00-086-1383	-	-	OR EQUIVALENT
41	48" FDP WALL TOP TRIM, SINGLE SIDED	41	6	-	-	-	-												
42	PROFILE WEDGE UPRIGHT, 30"	42	-	-	-	-	-	-	-	9	50		IAF	50	EA	-	PANDUIT	ABMT-S6-C69	-
43	PROFILE TRANSITION UPRIGHT, 30"	43	-	-	-	2	1	-	-	-	-		IAF	1	RO	9320-00-449-0809	-	-	-
44	FPD ARM, DELUXE	44	2	-	-	3	1	-	-	-	-		IAF	1	PG	-	FABRICATE	I180-0000001-1	WWW.CUSTOMPLATE.COM
45	48" PROFILE FPD WALL, SINGLE SIDED W SERV PANELS	45	10	-	-	-	-	-	-	-	-		IAF	10	EA	5975-00-685-9544	-	-	OR EQUIVALENT
46	48X30 CONCAVE WORKSERVICE W/22.5D ANGLE ON RIGHT	46	6	-	-	-	-	-	-	-	-		IAF	6	EA	5975-00-685-9545	-	-	OR EQUIVALENT
47	48X30 CONCAVE WORKSERVICE W/22.5D ANGLE ON LEFT	47	6	-	-	-	-	-	-	-	-		IAF	6	PG	5975-00-086-1383	-	-	OR EQUIVALENT
48	22W REMOVABLE SKIN FOR PROFILE CORE	48	10	-	-	-	-	-	-	-	-		IAF	10	EA	5975-00-685-9544	-	-	OR EQUIVALENT
49	48" PROFILE CORE, DOUBLE SIDED WITH NO SKINS	49	6	-	-	-	-	-	-	-	-		IAF	6	EA	5975-00-685-9545	-	-	OR EQUIVALENT
50	48" FPD WALL TOP TRIM, DOUBLE SIDED	50	6	-	-	-	-	-	-	-	-		IAF	6	PG	5975-00-086-1383	-	-	OR EQUIVALENT

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	IA	AS-BUILT ID	DRAWING NO.	REV
F	28687	A	080000	020-000-2080000	-
SCALE: NONE				SHEET 2	

MASTER PARTS LIST
(DRAWING TYPE CODE 022)

ATTACHMENT 5
(SHEET 2 OF 2)

GENERAL NOTES:

1. THIS IS NOT A TRUE IDP DRAWING. IT IS AN EXAMPLE DRAWING PROVIDED TO SHOW THE FORMAT AND CONTENT APPROPRIATE FOR A TECHNICAL DATA SUMMARY DRAWING. IT SHOWS HOW THE EXAMPLE TECH DATA IN THE IRD STANDARD WOULD NEED TO BE MODIFIED IF TWO CABINETS WERE USED INSTEAD OF THE ONE IRD STANDARD CABINET AND IF ONE CABINET ONLY HAD 120 VAC POWER AVAILABLE INSTEAD OF THE 208 VAC SHOWN IN THE IRD STANDARD.

2. CURRENT VALUES FOR EQUIPMENT IN CABINET TWO DIFFER FROM THOSE IN THE IRD STANDARD BECAUSE MORE CURRENT IS NEEDED AT 120 VAC TO POWER THE EQUIPMENT.

A1 → 3. MAXIMUM CURRENT VALUES ARE BASED ON EQUIPMENT OPERATING AT TYPICAL VOLTAGE (208 OR 120 VAC) AT MAXIMUM POSSIBLE SUSTAINED WORKLOAD UTILIZING THE EQUIPMENT HARDWARE AND SOFTWARE AS IT IS CURRENTLY CONFIGURED. OPERATING CURRENT VALUES ARE BASED ON EQUIPMENT OPERATING AT TYPICAL VOLTAGE AT NORMAL PEAK SUSTAINED WORKLOAD.

A2 → 4. SHOWS THE TYPE OF SHIP POWER FROM SECTION 1.3 (CLASSIFICATION) OF MIL-STD-1399 SECTION 300A NOTICE 1. (NOT RELEVANT TO SHORE INSTALLATIONS.)

A2 → 5. ENTER THE CLASS OF POWER FROM MIL-HDBK-411B (& MIL-HDBK-1012/1).
THE CHOICES ARE:
CLASS A (NON-OPERATIONAL). THIS CLASS COVERS ADMINISTRATIVE, SUPPORT, AND MISCELLANEOUS POWER REQUIREMENTS NOT ESSENTIAL TO FACILITY OPERATION. IT DOES NOT NORMALLY REQUIRE EMERGENCY POWER.
CLASS B (OPERATIONAL - NON-TECHNICAL). THIS CLASS COVERS THAT PART OF THE OPERATIONAL LOAD THAT IS USED FOR GENERAL LIGHTING, CONVENIENCE OUTLETS, AIR-CONDITIONING, VENTILATING EQUIPMENT, AND OTHER FUNCTIONS REQUIRED FOR NORMAL OPERATIONS AND DOES NOT NORMALLY REQUIRE EMERGENCY POWER.
CLASS C (NON-CRITICAL TECHNICAL) THE TECHNICAL LOAD COVERS ELECTRONIC EQUIPMENT AND ANCILLARY EQUIPMENT INCLUDING LIGHTING, AIR CONDITIONING, AND AIR-CONDITIONING REQUIRED FOR FULL CONTINUITY OF FACILITY FUNCTION. THIS CLASS COVERS THE PART OF THE TECHNICAL LOAD THAT IS NOT REQUIRED FOR SYNCHRONOUS OPERATION. IT IS IS SUPPORTED BY AN EMERGENCY POWER SYSTEM SUCH AS GENERATORS AND AUTOMATIC TRANSFER EQUIPMENT.
CLASS D (CRITICAL TECHNICAL) THIS CLASS COVERS THE PORTION OF THE TECHNICAL LOAD THAT WILL MALFUNCTION DURING A TEMPORARY POWER OUTAGE AND CAUSE ADDITIONAL OUTAGE AFTER POWER IS RESTORED. IT IS OFTEN CALLED 'NO-BREAK POWER'. IT MUST BE SERVED BY AN UNINTERRUPTIBLE POWER SUPPLY (UPS).

A3 → 6. TO CONVERT CUBIC METERS PER HOUR TO CUBIC FEET PER MINUTE MULTIPLY CUBIC METERS PER HOUR BY 0.589.

A3 → 7. CABINET ACCESSORIES WEIGH APPROXIMATELY 60 LBS. AND INCLUDE POWER STRIPS, BLANK PANELS, AND CABLE MANAGEMENT HARDWARE.

8. WEIGHTS INCLUDE CABLE MANAGEMENT AND RAIL ASSEMBLY HARDWARE.

9. THIS EQUIPMENT SHALL NOT BE MOUNTED IN A LOCATION EXPOSED TO THE WEATHER.

10. SERVICE AND CLEARANCE AREAS SHALL BE PROVIDED AS SHOWN IN THE REFERENCED OUTLINE AND INSTALLATION DRAWINGS.

11. THE EQUIPMENT SHOWN ON THIS DRAWING MEETS GRADE 'A' SHOCK REQUIREMENTS IN ACCORDANCE WITH MIL-S-901D AND VIBRATION IN ACCORDANCE WITH MIL-STD-167-1A.

12. SEE REF 1 FOR A LISTING OF ALL DRAWINGS RELEVANT TO THIS INSTALLATION. SEE REF 2 FOR EXACT PLACEMENT OF ALL EQUIPMENT LISTED HERE. SEE REF 3 FOR ELECTRICAL POWER CIRCUIT ASSIGNMENTS.

LEGEND:

AC - ALTERNATING CURRENT
TYP - TYPICAL
AVG - AVERAGE
BTU - BRITISH THERMAL UNIT
M3/HR - CUBIC METERS PER HOUR
N/A - NOT APPLICABLE OR NOT AVAILABLE

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, DRAWING REFERENCES, SHEET INDEX, AND GENERAL NOTES	1	28687-080000-A022-000-2080000-000A	A
TECHNICAL DATA SUMMARY TABLE	2	'	A

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	ZONES E8 AND F8	08-04-17	XXX
E8		(1) EXPANDED AND ROTATED FLAGNOTE TRIANGLE FOR NOTE 3.		
D8		(2) EXPANDED AND ROTATED FLAGNOTE TRIANGLES FOR NOTES 4 AND 5.		
		(3) ADDED FLAGNOTE TRIANGLES TO NOTES 6 AND 7. ZONES B1 AND B2		
		(4) ADDED DISTRIBUTION STATEMENT ZONES E13 THROUGH E15		
		(5) CHANGED SIZE AND ORIENTATION OF ALL FLAGNOTE TRIANGLES		
E11		(6) CHANGED '(NOTE 5)' TO FLAGNOTE 6 AND '(NOTE 7)' TO FLAGNOTE 7.		

A4 → DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: 2009/04/02. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO, CODE 4.2 OR PEO C4I AND SPACE.

INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
3	FICTITIOUS SITE, ANYTOWN, VA AN/USQ-172(V)2 (GCCS-M) POWER DISTRIBUTION	140-000-2080000
2	FICTITIOUS SITE, ANYTOWN, VA AN/USQ-172(V)2 (GCCS-M) INSTALLATION FLOOR PLAN AND ELEVATIONS	040-000-2080000
1	FICTITIOUS SITE, ANYTOWN, VA AN/USQ-172(V)2 (GCCS-M) INSTALLATION MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE XXXXX
DEVELOPING AGENT
ADDRESS
ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

FICTITIOUS SITE, ANYTOWN, VA
AN/USQ-172(V)2 (GCCS-M) INSTALLATION
TECHNICAL DATA SUMMARY

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	B	022-000-2080000	A

SCALE: NONE | MASS (WEIGHT): N/A | SHEET 1 OF 2

ATTACHMENT 6
(SHEET 1 OF 2)

TECHNICAL DATA SUMMARY
(DRAWING TYPE CODE 023)

TECHNICAL DATA SUMMARY
(DRAWING TYPE CODE 023)

ATTACHMENT 6
(SHEET 2 OF 2)

TECHNICAL DATA SUMMARY

EQUIPMENT	A5 POWER REQUIREMENTS										ENVIRONMENTAL REQUIREMENTS								A6 WEIGHTS AND DIMENSIONS								REMARKS
	TYPICAL VOLTAGE (AND RANGE)	MAXIMUM CURRENT 3	OPERATING CURRENT 3	NUMBER OF PHASES	FREQUENCY RANGE	POWER	SHIP POWER TYPE	SHIP POWER BUS	SHORE POWER TYPE	POWER FACTOR	SHOCK	VIBRATION	AVG HEAT DISSIPATION	% RELATIVE HUMIDITY (NON-CONDENSING) OPERATING	% RELATIVE HUMIDITY (NON-CONDENSING) STORAGE	TEMPERATURE OPERATING	TEMPERATURE STORAGE	AIR FLOW 6	WEIGHT CRATED	WEIGHT UNCRATED 7	DIMENSIONS CRATED HEIGHT	DIMENSIONS CRATED WIDTH	DIMENSIONS CRATED DEPTH	DIMENSIONS UNCRATED HEIGHT	DIMENSIONS UNCRATED WIDTH	DIMENSIONS UNCRATED DEPTH	
	(AC VOLTS)	(AMPS)	(AMPS)	(TYP)	(HERTZ)	(WATTS)	4	A5	5				(BTU/HOUR)			(°C)	(°C)	(M3/HR)	(POUNDS)	(POUNDS)	(INCHES)	(INCHES)	(INCHES)	(INCHES)	(INCHES)	(INCHES)	
ROW 5 BAY 6 (EXISTING CABINET)																											
EXISTING INSTALLED EQUIPMENT	208	3	2	2	50/60	400	N/A	N/A	N/A	.96	N/A	N/A	N/A	25 TO 80	N/A	5 TO 40	N/A	N/A	N/A	367	N/A	N/A	N/A	84	24	40	-
PRI_CP-EXP_1 (DISPLAY, DELL 15FP)	208 (100-240)	0.47	0.25	2	50/60	49	I	N/A	C	0.94 LAGGING	N/A	N/A	167	20 TO 80	5 TO 95	10 TO 35	-40 TO 65	0.0	N/A	11.12	N/A	N/A	N/A	13 - 20	13.7	7.4	-
PRI_CP-EXP_1 (SERVER, DELL POWEREDGE 2850)	208 (100-240)	2.80	2.2	2	50/60	435	I	N/A	D	0.95 LAGGING	N/A	N/A	1484	20 TO 80	5 TO 95	10 TO 35	-40 TO 65	71	N/A	70.5	N/A	N/A	N/A	3.38	17.6	29.79	-
PRI_CP-EXP_2 (SERVER, DELL POWEREDGE 2850)	208 (100-240)	2.80	2.2	2	50/60	435	I	N/A	D	0.95 LAGGING	N/A	N/A	1484	20 TO 80	5 TO 95	10 TO 35	-40 TO 65	71	N/A	70.5	N/A	N/A	N/A	3.38	17.6	29.79	-
PRI_CP-EXP_3 (SERVER, DELL POWEREDGE 2850)	208 (100-240)	2.80	2.2	2	50/60	435	I	N/A	D	0.95 LAGGING	N/A	N/A	1484	20 TO 80	5 TO 95	10 TO 35	-40 TO 65	71	N/A	70.5	N/A	N/A	N/A	3.38	17.6	29.79	-
PRI_CP-EXP_4 (SERVER, DELL POWEREDGE 2850)	208 (100-240)	2.80	2.2	2	50/60	435	I	N/A	D	0.95 LAGGING	N/A	N/A	1484	20 TO 80	5 TO 95	10 TO 35	-40 TO 65	71	N/A	70.5	N/A	N/A	N/A	3.38	17.6	29.79	-
PRI_CP-EXP_5 (SERVER, DELL POWEREDGE 2850)	208 (100-240)	2.80	2.2	2	50/60	435	I	N/A	D	0.95 LAGGING	N/A	N/A	1484	20 TO 80	5 TO 95	10 TO 35	-40 TO 65	71	N/A	70.5	N/A	N/A	N/A	3.38	17.6	29.79	-
PRI_CP-EXP_6 (SERVER, DELL POWEREDGE 2850)	208 (100-240)	2.80	2.2	2	50/60	435	I	N/A	D	0.95 LAGGING	N/A	N/A	1484	20 TO 80	5 TO 95	10 TO 35	-40 TO 65	71	N/A	70.5	N/A	N/A	N/A	3.38	17.6	29.79	-
COMBINED TOTALS FOR ROW 5 BAY 6 CABINET	208 (200-240)	20.27	15.45	2	50/60	3057				.95			10432	25 TO 80	N/A	10 TO 35	N/A							84	24	40	-
ROW 5 BAY 8 (EXISTING CABINET)																											
EXISTING INSTALLED EQUIPMENT	120	6	4	1	50/60	461	I	N/A	D	0.96 LAGGING	N/A	N/A	1573	8 TO 85	5 TO 95	10 TO 35	-40 TO 65	N/A	N/A	N/A	N/A	N/A	N/A	84	24	40	
PRI_VERITY_1 (SERVER, DELL POWEREDGE 6850)	120 (200-240)	7.97	6.24	1	50/60	719	I	N/A	D	0.96 LAGGING	N/A	N/A	2453	8 TO 85	5 TO 95	10 TO 35	-40 TO 65	314	N/A	112.5	N/A	N/A	N/A	6.8	17.6	27.6	-
PRI_VERITY_2 (SERVER, DELL POWEREDGE 6850)	120 (200-240)	7.97	6.24	1	50/60	719	I	N/A	D	0.96 LAGGING	N/A	N/A	2453	8 TO 85	5 TO 95	10 TO 35	-40 TO 65	314	N/A	112.5	N/A	N/A	N/A	6.8	17.6	27.6	-
PRI_SQL_1 (SERVER, DELL POWEREDGE 6850)	120 (200-240)	7.97	6.59	1	50/60	759	I	N/A	D	0.96 LAGGING	N/A	N/A	2590	8 TO 85	5 TO 95	10 TO 35	-40 TO 65	314	N/A	112.5	N/A	N/A	N/A	6.8	17.6	27.6	-
PRI_SQL_2 (SERVER, DELL POWEREDGE 6850)	120 (200-240)	7.97	6.59	1	50/60	759	I	N/A	D	0.96 LAGGING	N/A	N/A	2590	8 TO 85	5 TO 95	10 TO 35	-40 TO 65	314	N/A	112.5	N/A	N/A	N/A	6.8	17.6	27.6	-
COMBINED TOTALS FOR RACK	120 (200-240)	37.88	29.66	1	50/60	3417	I	N/A	D	0.95 LAGGING	N/A	N/A	11659	8 TO 85	5 TO 95	10 TO 35	-40 TO 65	N/A	N/A	N/A	N/A	N/A	N/A	84	24	40	

TABLE 12-B
TABULATION OF DATA

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	B	023-000-2080000	A

SCALE: NONE SHEET 2

GENERAL NOTES:

1. REFER TO REFERENCE 1 FOR LISTING OF DRAWINGS PERTAINING TO THIS INSTALLATION.
2. REFER TO REFERENCE 2 FOR CABINET GROUNDING DETAILS.
3. REFER TO REFERENCE 3 FOR EQUIPMENT AND CABINET LABELING DETAILS.

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST	1	28687-080000-A040-000-2080000-000-	-
PARTS LIST CONTINUATION	2	"	-
BUILDING NH-95 TECH CONTROL CABLE ROUTING LAYOUT FLOOR PLAN VIEW	3	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

PARTS LIST

ITEM	DESCRIPTION	FURN BY	QTY	U/M	NSN	SUPPLIER OR MFGR.	PART NUMBER	REMARKS
1	4MB X 32 EDO SIMM 16MB	CONTR	8	EA		ICS	TNS-40032-60	
2	BLANK A PANEL, 1-3/4"	CONTR	15	EA		CALIFORNIA CHASSIS	PWHA-10	
3	BLANK B PANEL, 3-1/2"	CONTR	1	EA		CALIFORNIA CHASSIS	PWHA-11	
4	BLANK D PANEL, 7.0"	CONTR	1	EA		CALIFORNIA CHASSIS	PWHA-13	
5	BLANK E PANEL, 8-3/4"	CONTR	1	EA		CALIFORNIA CHASSIS	PWHA-14	
6	BLANK H PANEL, 14.0"	CONTR	2	EA		CALIFORNIA CHASSIS	PWHA-17	
7	CIRCUIT CARD, DUAL PORT, PCI, RS-232	CONTR	1	EA		ICS	COMM232PCI/2-55	
8	CIRCUIT CARD, ISA, 8 PORT	CONTR	2	EA		CONNECT TECH INC.	DFLEX-8	
9	COMPUTER, RACK MOUNT CHASSIS	CONTR	1	EA		ICS	7415B6-23V-B4	
10	CP-2388/WR, P/O AN/WRR-12	GOVT	2	EA		SSCSD	CP-2388/WR	
11	CRYPTOGRAPHIC UNIT	GOVT	2	EA		DCMS	KOV-17	
12	CV-4331/WR, P/O AN/WRR-12	GOVT	2	EA		SSCSD	CV-4331/WR	
13	ENCLOSURE, RACK MOUNT, 20 SLOT	GOVT	2	EA		VERSITRON	HF-20	
14	FIBER OPTIC MODEM (RECEIVER)	GOVT	8	EA		VERSITRON	F2932	
15	FIBER OPTIC MODEM (TRANSMITTER)	GOVT	8	EA		VERSITRON	F2902	
16	KEYBOARD, RACK MOUNT	CONTR	1	EA		ICS	6531-KB3M	
17	MOBILE DRIVE, 2.1GB	CONTR	1	EA		SYMMATEC	5300001	
18	MOBILE DRIVE, INTERNAL STATION	CONTR	1	EA		SYMMATEC	5300000	
19	MONITOR ENCLOSURE	CONTR	1	EA		ICS	6531-UMMK	
20	NETWORK PATCH PANEL	CONTR	1	EA		L-COM	T110P-48B	
21	POWER SUPPLY, 115/230 VAC	CONTR	4	EA		VERSITRON	AC150W	
22	SHELF, EQUIPMENT, FIXED	CONTR	1	EA		EMCOR	SH-25A	
23	SWITCH BOX, RACK MOUNT CHASSIS	CONTR	2	EA		BLACK BOX	SR000A	
24	SWITCH BOX, SWITCH CARD, ABC	CONTR	16	EA		BLACK BOX	SR025	
25	VGA COLOR MONITOR	CONTR	2	EA		COTS		
26	COMPUTER, WINOTAM	CONTR	1	EA		COTS		

LEGEND:

(E) EXISTING
(N) NEW
(T) TRANSMIT
(R) RECEIVE
(F) FRONT
(EA) EACH
(CONTR) CONTRACTOR
(GOVT) GOVERNMENT

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: 2009/04/02. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO, CODE 4.2 OR PEO C4I AND SPACE.

INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
3	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLTION, LABELING DETAILS	120-000-2080000
2	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MISC INSTALLATION DETAILS	180-000-2080000
1	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

UNLESS OTHERWISE NOTED, DIMENSION UNITSS ARE ARCHITECTURAL (IN INCHES OR FEET AND INCHES).

TOLERANCES ARE +/- 1/2" FOR POSITIONING OF RACKS AND CABINETS IN RELATION TO THE RAISED FLOOR TILE GRID.

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/SSEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000
DEVELOPING AGENT
ADDRESS
ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
FLOOR PLANS AND ELEVATIONS

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	040-000-2080000	-

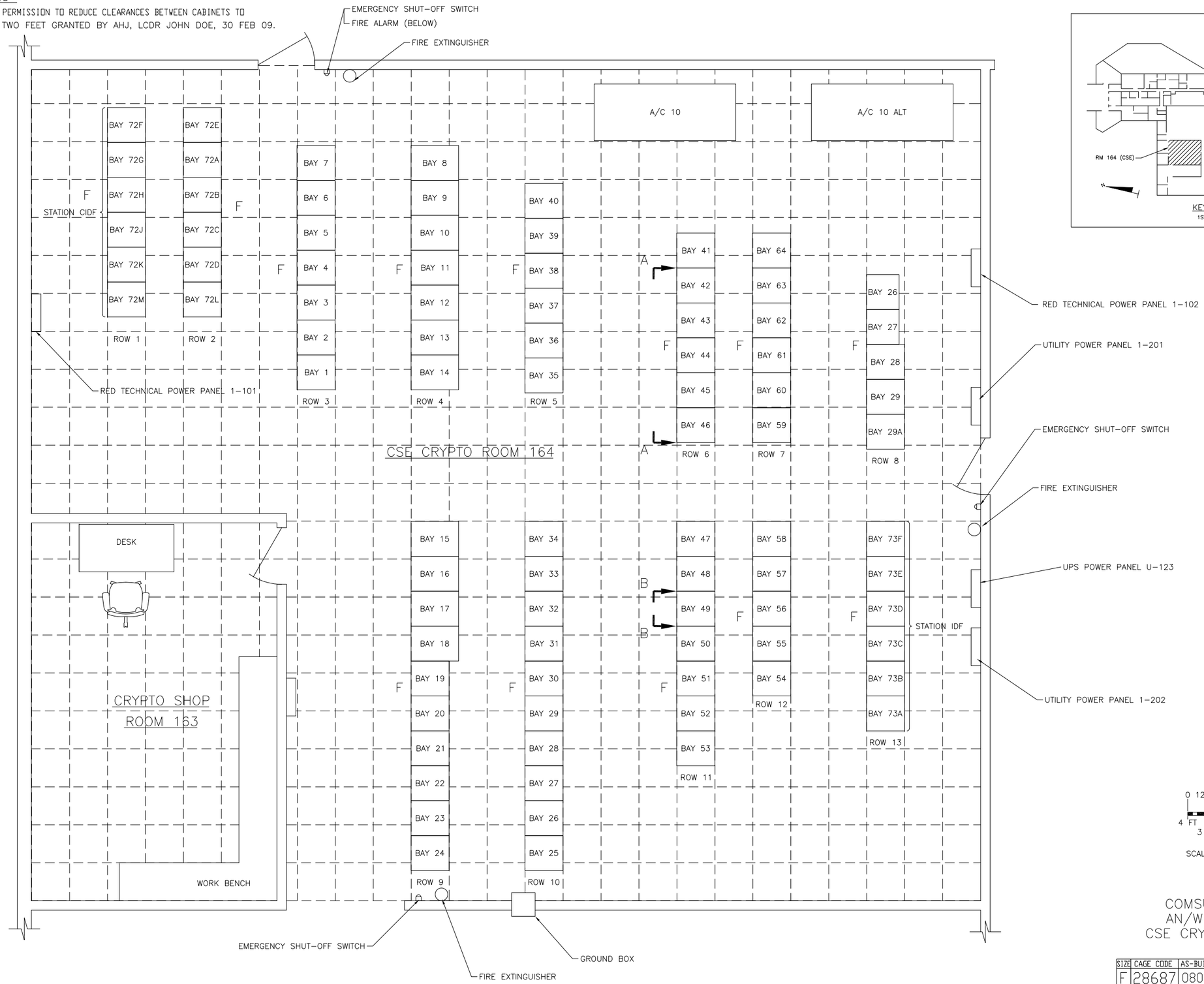
SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 3

FLOOR PLANS AND ELEVATIONS
(DRAWING TYPE CODE 040)

ATTACHMENT 7
(SHEET 1 OF 3)

NOTES:

A. PERMISSION TO REDUCE CLEARANCES BETWEEN CABINETS TO TWO FEET GRANTED BY AHJ, LCDR JOHN DOE, 30 FEB 09.



COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
CSE CRYPTO ROOM 164 FLOOR PLAN

INSTALLATION DESIGN PLAN

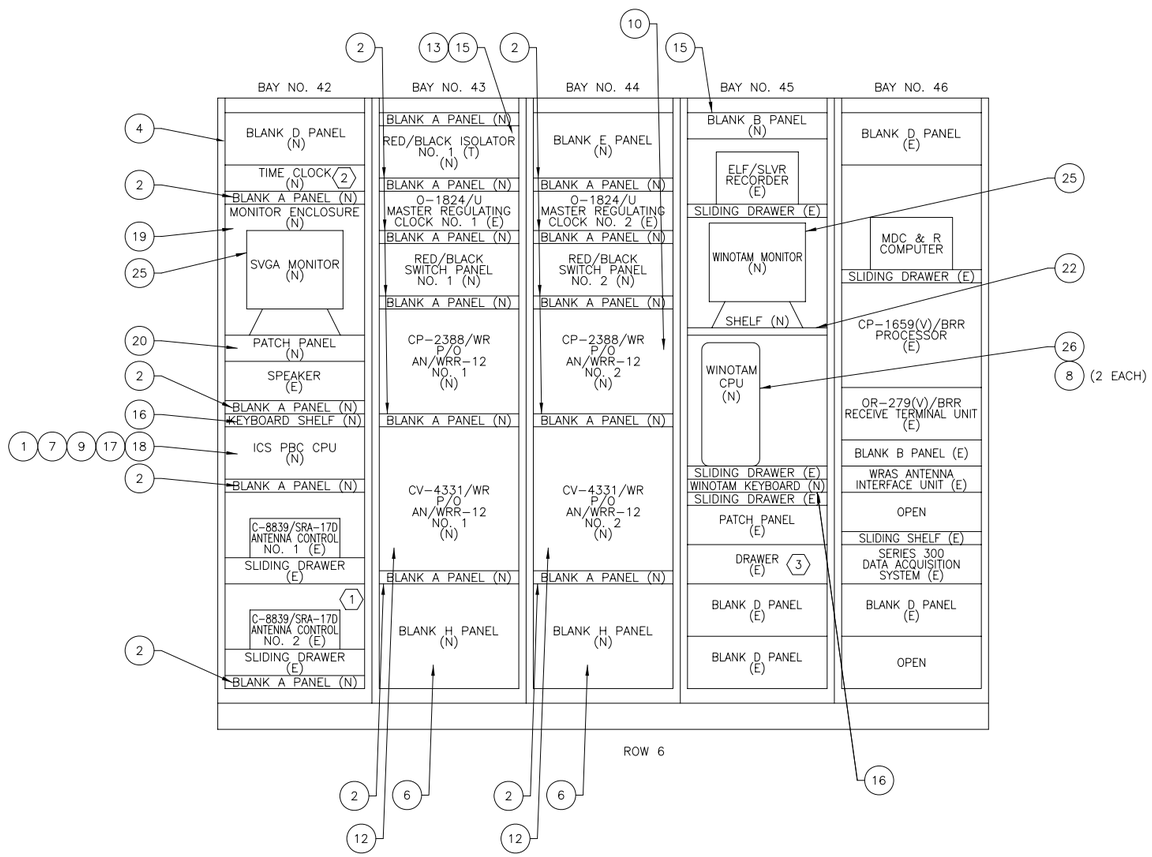
SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	040-000-2080000	-
SCALE: 1/30				SHEET 2	

ATTACHMENT 7
(SHEET 2 OF 3)

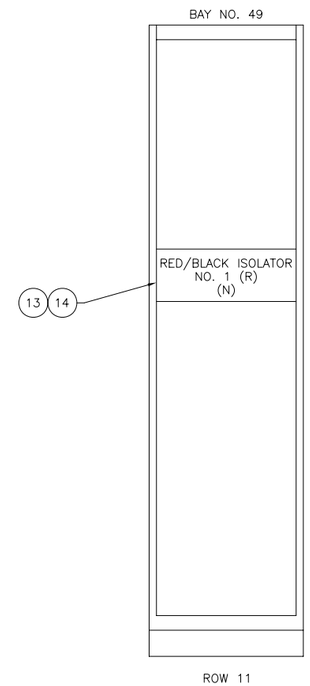
FLOOR PLANS AND ELEVATIONS
(DRAWING TYPE CODE 040)

NOTES:

1. RELOCATED FROM BAY 44.
2. RELOCATED FROM BAY 41.
3. QCP TB-1A/1B MOUNTED IN REAR OF BAY 45 IN THIS LOCATION.



ELEVATION "A-A"



ELEVATION "B-B"

COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
CSE CRYPTO ROOM 164 EQUIPMENT ELEVATION

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	040-000-2080000	-

SCALE: 1/4 SHEET 3

ATTACHMENT 7
(SHEET 3 OF 3)

FLOOR PLANS AND ELEVATIONS
(DRAWING TYPE CODE 040)

GENERAL NOTES:

1. SEE REFERENCE 1 FOR LISTING OF DRAWINGS PERTAINING TO THIS INSTALLATION.
2. SEE REFERENCE 2 FOR CABLE IDENTIFICATION AND INSTALLATION.
3. SEE REFERENCE 3 FOR CABLE LADDER INSTALLATION DETAILS.
4. SEE REFERENCE 4 FOR ANTENNA ASSEMBLY AND MOUNTING DETAILS.
5. SEE REFERENCE 5 FOR ANTENNA GROUNDING AND LIGHTNING PROTECTION DETAILS.
6. LABEL EACH ANTENNA WITH AN ENGRAVED PLATE AS SHOWN IN REFERENCE 6.

SHEET INDEX

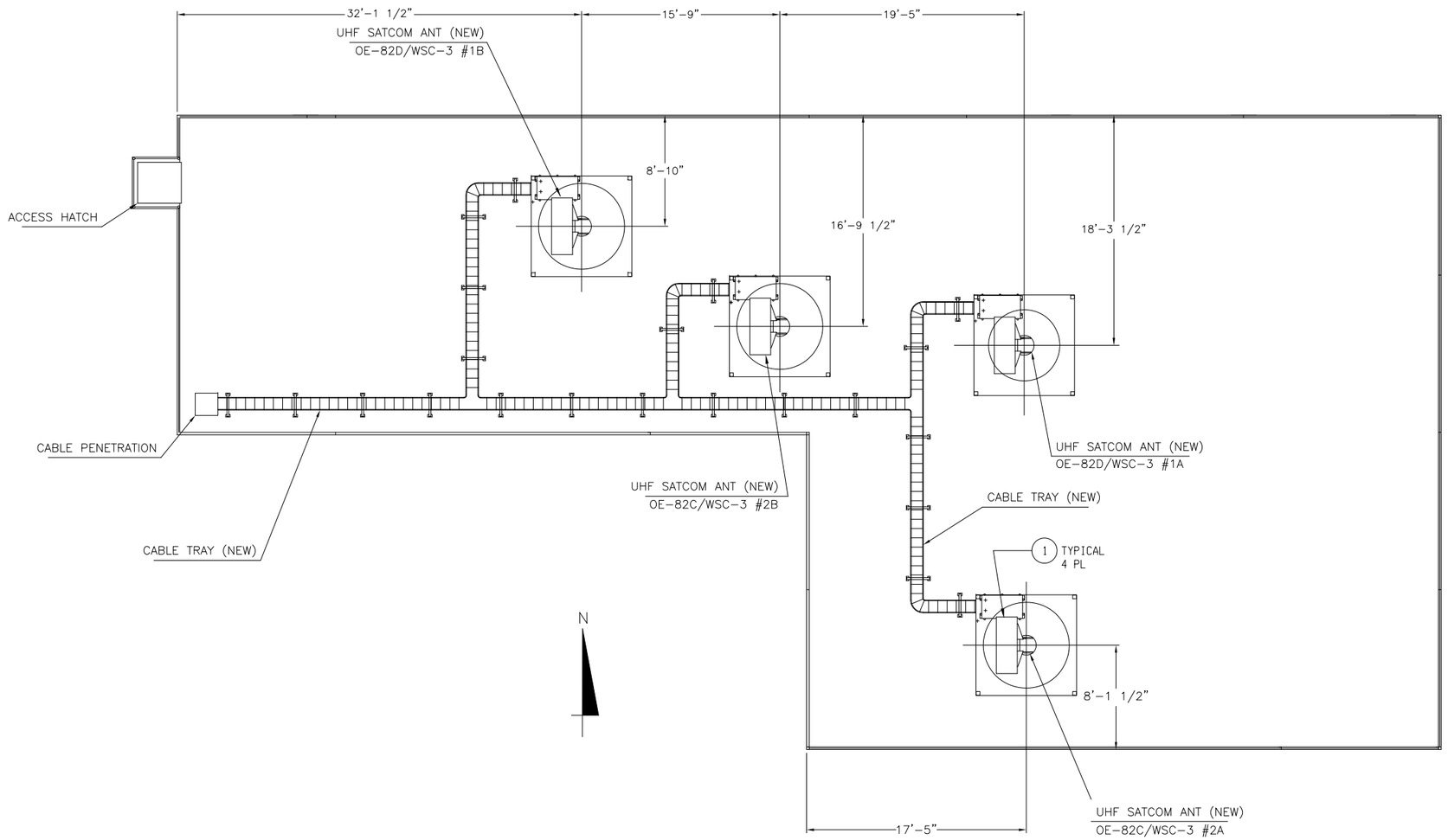
CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES, PLAN VIEW & PARTS LIST	1	28687-080000-A050-000-2080000-000-	-
ANTENNA ELEVATIONS	2	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

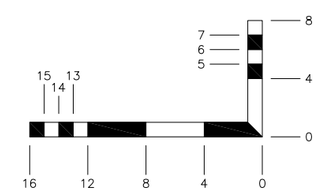
PARTS LIST

FIND	DESCRIPTION	FURN BY	QTY	U/M	NSN	SUPPLIER OR MFGR.	PART NUMBER	REMARKS
1	ANTENNA, UHF SATCOM	SWE	4	EA		SPAWAR	OE-82D/WSC-3	
2								
3								



ANTENNA PLAN VIEW

PLATFORM NO.1



GRAPHIC SCALE IN FEET
(FOR F SIZE PLOT, 1/4" = 1')

LEGEND:

SWE - SUPPLIED WITH EQUIPMENT
U/M - UNIT OF MEASURE
APPD - APPROVED
FURN BY - FURNISHED BY
MFGR - MANUFACTURER
PE - PROJECT ENGINEER
ISEA - IN-SERVICE ENGINEERING AGENT
CHKD - CHECKED
ANT - ANTENNA
SPRT - SUPPORT
REF X - PHYSICAL REFERENCE POINT X

NO.	DRAWING TITLE	DWG NO.
6	COMSUBGRU 10 KINGS BAY, GA AN/WSC-3 INSTALLATION, LABELING DETAILS	120-000-2080000
5	COMSUBGRU 10 KINGS BAY, GA AN/WSC-3 INSTALLATION, MISC INSTALLATION DETAILS	180-000-2080000
4	COMSUBGRU 10 KINGS BAY, GA AN/WSC-3 INSTALLATION, MECH ASSY & MOUNTING DETAILS	171-000-2080000
3	COMSUBGRU 10 KINGS BAY, GA AN/WSC-3 INSTALLATION, CABLE ROUTING LAYOUTS	160-000-2080000
2	COMSUBGRU 10 KINGS BAY, GA AN/WSC-3 INSTALLATION, CABLING BLOCK DIAGRAMS	070-000-2080000
1	COMSUBGRU 10 KINGS BAY, GA AN/WSC-3 INSTALLATIND, MASTER DRAWINGS	020-000-2080000

REFERENCE DRAWING(S)

UNLESS OTHERWISE NOTED, DIMENSION UNITSS ARE ARCHITECTURAL (IN INCHES OR FEET AND INCHES).

TOLERANCES ARE +/- 2 INCHES FOR ALL ANTENNA POSITIONS SHOWN.

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000
DEVELOPING AGENT
ADDRESS
ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

DISTRIBUTION AUTHORIZED TO U. S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: 2009/04/01. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO, CODE 4.2 OR PEO C4I AND SPACE.

INSTALLATION DESIGN PLAN

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

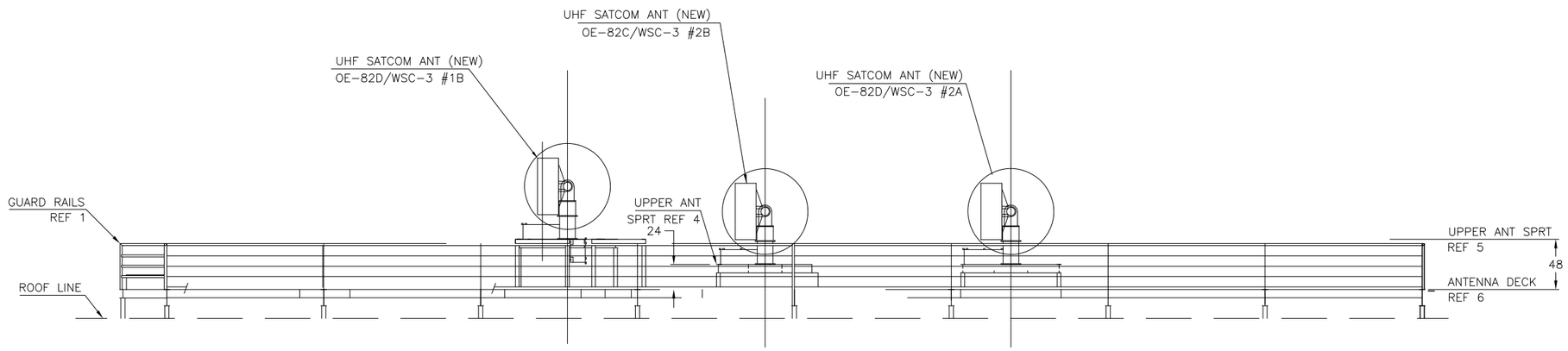
COMSUBGRU 10 KINGS BAY, GA
AN/WSC-3 INSTALLATION
ANTENNA LAYOUT & ELEVATION

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	050-000-2080000	-

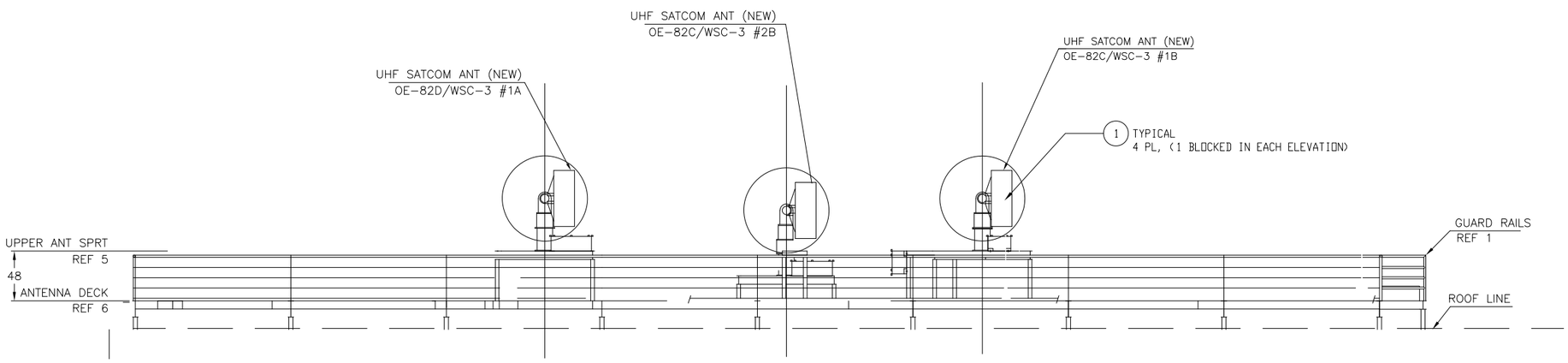
SCALE: 1/4 IN = 1 FT MASS (WEIGHT): N/A SHEET 1 OF 2

ANTENNA LAYOUT & ELEVATION
(DRAWING TYPE CODE 050)

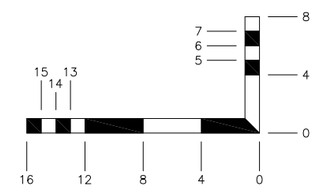
ATTACHMENT 8
(SHEET 1 OF 2)



NORTH FACING ELEVATION
PLATFORM NO.1



SOUTH FACING ELEVATION
PLATFORM NO.1



GRAPHIC SCALE IN FEET

COMSUBGRU 10 KINGS BAY, GA
AN/WSC-3 INSTALLATION
ANTENNA LAYOUT & ELEVATION

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	000000	A	050-000-2080000	–

SCALE: 1/4 IN = 1 FT | SHEET 2

ANTENNA LAYOUTS & ELEVATION
(DRAWING TYPE CODE 050)

ATTACHMENT 8
(SHEET 2 OF 2)

GENERAL NOTES:

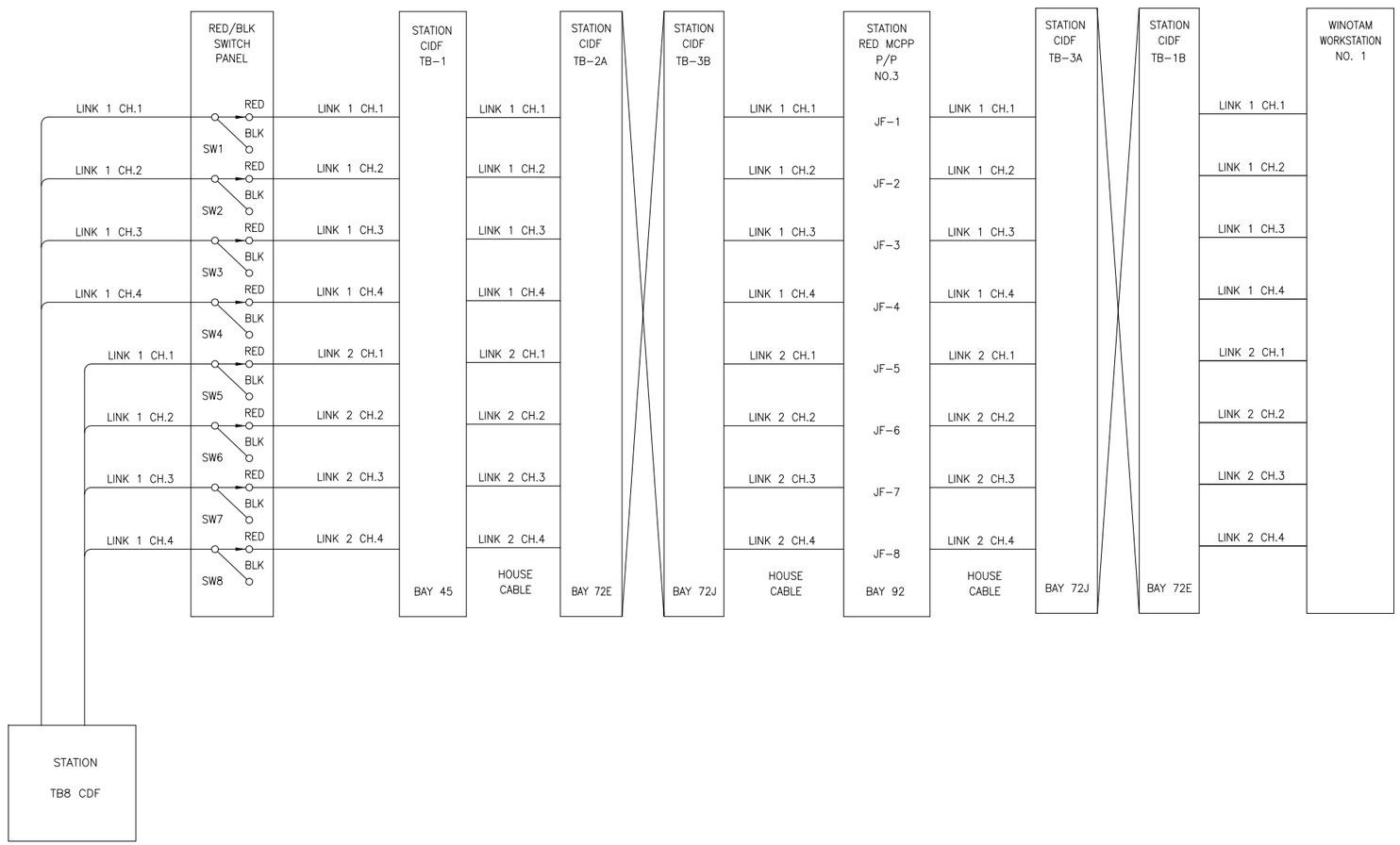
1. REFER TO REFERENCE 1 FOR LISTING OF DRAWINGS PERTAINING TO THIS INSTALLATION.
2. REFER TO REFERENCE 2 FOR EQUIPMENT CABLING CONFIGURATION.

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
SIMPLIFIED BLOCK DIAGRAM	1	28687-080000-A060-000-2080000-000-	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED



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INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
3	COMSUBGRU KINGS BAY, GA NETWORK SYSTEM LABELING DETAILS	120-000-2080000
2	COMSUBGRU KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, BLOCK DIAGRAM	070-000-2080000
1	COMSUBGRU KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000

DEVELOPING AGENT ADDRESS ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
SIMPLIFIED BLOCK DIAGRAM

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	060-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 1

SIMPLIFIED BLOCK DIAGRAMS
(DRAWING TYPE CODE 060)

ATTACHMENT 9
(SHEET 1 OF 1)

GENERAL NOTES:

1. REFER TO REFERENCE 1 FOR LISTING OF DRAWINGS PERTAINING TO THIS INSTALLATION.
2. REFER TO REFERENCE 2 FOR EQUIPMENT CABLING CONFIGURATION.
3. REFER TO REFERENCE 3 FOR CABLE CONFIGURATION AND PINOUT DETAILS.
4. PROVIDED WITH EQUIPMENT

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST	1	28687-080000-A070-000-2080000-000-	-
SYSTEM NO. 1 CABLING BLOCK DIAGRAM	2	"	-
SYSTEM NO. 2 CABLING BLOCK DIAGRAM	3	"	-
SYSTEM NO. 3 CABLING BLOCK DIAGRAM	4	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

ITEM	DESCRIPTION	FURN BY	QTY	U/M	NSN	SUPPLIER OR MFGR.	PART NUMBER	REMARKS
1	ADAPTER, BNC FEMALE TO TRIAX MALE	GOVT	6	EA		TROMPETER	ADBJ20-E3-PL375	
2	ADAPTER, BNC MALE TO TYPE N FEMALE	GOVT	1	EA		POMONA	3535	
3	BACKSHELL, DB-25	GOVT	80	EA		NORTHERN TECHNOLOGIES	C88320000	
4	BACKSHELL, DE-9	GOVT	8	EA		NORTHERN TECHNOLOGIES	C88E000000	
5	CABLE, 2PR, 22AWG, OA SHIELD	CONTR	750	FT		BELDEN	8302	
6	CABLE, 2PR, OA SHIELD, SOLID	CONTR	2000	FT		BELDEN	9302	
7	CABLE, 4PR, CAT5, UNSHIELDED	CONTR	200	FT		COMMSCOPE	55N4	
8	CABLE, 8PR, 22AWG, DOUBLE SHIELDED	CONTR	300	FT		BELDEN	8308	
9	CABLE, RF, DOUBLE SHIELDED	CONTR	400	FT			RG-223	
10	CABLE ASSEMBLY, 14AWG, POWER	CONTR	4	EA		BELDEN	17614	
11	CABLE ASSEMBLY, FIBER OPTIC	CONTR	2	EA		ANICOM	KFO 10078	JR TO J17
12	CABLE ASSEMBLY, FIBER OPTIC, 100FT	CONTR	8	EA		VERSITRON		
13	CONNECTOR	GOVT	4	EA	5935-00-490-5219		M24308/2-1	
14	CONNECTOR	GOVT	40	EA			M24308/3-3	DB-25P SOLDER
15	CONNECTOR	GOVT	40	EA	5935-00-489-9999		M24308/4-3	DB-25P
16	CONNECTOR	GOVT	4	EA	5936-01-282-2053		M24308/4-1F	DE-9P
17	CONNECTOR	GOVT	3	EA			M24308/4-15	
18	CONNECTOR	GOVT	2	EA			M28840/26CA1AAP1	J5
19	CONNECTOR	GOVT	2	EA			M28840/26CB1CAP1	J5 CV CHASSIS
20	CONNECTOR	GOVT	2	EA			M28840/26CB1CAS1	J4
21	CONNECTOR	GOVT	2	EA			M28840/26CC1BAG1	J6 CV CHASSIS
22	CONNECTOR	GOVT	2	EA			M28840/26CD1AAP1	J9
23	CONNECTOR	GOVT	2	EA	5935-00-509-6194		MS3106F14S-7S	
24	CONNECTOR	GOVT	2	EA	5935-03-231-3180		MS3106F16-10S	
25	CONNECTOR	GOVT	2	EA			MS3116F8-4P	MDC & R J1A
26	CONNECTOR	GOVT	2	EA	5935-01-084-8588		MS3406DJ11A-3S	
27	CONNECTOR	GOVT	4	EA	5935-01-134-9787		MS3406DJ11A-3S	
28	CONNECTOR, RECEPTACLE	GOVT	3	EA		CHAMP	552064-1	
29	CONNECTOR, RJ-45	GOVT	1	PK		L-COM	TSP3088R	
30	CONNECTOR, UG-88C	GOVT	20	EA	5935-00-815-9668			
31	COVER, STRAIN RELIEF	CONTR	3	EA		CHAMP	552011	USE WITH ITEM 27
32	LUG, TERMINAL, NO. 10, 12AWG	CONTR	25	EA		T & B	RC-363	
33	PIN, CONNECTOR	CONTR	25	EA			M39029/84-452	USE WITH ITEM 19
34	SCREW LOCK KIT, CONNECTOR	CONTR	3	EA		CHAMP	229911-1	USE WITH ITEM 27
35	SPLITTER, 2 WAY, RF	CONTR	3	EA		MINI-CIRCUITS	ZSC-2-2	
36	WIRE, 12AWG, STRANDED, GREEN	CONTR	25	FT		ALPHA WIRE	THHN-12	
37	WIRE, 22AWG, SOLID, BLACK	CONTR	100	FT		BELDEN	8530-10	
38	WIRE, 22AWG, SOLID, WHITE	CONTR	2000	FT		BELDEN	8530-9	
39	WIRE, 22AWG, SOLID, WHITE, GREEN	CONTR	2000	FT		BELDEN	8530-16	

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INSTALLATION DESIGN PLAN

REFERENCE DRAWING(S)

NO.	DRAWING TITLE	DWG NO.
4	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, LABELING DETAILS	120-000-2080000
3	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, CABLE RUNNING SHEETS	080-000-2080000
2	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, CIRCUIT DIAGRAMS	110-000-2080000
1	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MASTER DRAWING	020-000-2080000

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000

DEVELOPING AGENT ADDRESS ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

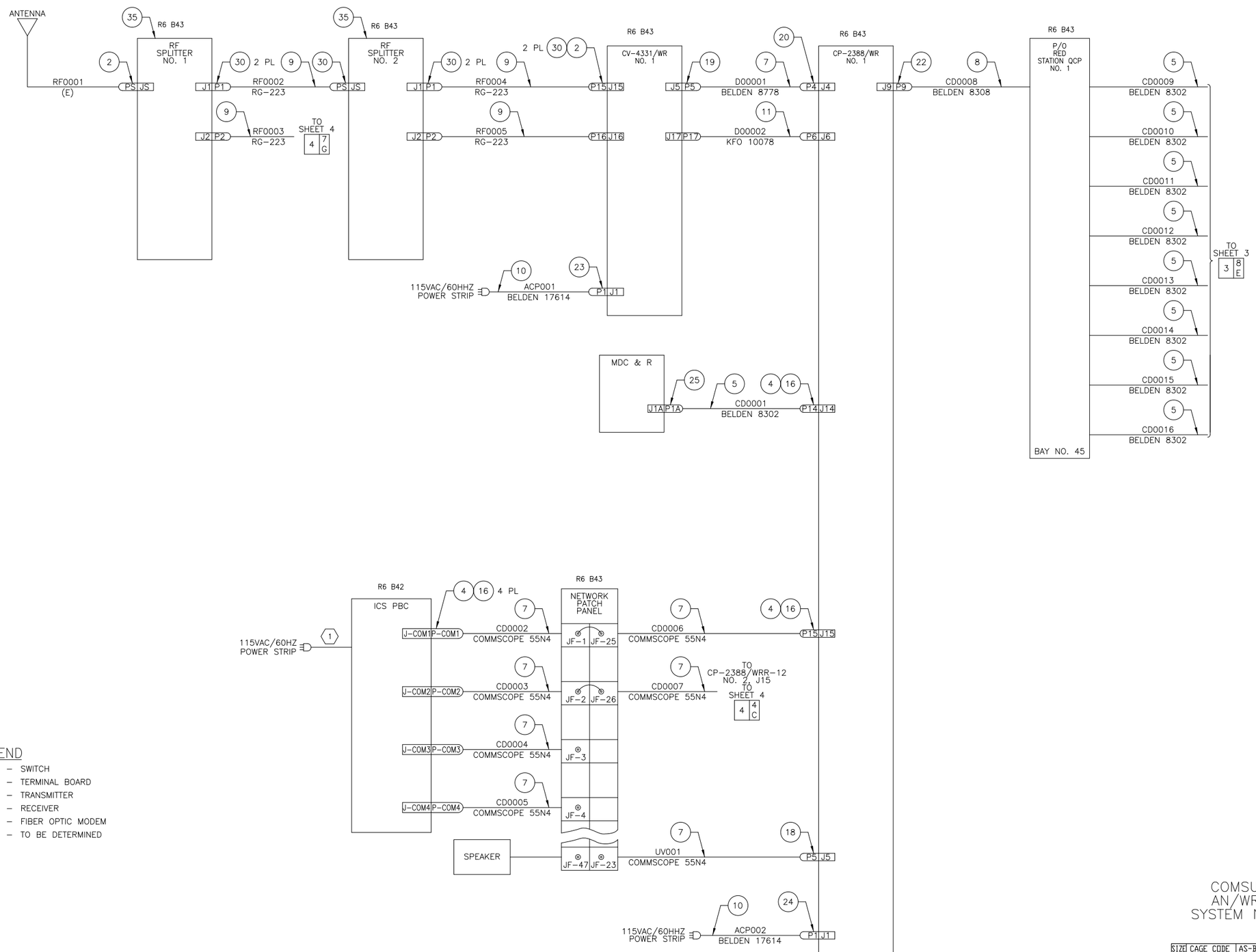
COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
CABLE BLOCK DIAGRAM

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	070-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 2

CABLE BLOCK DIAGRAM
(DRAWING TYPE CODE 070)

ATTACHMENT 10
(SHEET 1 OF 2)



LEGEND

SW	–	SWITCH
TB	–	TERMINAL BOARD
(T)	–	TRANSMITTER
(R)	–	RECEIVER
(FOM)	–	FIBER OPTIC MODEM
(TBD)	–	TO BE DETERMINED

COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
SYSTEM NO. 1 CABLE BLOCK DIAGRAM

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	000000	A	070-000-2080000	–

SCALE: NONE SHEET 2

ATTACHMENT 10
(SHEET 2 OF 2)

CABLE BLOCK DIAGRAM
(DRAWING TYPE CODE 070)

NTS ANYTOWN		MR. MAGOO	3/08
PLATFORM	REV	SURVEY	DATE

PLATFORM APPLICABILITY

INSTALLATION DESIGN PLAN

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SPAWAR APPROVAL

PE/ISEA	DATE
REVIEWER	
APPROVAL	
APPD FOR SPAWAR	

AUTHORITY:

THIS DRAWING MODIFIES NO KNOWN DRAWING

DEVELOPING AGENT LOGO

CAGE CODE 55910

SPACE AND NAVAL WARFARE SYSTEMS CENTER
53560 HULL STREET
SAN DIEGO, CA 92152-5001

DSGN	DATE
CHKD	
APVD	

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

NAVY TRAINING SITE, ANYTOWN
AN/USQ-172(V)2 (GCCS-M) INSTALLATION
CABLE RUNNING SHEETS

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
A	28687	080000	A	080-000-2080000	–

SCALE: NONE

SHEET 1 OF 8

ATTACHMENT 11 (SHEET 1 OF 8)

CABLE RUNNING SHEETS (DRAWING TYPE CODE 080)

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
A	28687	080000	B	080-000-2080000	-
SCALE: NONE				SHEET 2	

ATTACHMENT 11 (SHEET 2 OF 8)

CABLE RUNNING SHEETS (DRAWING TYPE CODE 080)

1	2	3	4	5	6	7	8
–	–	–	–	–	–	–	–

REVISION STATUS OF SHEETS

NO.	DRAWING TITLE	DWG NO.
4	NTS ANYTOWN, GCCS–M GENSER 4.X FORCE LEVEL AN/USQ–172(V)2 INSTALLATION CABLE BLOCK DIAGRAM	070–000–2080000
3	NTS ANYTOWN, GCCS–M GENSER 4.X FORCE LEVEL AN/USQ–172(V)2 INSTALLATION LABELING DETAILS	120–000–2080000
2	NTS ANYTOWN, GCCS–M GENSER 4.X FORCE LEVEL AN/USQ–172(V)2 INSTALLATION MASTER DRAWING	020–000–2080000
1	NTS ANYTOWN, GCCS–M GENSER 4.X FORCE LEVEL AN/USQ–172(V)2 MISCELLANEOUS INSTALLATION DETAILS	180–000–2080000

REFERENCES

SIZE	CAGE CODE	AS–BUILT ID	IA CODE	DRAWING NO.	REV
A	28687	080000	B	080–000–2080000	–

SCALE: NONE

SHEET 3

ATTACHMENT 11
(SHEET 3 OF 8)

CABLE RUNNING SHEETS
(DRAWING TYPE CODE 080)

GENERAL NOTES

1. THIS DESIGN INCLUDES CABLE THAT WILL BE ROUTED ABOVE CEILINGS & BELOW FLOORS. CABLE IS "PLENUM RATED" IN ACCORDANCE WITH UFC 3-600-01 PARA 6-8.1.3.
2. GROUNDING, BONDING AND SHIELDING FOR SHORE INSTALLATIONS WILL BE IN ACCORDANCE WITH REFERENCE 1.
3. ALL OTHER DRAWINGS PERTAINING TO THIS INSTALLATION ARE LISTED IN REFERENCE 2.
4. ENGINEERING DATA IS NOT REQUIRED TO SUPPORT THIS DRAWING.
5. THE PURPOSE OF THIS DRAWING IS TO PROVIDE A LIST OF CONNECTIONS
6. ABBREVIATIONS ARE IN ACCORDANCE WITH ASME Y14.38 EXCEPT FOR THE FOLLOWING: RX=RECEIVE, TX=TRANSMIT.
7. LABEL CABLE PER REFERENCE 3.
9. MANUFACTURER'S OR INDUSTRY STANDARD MINIMUM CABLE BEND RADII ARE STATED ON REFERENCE 4 AND SHALL BE OBSERVED.

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
A	28687	080000	B	080-000-2080000	-
SCALE: NONE				SHEET 4	

ATTACHMENT 11 (SHEET 4 OF 8)

CABLE RUNNING SHEETS (DRAWING TYPE CODE 080)

CIRCUIT INDEX SHEET

SHEET NUMBER	CONTENT
1	COVER SHEET
2	REVISIONS
3	REFERENCES
4	GENERAL NOTES
5	INDEX
6	CABLE NO. D05000
7	CABLE NO. RGB0001
7	CABLE NO. RGB0002
8	CABLE NO. FM0051
8	CABLE NO. FM0052
8	CABLE NO. FM0053

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
A	28687	080000	B	080-000-2080000	–
SCALE: NONE				SHEET 5	

ATTACHMENT 11 (SHEET 5 OF 8)

CABLE RUNNING SHEETS (DRAWING TYPE CODE 080)

CABLE NO: D05000	CABLE TYPE: BELDEN 88107 (7.5 PAIR PLENUM SHIELDED)	ACTIVE COND: 13
UNIT NO:	UNIT A: KG-194A CRYPTO NO. 2	UNIT B: SB-4124C/WSC NO. 2
CONNECTOR:	MS27467T15F35S	DB-25 MALE
BACKSHELL:		TYCO 745833-7

NO.	COLOR	TERM	WIRE MARKING	TERM	WIRE MARKING	REMARKS
1	BLU/WHT	P4-11		P4E-2		SD (A)/TXCT
1	WHT/BLU	P4-12		P4E-14		SD (B)/TXCT RTN
2	ORN/WHT	P4-9		P4E-3		RD (A)/RXCT
2	WHT/ORN	P4-10		P4E-16		RD (B)/RXCT RTN
3	GRN/WHT	P4-13		P4E-15		ST (A)/BSC
3	WHT/GRN	P4-14		P4E-12		ST (B)/BSC
4	BRN/WHT	P4-17		P4E-17		RT (A)/RXCTCL
4	WHT/BRN	P4-18		P4E-9		RT (B)/RXCTCL RTN
5	GRA/WHT	P4-15		P4E-24		TT (A)/TXCTCL
5	WHT/GRA	P4-16		P4E-11		TT (B)/TXCTCL RTN
6	BLU/RED	P4-31		P4E-8		RC (A)/RESYNC
6	RED/BLU	P4-36		P4E-10		RC (B)/RESYNC RTN
7	ORN/RED	P4-19		P4E-7		SG
7	RED/ORN	GND		GND		SPARE NOTE 1
NO PR	GRAY	GND		GND		SPARE NOTE 1
		P4-8		P4E-1		CHASSIS GND NOTE 1

NOTES: 1. CONNECT SPARE CONDUCTORS TO CHASSIS GROUND OF EACH CONNECTOR AND TO BACKSHELL AT UNITS A AND B.

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
A	28687	080000	B	080-000-2080000	–
SCALE: NONE				SHEET 6	

ATTACHMENT 11 (SHEET 6 OF 8)

CABLE RUNNING SHEETS (DRAWING TYPE CODE 080)

CABLE NO: RGB0001		CABLE TYPE: K5310-1193				ACTIVE COND: 3
UNIT NO:		UNIT A: UNIT 49 VIDEO CONVERTER INTERFACE		UNIT B: AUDIO VIDEO SWITCHING UNIT		
CONNECTOR:		UPL 220-020 (BNC) (NOTE 1)		UPL 220-020 (BNC) (NOTE 1)		
BACKSHELL:						
NO.	COLOR	TERM	WIRE MARKING	TERM	WIRE MARKING	REMARKS
1	RED	1-RED		1-RED		RED SIGNAL
1						SHIELD/GROUND
2	GRN	1-GRN		1-GRN		GREEN SIGNAL
2						SHIELD/GROUND
3	BLU	1-BLU		1-BLU		BLUE SIGNAL
3						SHIELD/GROUND

CABLE NO: RGB0002		CABLE TYPE: K5310-1193				ACTIVE COND: 3
UNIT NO:		UNIT A: UNIT 49 VIDEO CONVERTER INTERFACE		UNIT B: AUDIO VIDEO SWITCHING UNIT		
CONNECTOR:		UPL 220-020 (BNC) (NOTE 1)		UPL 220-020 (BNC) (NOTE 1)		
BACKSHELL:						
NO.	COLOR	TERM	WIRE MARKING	TERM	WIRE MARKING	REMARKS
1	RED	2-RED		2-RED		RED SIGNAL
1						SHIELD/GROUND
2	GRN	2-GRN		2-GRN		GREEN SIGNAL
2						SHIELD/GROUND
3	BLU	2-BLU		2-BLU		BLUE SIGNAL
3						SHIELD/GROUND

NOTES: 1. QUANTITY 3 CONNECTORS REQUIRED ON EACH END OF CABLE.

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
A	28687	080000	B	080-000-2080000	-
SCALE: NONE				SHEET 7	

ATTACHMENT 11 (SHEET 7 OF 8)

CABLE RUNNING SHEETS (DRAWING TYPE CODE 080)

CABLE NO: FM0051			CABLE TYPE: CORNING MIC PLENUM 004K88-31130-29			ACTIVE COND: 2
UNIT NO:		UNIT A: SINGLE FIBER OPTIC DROP BOX NO. 4 SYM 435.1		UNIT B: ISNS GENSER SYSTEM LAN PATCH (100 BASE FX)		
CONNECTOR:		TWO DUPLEX MM LC, 3M 6601-D		TWO 3M 6300-W AND TWO 3M 6306-BE MULTIMODE SC		
BACKSHELL:						
NO.	COLOR	TERM	WIRE MARKING	TERM	WIRE MARKING	REMARKS
1	BLU	1A	BEIGE BOOT	1B	BEIGE BOOT (6306-BE)	TRANSMIT
2	ORN	1B	WHITE BOOT	1A	WHITE BOOT (6300-W)	RECEIVE
3	GRN	2A	BEIGE BOOT	2B	BEIGE BOOT (6306-BE)	SPARE
4	BRN	2B	WHITE BOOT	2A	WHITE BOOT (6300-W)	SPARE
CABLE NO: FM0052			CABLE TYPE: CORNING MIC PLENUM 004K88-31130-29			ACTIVE COND: 2
UNIT NO:		UNIT A: UNIT 03-002		UNIT B: ISNS GENSER SYSTEM LAN (100 BASE FX)		
CONNECTOR:		M83522/16-DNX (4 EA)		TWO 3M 6300-W AND TWO 3M 6306-BE MULTIMODE SC		
BACKSHELL:						
NO.	COLOR	TERM	WIRE MARKING	TERM	WIRE MARKING	REMARKS
1	BLU	J7 TX		3B	BEIGE BOOT (6306-BE)	TRANSMIT
2	ORN	J8 RX		3A	WHITE BOOT (6300-W)	RECEIVE
3	GRN	SPARE		4B	BEIGE BOOT (6306-BE)	SPARE
4	BRN	SPARE		4A	WHITE BOOT (6300-W)	SPARE
CABLE NO: FM0053			CABLE TYPE: CORNING MIC PLENUM 004K88-31130-29			ACTIVE COND: 2
UNIT NO:		UNIT A: UNIT 03-002		UNIT B: ISNS GENSER SYSTEM LAN (100 BASE FX)		
CONNECTOR:		M83522/16-DNX (4 EA)		TWO 3M 6300-W AND TWO 3M 6306-BE MULTIMODE SC		
BACKSHELL:						
NO.	COLOR	TERM	WIRE MARKING	TERM	WIRE MARKING	REMARKS
1	BLU	J11 TX		TBD RX	BEIGE BOOT (6306-BE)	TRANSMIT
2	ORN	J12 RX		TBD TX	WHITE BOOT (6300-W)	RECEIVE
3	GRN	SPARE		SPARE	BEIGE BOOT (6306-BE)	SPARE
4	BRN	SPARE		SPARE	WHITE BOOT (6300-W)	SPARE

NOTES: 1. ENSURE THAT ENDS OF UNUSED CONNECTORS ARE CAPPED AND SUPPORTED.

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
A	28687	080000	B	080-000-2080000	–
SCALE: NONE				SHEET 8	

ATTACHMENT 11 (SHEET 8 OF 8)

CABLE RUNNING SHEETS (DRAWING TYPE CODE 080)

		AGENT	
PLATFORM	REV	SURVEY	DT

PLATFORM APPLICABILITY

INSTALLATION DESIGN PLAN

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: 2009/04/01. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO, CODE 4.2 OR PEO C4I AND SPACE.

SPAWAR APPROVAL

PE/ISEA	DATE
REVIEWER	
APPROVAL	
APPD FOR SPAWAR	

AUTHORITY:

THIS DRAWING MODIFIES NO KNOWN DRAWING

DEVELOPING AGENT LOGO

CAGE CODE XXXXX

DEVELOPING AGENT
ADDRESS
ADDRESS

DSGN	DATE
CHKD	
APVD	

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

IDENTIFY SITE HERE
IDENTIFY SYSTEM HERE
CROSS CONNECT RECORDS

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
A	28687	080000	C	090-000-2080000	–

SCALE: NONE

SHEET 1 OF 6

ATTACHMENT 12 CROSS CONNECT RECORDS
(DRAWING TYPE CODE 090)
(SHEET 1 OF 6)

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

SIZE	CAGE CODE	IA CODE	AS-BUILT ID	DRAWING NO.	REV
A	28687	C	080000	090-000-2080000	–

SCALE: NONE

SHEET 2

ATTACHMENT 12 CROSS CONNECT RECORDS
(DRAWING TYPE CODE 090)
(SHEET 2 OF 6)

-	-	-	-	-	-
1	2	3	4	5	6

REVISION STATUS OF SHEETS

NO.	DRAWING TITLE	DWG NO.
5	IDENTIFY SITE HERE, IDENTIFY SYSTEM HERE MISCELLANEOUS INSTALLATION DETAILS	180-000-2080000
4	IDENTIFY SITE HERE, IDENTIFY SYSTEM HERE CABLE BLOCK DIAGRAM	070-000-2080000
3	IDENTIFY SITE HERE, IDENTIFY SYSTEM HERE SYSTEM ELEVATION DRAWING	040-000-2080000
2	IDENTIFY SITE HERE, IDENTIFY SYSTEM HERE DISTRIBUTION FRAME LAYOUT	100-000-2080000
1	IDENTIFY SITE HERE, IDENTIFY SYSTEM HERE INSTALLATION MASTER DRAWING	020-000-2080000

REFERENCES

SIZE	CAGE CODE	IA CODE	AS-BUILT ID	DRAWING NO.	REV
A	28687	C	080000	090-000-2080000	-

SCALE: NONE

SHEET 3

ATTACHMENT 12 (SHEET 3 OF 6)

CROSS CONNECT RECORDS (DRAWING TYPE CODE 090)

GENERAL NOTES

1. THE CONTENTS OF THIS DRAWING DESCRIBE THE SYSTEM INTERCONNECTIONS MADE ON THE INTERMEDIATE DISTRIBUTION FRAME (IDF) SHOWN IN REFERENCE 2.
2. THE LOCATIONS OF THE INDIVIDUAL TERMINAL BLOCKS (TB) WITHIN THE IDF ARE SHOWN IN REFERENCE 3.
3. ABBREVIATIONS ARE IN ACCORDANCE WITH ASME Y14.38 EXCEPT FOR THE COLOR CODES (SEE CHART ON SH 13) AND RX=RECEIVE AND TX=TRANSMIT.
4. SEE REFERENCE 4 PARTS LIST FOR CROSS-CONNECT WIRE ORDERING INFORMATION.
5. ALL CROSS-CONNECT TERMINATIONS ARE WIRE WRAP. USE A STANDARD WRAP WITH A MINIMUM OF FIVE TURNS.
6. ROWS J & K OF ALL TERMINAL BLOCKS ARE PERMANENTLY STRAPPED TO GROUND.
7. SEE REF 5, MISCELLANEOUS INSTALLATION DETAILS, FOR TERMINAL BLOCK GROUNDING METHODS.

SIZE	CAGE CODE	IA CODE	AS-BUILT ID	DRAWING NO.	REV
A	28687	C	080000	090-000-2080000	–
SCALE: NONE				SHEET 4	

ATTACHMENT 12 CROSS CONNECT RECORDS
(DRAWING TYPE CODE 090)
(SHEET 4 OF 6)

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TITLE			1
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GENERAL NOTES			4
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TB-1A GROUNDS	ATM SWITCH # 1	FRAME GROUND	6
TB-1A GROUNDS	ATM SWITCH # 2	FRAME GROUND	7
TB-1A TO 1B	ATM SWITCH # 1 & 2	TIMING EQUIPMENT	8
TB-1A TO 2A	ATM SWITCH # 1	USER TRUNK	9
TB-1A TO 2A	ATM SWITCH # 2	USER TRUNK	10
TB-1B GROUNDS	TIMING EQUIPMENT	FRAME GROUND	11
TB-2A GROUNDS	USER TRUNK	FRAME GROUND	12
COLOR CODE CHART			13

SIZE	CAGE CODE	IA CODE	AS-BUILT ID	DRAWING NO.	REV
A	28687	C	080000	090-000-2080000	–

SCALE: NONE

SHEET 5

ATTACHMENT 12 CROSS CONNECT RECORDS
(DRAWING TYPE CODE 090)
(SHEET 5 OF 6)

IDF #1 TERMINAL BLOCK 1A			CROSS-CONNECT	IDF #1 TERMINAL BLOCK 2A			
CABLE NUMBER	PAIR NUMBER	PIN NUMBER	WIRE COLOR	PIN NUMBER	PAIR NUMBER	CABLE NUMBER	FUNCTION
R-TE001	1-BLU	A1	BLK	A1	1-BLU	R-TE101	TX DATA (RING)
	1-WHT/B	B1	WHT	B1	1-WHT		TX DATA (TIP)
	3-GRN	E1	BLK	C1	2-ORN		RX DATA (RING)
	3-WHT/G	F1	WHT	D1	2-WHT		RX DATA (TIP)
R-TE002	1-BLU	A2	BLK	E1	3-GRN		TX DATA (RING)
	1-WHT/B	B2	WHT	F1	3-WHT		TX DATA (TIP)
	3-GRN	E2	BLK	G1	4-BRN		RX DATA (RING)
	3-WHT/G	F2	WHT	H1	4-WHT		RX DATA (TIP)
R-TE003	1-BLU	A3	BLK	A2	5-SLT		TX DATA (RING)
	1-WHT/B	B3	WHT	B2	5-WHT		TX DATA (TIP)
	3-GRN	E3	BLK	C2	6-BLU		RX DATA (RING)
	3-WHT/G	F3	WHT	D2	6-RED		RX DATA (TIP)
R-TE004	1-BLU	A4	BLK	E2	7-ORN		TX DATA (RING)
	1-WHT/B	B4	WHT	F2	7-RED		TX DATA (TIP)
	3-GRN	E4	BLK	G2	8-GRN		RX DATA (RING)
	3-WHT/G	F4	WHT	H2	8-RED		RX DATA (TIP)
R-TE005	1-BLU	A5	BLK	A3	9-BRN		TX DATA (RING)
	1-WHT/B	B5	WHT	B3	9-RED		TX DATA (TIP)
	3-GRN	E5	BLK	C3	10-SLT		RX DATA (RING)
	3-WHT/G	F5	WHT	D3	10-RED		RX DATA (TIP)
R-TE006	1-BLU	A6	BLK	E3	11-BLU		TX DATA (RING)
	1-WHT/B	B6	WHT	F3	11-BLK		TX DATA (TIP)
	3-GRN	E6	BLK	G3	12-ORN		RX DATA (RING)
	3-WHT/G	F6	WHT	H3	12-BLK		RX DATA (TIP)
R-TE007	1-BLU	A7	BLK	A4	13-GRN		TX DATA (RING)
	1-WHT/B	B7	WHT	B4	13-BLK		TX DATA (TIP)
	3-GRN	E7	BLK	C4	14-BRN		RX DATA (RING)
	3-WHT/G	F7	WHT	D4	14-BLK		RX DATA (TIP)
R-TE008	1-BLU	A8	BLK	E4	15-SLT		TX DATA (RING)
	1-WHT/B	B8	WHT	F4	15-BLK		TX DATA (TIP)
	3-GRN	E8	BLK	G4	16-BLU		RX DATA (RING)
	3-WHT/G	F8	WHT	H4	16-YEL		RX DATA (TIP)

SIZE	CAGE CODE	IA CODE	AS-BUILT ID	DRAWING NO.	REV
A	28687	C	080000	090-000-2080000	–

SCALE: NONE

SHEET 6

ATTACHMENT 12 CROSS CONNECT RECORDS
(DRAWING TYPE CODE 090)
(SHEET 6 OF 6)

GENERAL NOTES:

1. REFER TO REFERENCE 1 FOR LISTING OF DRAWINGS PERTAINING TO THIS INSTALLATION.

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST	1	28687-080000-A100-000-2080000-000-	-
TERMINAL BLOCK LAYOUT	2	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

	20	19	18	17	16	15	14
	UNUSED	MODEM MCP #1	AN/FCC-100 MCP #1	DCSS TRUNK DATA/CLOCK	UNUSED	PRIMARY ISLAND INTERCONNECT	UNUSED
H	10 X 26 WIREWRAP TO WIREWRAP BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK
	UNUSED	BLK M/C PATCH TRUNK CABLES	AN/FCC-100 MCP #2	DCSS TRUNK DATA/CLOCK	EMPTY	SECONDARY ISLAND INTERCONNECT	VF PATCH PNL VF14-81, 82
G	10 X 26 WIREWRAP TO WIREWRAP BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	NO TERMINAL BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK
	UNUSED	AN/FCC-100 MCP #8	AN/FCC-100 MCP #3	DCSS TRUNK DATA/CLOCK	ATTENUATOR #1-20 (R5B1)	LANDLINE TO AIR OPS & T-SITE	VF PATCH PNL VF14-83, 84
F	10 X 26 WIREWRAP TO WIREWRAP BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK
	UNUSED	AN/FCC-100 MCP #9	AN/FCC-100 MCP #4	DCSS TRUNK DATA/CLOCK	VSRT	LANDLINE TO T-SITE VIA AIR OPS	MOD 3480 #1, 2
E	10 X 26 WIREWRAP TO WIREWRAP BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK
	UNUSED	UNUSED	AN/FCC-100 MCP #5	DCSS TRUNK DATA/CLOCK	DAMA PATCH PNL	EMPTY	DSU AUTOMATED PATCH AND TEST
D	10 X 26 WIREWRAP TO WIREWRAP BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	NO TERMINAL BLOCK	4 X 50 PIN TELCO TO WIRE WRAP TERMINAL BLOCK
	UNUSED	AN/FCC-100 #1-6 ALARM	AN/FCC-100 MCP #6	DCSS TRUNK DATA/CLOCK	DAMA PATCH PNL	C-SITE LANDLINE	DCCS TRUNK MISC
C	10 X 26 WIREWRAP TO WIREWRAP BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK
	UNUSED	AN/FCC-100 #7-9 ALARM	AN/FCC-100 MCP #7	DCSS TRUNK DATA/CLOCK	DAMA PATCH PNL	EMPTY	EMPTY
B	10 X 26 WIREWRAP TO WIREWRAP BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	NO TERMINAL BLOCK	NO TERMINAL BLOCK
	UNUSED	HF MODEM	MODEM AUDIO	HSAM DATA	DAMA PATCH PNL WSC-3 MCPP	TELEX LANDLINE FLT CTR, ADMIN TELEX DISTR PBX	
A	10 X 26 WIREWRAP TO WIREWRAP BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	10 X 26 SOLDER TO SOLDER BLOCK	

TERMINAL BLOCKS F15E AND F15C WILL HAVE CROSS-CONNECTIONS ALTERED BY THIS PROJECT. SEE REFERENCE 4.

NEW TERMINAL BLOCK F14D TO BE INSTALLED BY THIS PROJECT. SEE REFERENCE 3 FOR INSTALLATION DETAILS.

TECHNICAL CONTROL FACILITY MAIN DISTRIBUTION FRAME LAYOUT

DISTRIBUTION AUTHORIZED TO U. S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: 2009/04/01. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO, CODE 4.2 OR PEO C4I AND SPACE.

INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
2	CONSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, CIRCUIT DIAGRAMS	110-000-2080000
1	CONSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000
DEVELOPING AGENT ADDRESS
ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
MAIN DISTRIBUTION FRAME LAYOUT

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	100-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 6

ATTACHMENT 13
(SHEET 1 OF 2)

DISTRIBUTION FRAME LAYOUT
(DRAWING TYPE CODE 100)

DISTRIBUTION FRAME LAYOUT
(DRAWING TYPE CODE 100)

ATTACHMENT 13
(SHEET 2 OF 2)

	K	J	H	G	F	E	D	C	B	A	
			WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU	1
			WHT	ORN	WHT	BLU	RED	BLU	WHT	SLT	
			RED	BLU	WHT	SLT	WHT	BRN	WHT	GRN	
			WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU	
			WHT	ORN	WHT	BLU	RED	BLU	WHT	SLT	5
			RED	BLU	WHT	SLT	WHT	BRN	WHT	GRN	
			WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU	
			WHT	ORN	WHT	BLU	RED	BLU	WHT	SLT	
			RED	BLU	WHT	SLT	WHT	BRN	WHT	GRN	
			WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU	10
			WHT	ORN	WHT	BLU	RED	BLU	WHT	SLT	
			RED	BLU	WHT	SLT	WHT	BRN	WHT	GRN	
			WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU	
			WHT	ORN	WHT	BLU	RED	BLU	WHT	SLT	
			RED	BLU	WHT	SLT	WHT	BRN	WHT	GRN	15
			WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU	
			WHT	ORN	WHT	BLU	RED	BLU	WHT	SLT	
			RED	BLU	WHT	SLT	WHT	BRN	WHT	GRN	
			WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU	20
			WHT	ORN	WHT	BLU	RED	BLU	WHT	SLT	
			RED	BLU	WHT	SLT	WHT	BRN	WHT	GRN	
			WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU	
			WHT	ORN	WHT	BLU	RED	BLU	WHT	SLT	
			RED	BLU	WHT	SLT	WHT	BRN	WHT	GRN	25

TB–F1B

CA–5301 TO FCC–98 #1 J101
CA–5302 TO FCC–98 #1 J100

CA–5303 TO FCC–98 #1 J103
CA–5304 TO FCC–98 #1 J102

CA–5305 TO FCC–98 #1 J105
CA–5306 TO FCC–98 #1 J104

CA–5307 TO FCC–98 #1 J107
CA–5308 TO FCC–98 #1 J106

CA–5316 TO FCC–98 #2 J101
CA–5317 TO FCC–98 #2 J100

CA–5318 TO FCC–98 #2 J103
CA–5319 TO FCC–98 #2 J102

CA–5320 TO FCC–98 #2 J105
CA–5321 TO FCC–98 #2 J104

CA–5322 TO FCC–98 #2 J107
CA–5323 TO FCC–98 #2 J106

CA–3303 TO FCC–98 #1 J131
CA–3304 TO FCC–98 #1 J130

CA–3305 TO FCC–98 #1 J129
CA–3306 TO FCC–98 #1 J128

CA–3313 TO FCC–98 #2 J131
CA–3314 TO FCC–98 #2 J130

CA–3315 TO FCC–98 #2 J129
CA–3316 TO FCC–98 #2 J128

	A	B	C	D	E	F	G	H	J	K
1	BLU	WHT	ORN	WHT	GRN	WHT	BRN	WHT		
	SLT	WHT	BLU	RED	BLU	WHT	ORN	WHT		
	GRN	WHT	BRN	WHT	SLT	WHT	BLU	RED		
	WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU		
5	WHT	ORN	WHT	BLU	RED	BLU	WHT	SLT		
	RED	BLU	WHT	SLT	WHT	BRN	WHT	GRN		
	WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU		
	WHT	ORN	WHT	BLU	RED	BLU	WHT	SLT		
	RED	BLU	WHT	SLT	WHT	BRN	WHT	GRN		
10	WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU		
	WHT	ORN	WHT	BLU	RED	BLU	WHT	SLT		
	RED	BLU	WHT	SLT	WHT	BRN	WHT	GRN		
15										
20										
25										

TB–F2B

	K	J	H	G	F	E	D	C	B	A	
			WHT	GRN	WHT	ORN	WHT	BLU	WHT	BLU	1
			WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU	
			RED	GRN	RED	ORN	RED	BLU	WHT	SLT	
			BLK	ORN	BLK	BLU	RED	SLT	RED	BRN	
			YEL	BLU	BLK	SLT	BLK	BRN	BLK	GRN	5
			WHT	GRN	WHT	ORN	WHT	BLU	WHT	BLU	
			WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU	
			RED	GRN	RED	ORN	RED	BLU	WHT	SLT	
			BLK	ORN	BLK	BLU	RED	SLT	RED	BRN	
			YEL	BLU	BLK	SLT	BLK	BRN	BLK	GRN	10
											15
											20
											25

TB–F1A

CA–3308/CA–3309 TO FCC–98 #1 J117/J119
CA–3307 TO FCC–98 #1 J116

CA–3318/CA–3319 TO FCC–98 #2 J117/J119
CA–3317 TO FCC–98 #2 J116

CA–3301 TO FCC–98 #1 J119

CA–3302 TO FCC–98 #1 J118

CA–3311 TO FCC–98 #2 J119

CA–3312 TO FCC–98 #2 J118

	A	B	C	D	E	F	G	H	J	K
1	BLU	WHT	ORN	WHT	GRN	WHT	BRN	WHT		
	SLT	WHT	BLU	RED	ORN	RED	GRN	RED		
	BRN	RED	SLT	RED	BLU	BLK	ORN	BLK		
	GRN	BLK	BRN	BLK	SLT	BLK	BLU	YEL		
5	WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU		
	RED	GRN	RED	ORN	RED	BLU	WHT	SLT		
	BLK	ORN	BLK	BLU	RED	SLT	RED	BRN		
	YEL	BLU	BLK	SLT	BLK	BRN	BLK	GRN		
	WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU		
10	RED	GRN	RED	ORN	RED	BLU	WHT	SLT		
	BLK	ORN	BLK	BLU	RED	SLT	RED	BRN		
	YEL	BLU	BLK	SLT	BLK	BRN	BLK	GRN		
	WHT	BRN	WHT	GRN	WHT	ORN	WHT	BLU		
	RED	GRN	RED	ORN	RED	BLU	WHT	SLT		
15	BLK	ORN	BLK	BLU	RED	SLT	RED	BRN		
	YEL	BLU	BLK	SLT	BLK	BRN	BLK	GRN		
20										
25										

TB–F2A

VIEW FROM FRONT OF CABINET

TECHNICAL CONTROL FACILITY IDF
ROW A AND B
TERMINAL BLOCK LAYOUT

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	000000	A	100-000-2080000	–
SCALE: NONE				SHEET 2	

GENERAL NOTES:

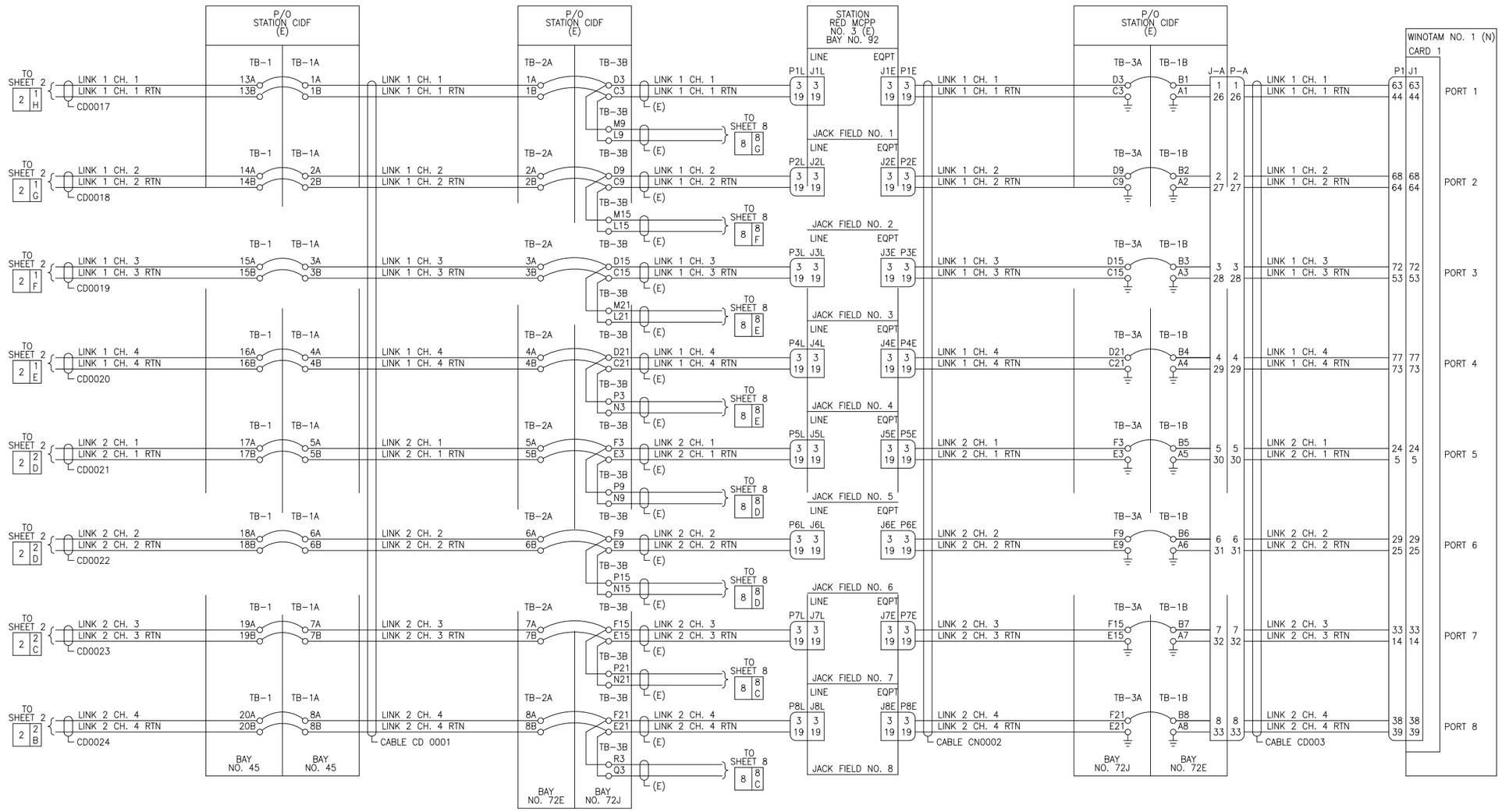
1. REFER TO REFERENCE 1 FOR LISTING OF DRAWINGS PERTAINING TO THIS INSTALLATION.

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST, RCV SYSTEM 1 CIRCUIT	1	28687-080000-A110-000-2080000-000-	-
RECEIVE SYSTEM 2 CIRCUIT DIAGRAM	2	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED



RECEIVE SYSTEM NO. 1

DISTRIBUTION AUTHORIZED TO U. S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: 2009/01/04. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO, CODE 4.2 OR PEO C4I AND SPACE.

INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
3	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, LABELING DETAILS	120-000-2080000
2	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MISC INSTALLATION DETAILS	180-000-2080000
1	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000

DEVELOPING AGENT ADDRESS ADDRESS

		DATE
DSGN		DATE
CHKD		DATE
APVD		DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
CIRCUIT DIAGRAM

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	110-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 1

CIRCUIT DIAGRAMS
(DRAWING TYPE CODE 110)

ATTACHMENT 14
(SHEET 1 OF 1)

SHEET INDEX			
CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST	1	28687-080000-A120-000-2080000-000-	-

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED

NOTES:

1. ALL NAMEPLATES ARE 2 x 3/4 x 1/8 TYPE B, STYLE II, BLUE-WHITE-BLUE PHENOLIC.
2. LOCATE AND CENTER LETTERING AS SHOWN.
3. UNLESS OTHERWISE NOTED, ALL LETTERING IS 3/16 IN.
4. BEVEL EDGES 1/16 IN.
5. FABRICATE ONE NAMEPLATE EACH.

141'-5 45/64"

11'-10 1/16"

ICS PBC COM1 JF-1	ICS PBC COM2 JF-2	ICS PBC COM3 JF-3	ICS PBC COM4 JF-4	SPARE JF-5	SPARE JF-6	SPARE JF-7	SPARE JF-8	SPARE JF-9	SPARE JF-10	SPARE JF-11	SPARE JF-12	SPARE JF-13	SPARE JF-14	SPARE JF-15	SPARE JF-16	SPARE JF-17	SPARE JF-18	SPARE JF-19	SPARE JF-20	SPARE JF-21	SPARE JF-22	AN/WRR-12 NO.1 J5 JF-23	AN/WRR-12 NO.2 J5 JF-24
JF-25	JF-26	JF-27	JF-28	JF-29	JF-30	JF-31	JF-32	JF-33	JF-34	JF-35	JF-36	JF-37	JF-38	JF-39	JF-40	JF-41	JF-42	JF-43	JF-44	JF-45	JF-46	JF-47	JF-48
AN/WRR-12 NO.1 J15	AN/WRR-12 NO.2 J15	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPEAKER	SPARE

DETAIL 4-E NETWORK PATCH PANEL LABEL PLATE
(ITEM 3)

(1) 19 PL

BAY NO.42	BAY NO.43	BAY NO.44	BAY NO.45	BAY NO.49
ICS PBC MONITOR	CV-4331/WR NO.1	CV-4331/WR NO.2	ELF/SLVR RECORDER	R/B ISOLATOR NO.1 (R)
ICS PBC CPU	CP-2388/WR NO.1	CP-2388/WR NO.2	WINOTAM WORKSTATION	
ICS PBC KEYBOARD	RED/BLACK SWITCH PANEL NO.1	RED/BLACK SWITCH PANEL NO.2		
NETWORK PATCH PANEL	O-1824A/U NO. 1	O-1824A/U NO. 2		
TIME CLOCK	R/B ISOLATOR NO. 1 (T)			
C-8839/SRA-17D NO. 1				
C-8839/SRA-17D NO. 2				

71'-4 51/64"

4'-2 13/32" TYP

15'-6 29/32"

0.3938	JACK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0.8750 TYP	CIRCUIT DESIGN	SLVR NO. 1 LINK 1				SLVR NO.1 LINK 2				SLVR NO.2 LINK 1				SLVR NO.2 LINK 2			
	MON																
	LINE	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4
	EQPT	OTAM NO. 1 CHAN 1	OTAM NO. 1 CHAN 2	OTAM NO. 1 CHAN 3	OTAM NO. 1 CHAN 4	OTAM NO. 1 CHAN 5	OTAM NO. 1 CHAN 6	OTAM NO. 1 CHAN 7	OTAM NO. 1 CHAN 8	OTAM NO. 1 CHAN 9	OTAM NO. 1 CHAN 10	OTAM NO. 1 CHAN 11	OTAM NO. 1 CHAN 12	OTAM NO. 1 CHAN 13	OTAM NO. 1 CHAN 14	OTAM NO. 1 CHAN 15	OTAM NO. 1 CHAN 16

DETAIL 3-C RED MCPP NO. 3 BAY 92 LABEL PLATE
(ITEM 2)

ITEM	DESCRIPTION	FURN BY	QTY	U/M	NSN	SUPPLIER OR MFGR.	PART NUMBER	REMARKS
1	LABELS, PHENOLIC (2 X 3/4 X 1/8)	CONTR	19	EA		COML		SEE NOTES
2	LABELS, AVERY (PAPER)(17.85 X 3.89)	CONTR	4	EA		COML		DETAIL 3-C
3	LABELS, AVERY (PAPER)(35.3689 X 2.9598)	CONTR	1	EA		COML		DETAIL 4-E

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: 2009/04/01. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO, CODE 4.2 OR PEO C4I AND SPACE.

INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
3	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MISC INSTALLATION DETAILS	180-000-2080000
2	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, SIMPLIFIED BLOCK DIAGRAM	060-000-2080000
1	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

UNLESS OTHERWISE NOTED, DIMENSION UNITSS ARE ARCHITECTURAL (IN INCHES OR FEET AND INCHES).

TOLERANCES ARE +/- 1/4" FOR VERTICAL POSITIONING OF DUCTS, AND +/- 1/8" FOR HORIZONTAL POSITIONING OF DUCTS AND CONDUITS.

SPAWAR APPROVAL	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000

DEVELOPING AGENT ADDRESS ADDRESS

DSGN DATE
CHKD DATE
APVD DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBSOMEWHERE, ANYWHERE USA
AN/FAKE-1 FICTITIOUS NETWORK SYSTEM
LABELING DETAILS

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	120-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 1

ATTACHMENT 15
(SHEET 1 OF 1)

LABELING DETAILS
(DRAWING TYPE CODE 120)

GENERAL NOTES:

1. REFER TO REFERENCE 1 FOR LISTING OF DRAWINGS PERTAINING TO THIS INSTALLATION.
2. REFER TO REFERENCE 2 FOR CABINET GROUNDING DETAILS.
3. REFER TO REFERENCE 3 FOR EQUIPMENT AND CABINET LABELING DETAILS.

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST	1	28687-080000-A130-000-2080000-000-	-
BLACK MCPP NO. 5 AND NETWORK PATCH PANEL LAYOUT	2	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

JACK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CIRCUIT DESIGN	SLVR NO. 1 LINK 1				SLVR NO.1 LINK 2				SLVR NO.2 LINK 1				SLVR NO.2 LINK 2			
MON																
LINE	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4
EQPT	OTAM NO. 1 CHAN 1	OTAM NO. 1 CHAN 2	OTAM NO. 1 CHAN 3	OTAM NO. 1 CHAN 4	OTAM NO. 1 CHAN 5	OTAM NO. 1 CHAN 6	OTAM NO. 1 CHAN 7	OTAM NO. 1 CHAN 8	OTAM NO. 1 CHAN 9	OTAM NO. 1 CHAN 10	OTAM NO. 1 CHAN 11	OTAM NO. 1 CHAN 12	OTAM NO. 1 CHAN 13	OTAM NO. 1 CHAN 14	OTAM NO. 1 CHAN 15	OTAM NO. 1 CHAN 16

RED MCPP NO. 3 BAY NO. 92

JACK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CIRCUIT DESIGN	SLVR NO. 1 LINK 1				SLVR NO.1 LINK 2				SLVR NO.2 LINK 1				SLVR NO.2 LINK 2			
MON																
LINE	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4	CHAN NO. 1	CHAN NO. 2	CHAN NO. 3	CHAN NO. 4
EQPT	OTAM NO. 2 CHAN 1	OTAM NO. 2 CHAN 2	OTAM NO. 2 CHAN 3	OTAM NO. 2 CHAN 4	OTAM NO. 2 CHAN 5	OTAM NO. 2 CHAN 6	OTAM NO. 2 CHAN 7	OTAM NO. 2 CHAN 8								

RED MCPP NO. 4 BAY NO. 92

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INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
3	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, LABELING DETAILS	120-000-2080000
2	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MISC INSTALLATION DETAILS	180-000-2080000
1	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000

DEVELOPING AGENT
ADDRESS
ADDRESS

DSGN DATE
CHKD DATE
APVD DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
PATCH PANEL LAYOUTS

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	130-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 2

PATCH PANEL LAYOUTS
(DRAWING TYPE CODE 130)

ATTACHMENT 16
(SHEET 1 OF 2)

JACK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CIRCUIT DESIGN	SLVR NO. 1 LINK 1				SLVR NO.1 LINK 2				SLVR NO.2 LINK 1				SLVR NO.2 LINK 2			
MON																
LINE	SLVR #1 LINK 1 CH.1	SLVR #1 LINK 1 CH.2	SLVR #1 LINK 1 CH.3	SLVR #1 **LINK 1** CH.4	SLVR #1 LINK 2 CH.1	SLVR #1 LINK 2 CH.2	SLVR #1 LINK 2 CH.3	SLVR #1 LINK 2 CH.4	SLVR #2 LINK 1 CH.1	SLVR #2 LINK 1 CH.2	SLVR #2 LINK 1 CH.3	SLVR #2 **LINK 1** CH.4	SLVR #2 LINK 2 CH.1	SLVR #2 LINK 2 CH.2	SLVR #2 LINK 2 CH.3	SLVR #2 LINK 2 CH.4
EQUIP																

BLK MCPP NO. 5 BAY NO. 32

ICS PBC COM1 JF-1	ICS PBC COM2 JF-2	ICS PBC COM3 JF-3	ICS PBC COM4 JF-4	SPARE JF-5	SPARE JF-6	SPARE JF-7	SPARE JF-8	SPARE JF-9	SPARE JF-10	SPARE JF-11	SPARE JF-12	SPARE JF-13	SPARE JF-14	SPARE JF-15	SPARE JF-16	SPARE JF-17	SPARE JF-18	SPARE JF-19	SPARE JF-20	SPARE JF-21	SPARE JF-22	AN/WRR-12 NO.1 J5 JF-23	AN/WRR-12 NO.2 J5 JF-24
JF-25	JF-26	JF-27	JF-28	JF-29	JF-30	JF-31	JF-32	JF-33	JF-34	JF-35	JF-36	JF-37	JF-38	JF-39	JF-40	JF-41	JF-42	JF-43	JF-44	JF-45	JF-46	JF-47	JF-48
AN/WRR-12 NO.1 J15	AN/WRR-12 NO.2 J15	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPEAKER	SPARE

NETWORK PATCH PANEL

COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
BLACK MCPP NO. 5 AND NETWORK P/P LAYOUTS

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	000000	A	130-000-2080000	–

SCALE: NONE SHEET 2

ATTACHMENT 16
(SHEET 2 OF 2)

PATCH PANEL LAYOUTS
(DRAWING TYPE CODE 130)

GENERAL NOTES:

1. SEE REFERENCE 1 FOR A COMPLETE LISTING OF OTHER DRAWINGS PERTAINING TO THIS PROJECT. SEE REFERENCE 2 FOR WIRING PARTS INFORMATION. SEE REFERENCE 3 FOR ELECTRICAL WIREWAY AND CONDUIT ROUTING INFORMATION.

2. MAXIMUM DISTANCE ALLOWED FOR #10 AWG WIRES TO CABINETS IS 93 FEET BASED ON A MAXIMUM CURRENT OF 16 AMPS AND A VOLTAGE DROP OF 3%, WITH EQUAL DROPS ON PHASE AND NEUTRAL WIRES DUE TO HIGH HARMONICS. THE MAXIMUM DISTANCE ALLOWED FOR #12 AWG WIRES TO CABINETS AND FLOOR BOXES IS 56 FEET, ALSO BASED ON A MAXIMUM OF 16 AMPS. THE ESTIMATED LENGTH INCLUDES 6 FEET FOR SERVICE LOOPS AND SLACK.

3. PROVIDE NEW CIRCUIT BREAKER LABELS IN ACCORDANCE WITH REF 4.

4. MAXIMUM LENGTH OF #6 AWG WIRES TO DC POWERED CABINETS IS 104 FEET BASED ON A MAXIMUM FUTURE CURRENT DRAW OF 35 AMPS AND A 3 % VOLTAGE DROP. #4 AWG CAN BE USED TO EXTEND RUNS TO 165 FEET.

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST	1	28687-080000-A140-000-2080000-000-	A
AC POWER PANEL ASSIGNMENT TABLE, LAYOUT, AND DATA	2	"	-
-48 VDC POWER PANEL ASSIGNMENT TABLE	3	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	ADDED SHEET INDEX TO ZONES F2, F3, F4, F5	08-03-28	IMO JOE

LEGEND:

KVA - KILOVOLT-AMPERES
AC - ALTERNATING CURRENT
AWG - AMERICAN WIRE GAUGE
UPS - UNINTERRUPTIBLE POWER SUPPLY
AIC - AMPERES INTERRUPT CURRENT
NEUT - NEUTRAL
BLK - BLACK
WHT - WHITE
GRN - GREEN
BLU - BLUE
N/A - NOT APPLICABLE
* - DATA OBTAINED BY TEST EQUIPMENT MEASUREMENT
NFPA - NATIONAL FIRE PROTECTION ASSOCIATION
PROT - PROTECTIVE

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REFERENCE DRAWING(S)

NO.	DRAWING TITLE	DWG NO.
4	EXAMPLE SITE, ANYWHERE USA, PROJECT X INSTALLATION LABELING DETAILS	120-000-2080000
3	EXAMPLE SITE, ANYWHERE USA, PROJECT X INSTALLATION CABLE ROUTING LAYOUTS	160-000-2080000
2	EXAMPLE SITE, ANYWHERE USA, PROJECT X INSTALLATION CABLING BLOCK DIAGRAM	070-000-2080000
1	EXAMPLE SITE, ANYWHERE USA, PROJECT X INSTALLATION MASTER DRAWING	020-000-2080000

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE XXXXX
DEVELOPING AGENT
ADDRESS
ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

INSTALLATION DESIGN PLAN

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

EXAMPLE SITE, ANYWHERE USA
PROJECT X INSTALLATION
POWER DISTRIBUTION

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	140-000-2080000	A

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 3

POWER DISTRIBUTION
(DRAWING TYPE CODE 140)

ATTACHMENT 17
(SHEET 1 OF 3)

POWER PANEL TPP-1 (UPS POWER) ASSIGNMENT TABLE

SUPPLEMENTAL TECHNICAL DATA			CIRCUIT BREAKER			CONNECTED LOAD (KVA)			WIRING						CONNECTION				REMARKS
CIRCUIT BREAKER NUMBER (FROM THIS DRAWING)	TYPICAL CURRENT DATA: MAXIMUM CURRENT (AMPS)	TYPICAL CURRENT DATA: OPERATING CURRENT (AMPS)	POS.	POLE	AMP	Ø A	Ø B	Ø C	CABLE/WIRE TYPE	WIRE SIZE (AWG)	COLOR CODE: HOT	COLOR CODE: NEUT	COLOR CODE: AC PROT GND	EST RUN IN FEET/MAX (FT)	ROOM	ROW	BAY	EQUIPMENT	
1	UNKNOWN	8.1*	1	1	20A	0.87*			THHN/THWN	12	BLK	WHT	GRN	UNKNOWN	123 TECH CONT	1	1	PROJECT A SERVERS AND ROUTER	-
2	UNKNOWN	6.9*	2	1	20A	0.94*					BLK	WHT	GRN	UNKNOWN		1	2	PROJECT A IA SUITE	-
3	UNKNOWN	3.0*	3	1	20A		0.36*				BLK	WHT	GRN	UNKNOWN		1	3	KVM/MONITOR/ETHERNET SWITCH	-
4	UNKNOWN	4.5*	4	1	20A		0.54*				BLK	WHT	GRN	UNKNOWN		1	4	CRYPTO BAY	-
5	UNKNOWN	8.0*	5	1	20A			0.96*			BLK	WHT	GRN	UNKNOWN		2	1	TV RECEIVER BAY	-
6	UNKNOWN	7.6*	6	1	20A			0.91*			BLK	WHT	GRN	UNKNOWN		2	3	HF RECEIVER BAY	-
7	UNKNOWN	4.7*	7	1	20A	0.56*					BLK	WHT	GRN	UNKNOWN		2	3	TEST EQUIPMENT BAY	-
8	UNKNOWN	9.6*	8	1	20A	1.15*					BLK	WHT	GRN	UNKNOWN		2	4	INNER AND OUTER ROUTER	-
9	UNKNOWN	3.6*	9	1	20A		0.43*				BLK	WHT	GRN	UNKNOWN		2	5	FIREWALL AND IDS	-
10	UNKNOWN	8.2*	10	1	20A		0.98*				BLK	WHT	GRN	UNKNOWN		2	6	ATM SWITCH	-
11	UNKNOWN	2.4*	11	1	20A			0.28*			BLK	WHT	GRN	UNKNOWN		2	7	PHONE SWITCH	-
12	UNKNOWN	11.2*	12	1	20A			1.34*			BLK	WHT	GRN	UNKNOWN		2	8	VTC EQUIPMENT BAY	-
13	11	8.0	13	1	20A	0.96					BLK	WHT	GRN	40/56		3	1	PROJECT X CABINET 1	POWER STRIP #1 (FOR ROUTERS AND SWITCFHES)
14	11	8.0	14	1	20A	0.96					BLK	WHT	GRN	42/56		3	2	2	POWER STRIP #3 (FOR MONITOR/TEST EQUIPMENT)
15	4.0	3.0	15	1	20A		0.36				BLK	WHT	GRN	40/56		3	1	1	POWER STRIP #2 (FOR ROUTERS AND SWITCHES)
16	12	10	16	3	30A		1.20			10	BLK	WHT	GRN	46/93		3	3	3	PROJECT X THREE PHASE PDU #1 (FOR SERVERS)
17	12	10	17	3	30A			1.20			BLK	WHT	GRN	48/93		3	4	4	PROJECT X THREE PHASE PDU #2 (FOR SERVERS)
16	14	12	18	3	30A			1.44			RED			46/93		3	3	3	PROJECT X THREE PHASE PDU #1 (FOR SERVERS)
17	14	12	19	3	30A	1.44					RED			48/93		3	4	4	PROJECT X THREE PHASE PDU #2 (FOR SERVERS)
16	13	11	20	3	30A	1.32					BLU			46/93		3	3	3	PROJECT X THREE PHASE PDU #1 (FOR SERVERS)
17	13	11	21	3	30A		1.32				BLUE			48/93		3	4	4	PROJECT X THREE PHASE PDU #2 (FOR SERVERS)
18	13	9	22	2	20A		0.94			12	BLU		GRN	50/56		FLRBOX	5	PROJECT X FLOOR BOX 1	BATTLESPACE DISPLAY WORKSTATION & PROJECTOR #1
19			23	N/A	20A			0	N/A										
18	13	9	24	2	20A			0.94	THHN/THWN	12	RED			50/56		FLRBOX	5	PROJECT X FLOOR BOX 1	BATTLESPACE DISPLAY WORKSTATION & PROJECTOR #1
21			25	N/A	20A	0			N/A										
18			26	N/A	BLANK	0			N/A										
23	13	9	27	2	20A		0.94		THHN/THWN	10	BLU		GRN	60/93		FLRBOX	2	PROJECT X FLOOR BOX 2	BATTLESPACE DISPLAY WORKSTATION & PROJECTOR #2
			28	N/A	BLANK		0		N/A										
23	13	9	29	2	20A			0.94	THHN/THWN	10	RED			60/93		FLRBOX	2	PROJECT X FLOOR BOX 2	BATTLESPACE DISPLAY WORKSTATION & PROJECTOR #2
			30	N/A	BLANK			0	N/A										
			PHASE TOTAL			7.59	7.12	7.73											
			CONNECTED LOAD			22.45 KVA													
			DEMAND LOAD			22.45 KVA													

AC POWER PANEL LAYOUT

SQUARE-D QO330MQ125

BREAKER NO. (FROM THIS DRAWING)	BREAKER AMP RATING	NUMBER OF POLES (OR 'B' FOR BLANK)	BREAKER POSITION				
1	20	1	1	2	2	20	2
3	20	1	3	4	4	20	4
5	20	1	5	6	6	20	6
7	20	1	7	8	8	20	8
9	20	1	9	10	10	20	10
11	20	1	11	12	12	20	12
13	20	1	13	14	14	20	14
15	20	1	15	16	3	30	16
17	30	3	17	18			
			19	20			
			21	22	2	20	18
19 (SPARE)	20	1	23	24			
21 (SPARE)	20	1	25	26	B		
23	20	2	27	28	B		
			29	30	B		

AC POWER PANEL DATA

SQUARE-D QO330MQ125

MANUFACTURER: SQUARE-D
MODEL NO.: QO330MQ125 (CLASS 1130)
VOLTAGE: 3-PHASE, 4-WIRE, 208Y/120 VAC
MAXIMUM UL SHORT CIRCUIT RATING: 25,000 AMPS WITH TYPE QDL MAIN CIRCUIT BREAKER
MAINS RAITING: 125 AMPS
MAIN BREAKER: FACTORY INSTALLED 125 AMP QDL
CIRCUIT BREAKER TYPE: QO
CIRCUIT BREAKER SPACES: 30
PANELBOARD DIMENSIONS (INCHES): 14.25 W X 39.37 H X 3.75 D

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	140-000-2080000	-
SCALE: NONE				SHEET 2	

ATTACHMENT 17
(SHEET 2 OF 3)

POWER DISTRIBUTION
(DRAWING TYPE CODE 140)

NEGATIVE FORTY-EIGHT VOLT DC POWER PANEL ASSIGNMENT TABLE

CIRCUIT BREAKER			EST. LOAD	WIRING (SEE NOTES 8 & 9.)						CONNECTIONS				REMARKS
				CABLE/WIRE TYPE	SIZE (AWG)	WIRE INSULATION COLOR CODE			RUN IN FEET	LOCATIONS			EQUIPMENT	
NO.	POLE	AMP	(AMPS)			-48 V	-48V RTN	SAFETY GROUND		ROOM	ROW	BAY		
1	1	50	12.5	THHN/THWN	6	BLACK	WHITE	GREEN	50	567	3	4	MGX-8950 PRIMARY DC PEM TB-1	CORE ATM SWITCH
2	1	50	12.5	THHN/THWN	6	BLACK	WHITE	GREEN	50	567	3	4	MGX-8950 PRIMARY DC PEM TB-2	
3	1	50	0	THHN/THWN	6	BLACK	WHITE	GREEN	52	567	3	5	MGX-8950 SECONDARY DC PEM TB-1	
4	1	50	0	THHN/THWN	6	BLACK	WHITE	GREEN	52	567	3	5	MGX-8950 SECONDARY DC PEM TB-2	
5														
6														
7														
8														
TOTAL EST. LOAD			25.0											

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	140-000-2080000	-

SCALE: NONE SHEET 3

ATTACHMENT 17
(SHEET 3 OF 3)

POWER DISTRIBUTION
(DRAWING TYPE CODE 140)

GENERAL NOTES:

1. THIS IS NOT A TRUE OR COMPLETE IDP DRAWING. IT IS AN EXAMPLE PROVIDED TO SHOW THE FORMAT AND CONTENT OF A CABLE ROUTING LAYOUT.
2. LABEL DUCT PER REF 3. USE ITEMS 58 TO MARK BLACK SIGNAL DUCT AND 59 TO MARK RED DUCT EVERY THREE FEET.
3. GROUNDING AND BONDING, OF DUCT AND CONDUIT SHALL BE IN ACCORDANCE WITH REFERENCE 2.
4. MAIN DUCT RUNS SHALL NOT BE SUPPORTED BY UNISTRUT ATTACHED TO RAISED FLOOR PEDESTALS. MAIN DUCT RUNS SHALL BE SUPPORTED AT LEAST EVERY 4 FEET USING UNISTRUT AS SHOWN IN ELEVATION A–A.
5. DUCT SPURS TO CABINETS SHALL BE SUPPORTED USING THE METHOD SHOWN IN ELEVATION A-A.
6. EACH DUCT SECTION, CROSS, TEE, AND ELBOW SHALL BE SUPPORTED BY AND FASTENED TO A UNISTRUT CHANNEL AS AS SHOWN BY ELEVATION B–B.
7. RETOUCH DAMAGED ANGLE COATING USING ITEM 60 OR ANY PRE-APPROVED EQUIVALENT ZINC-RICH GALVANIZING MATERIAL THAT MEETS THE REQUIREMENTS OF ASTM A 780, REPAIR OF HOT DIP GALVANIZED COATINGS. ALWAYS PAINT BETWEEN 1/2' TO 1' BEYOND THE BARE AREA TO PREVENT UNDERCUTTING CORROSION.
8. MAINTAIN AT LEAST TWO INCHES OF VERTICAL SEPARATION BETWEEN RED, BLACK, AND POWER DUCT SYSTEMS.
9. CENTER LINE OF VERTICAL RED DUCT SHALL BE 24.5 INCHES (+/- 1/4") ABOVE TRUE FLOOR, AND THE. CENTER LINE OF VERTICAL BLACK DUCT SHALL BE 13.625 INCHES (+/- 1/4") ABOVE TRUE FLOOR. . INSTALLL LARGEST DUCT FIRST.
10. LABEL FIRESTOP LOCATIONS AS SHOWN IN REF 3.
11. EXTENSIVE USE OF STAINLESS STEEL IS DUE TO HISTORY OF MINOR FLOODING BELOW RAISED FLOOR AND SITE'S. PREVIOUS PROBLEMS WITH ZINC WHISKERS.
12. ALL DUCT AND CONDUIT SHOWN ON THIS DRAWING IS TO BE INSTALLED BY THIS PROJECT.

LEGEND:

FURN BY - FURNISHED BY
U/M - UNIT OF MEASURE
SS - STAINLESS STEEL
KO - KNOCK-OUT
LG - LENGTH
HD - HUNDRED
MFGR - MANUFACTURER
RO - ROLL
TYP - TYPICAL
PL - PLACES
GL - GALLON

- BLACK SIGNAL DUCT
- POWER DUCT/CONDUIT
- SIGNAL DUCT

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST	1	28687-080000-A160-000-2080000-000-	-
PARTS LIST CONTINUATION	2	"	-
BUILDING NH-95 TECH CONTROL CABLE ROUTING LAYOUT FLOOR PLAN VIEW	3	"	-
CROSS-SECTIONAL VIEW OD DUCT SERVING CRYPTO BAYS	4	"	-
DUCT SUPPORT FRAMING INSTALLATION DETAIL & CROSS-SECTIONAL VIEW OF TYPICAL WALL PENETRATION	5	"	-
POWER RISER INSTALLATION DETAIL	6	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

PARTS LIST

FIND	DESCRIPTION	FURN BY	QTY	U/M	NSN	SUPPLIER OR MFGR.	PART NUMBER	REMARKS
1	END, WIREWAY, PAINTED, WITH KO, 8" X 8"	CONTRACTOR	8	EA	-	B-LINE	88 E	-
2	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 8" X 8" X 48"	CONTRACTOR	9	EA	-	B-LINE	8848 G NK	-
3	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 6" X 6" X 12"	CONTRACTOR	22	EA	-	B-LINE	6612 G NK	-
4	END FLANGE, WIREWAY, 6" X 6", GRAY	SSC SD	70	EA	-	B-LINE	66 GF	-
5	SECTION, WIREWAY, SCREW COVER, CUSTOM SHORT LENGTH, 6" X 6"	CONTRACTOR	27	EA	-	FABRICATE	-	-
6	ELBOW, WIREWAY, 90 DEG., GRAY, COMBO OPENING, 6" X 6"	CONTRACTOR	27	EA	-	B-LINE	66 L COMBO	-
7	CONNECTOR, WIREWAY, 6" X 6"	CONTRACTOR	??	EA	-	B-LINE	66 C	-
8	CONNECTOR, WIREWAY, 8" X 8"	SSC SD	21	EA	-	B-LINE	88 C	-
9	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 6" X 6" X 120"	CONTRACTOR	6	EA	-	B-LINE	66120 G NK	2 TO MAKE ADAPTERS
10	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 6" X 6" X 24"	CONTRACTOR	8	EA	-	B-LINE	6624 G NK	-
11	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 6" X 6" X 60"	CONTRACTOR	4	EA	-	B-LINE	6660 G NK	-
12	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 4" X 4" X 72"	CONTRACTOR	6	EA	-	B-LINE	4472 G NK	-
13	CONNECTOR, WIREWAY, 4" X 4", SCREW COVER	CONTRACTOR	52	EA	-	B-LINE	44 C	-
14	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 4" X 4" X 120"	CONTRACTOR	10	EA	-	B-LINE	44120 G NK	1 TO MAKE ADAPTERS
15	ELBOW, WIREWAY, 90 DEG, GRAY, COMBO OPENING, 4' X 4"	CONTRACTOR	13	EA	-	B-LINE	44 L COMBO	-
16	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 4" X 4" X 36"	CONTRACTOR	1	EA	-	B-LINE	4436 G NK	-
17	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 4" X 4" X 48"	CONTRACTOR	1	EA	-	B-LINE	4448 G NK	-
18	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 4" X 4" X 24"	CONTRACTOR	8	EA	-	B-LINE	4424 G NK	-
19	CROSS, WIIREWAY, GRAY, 4" X 4" X 4"	CONTRACTOR	3	EA	-	B-LINE	44 X	-
20	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 4" X 4" X 60"	CONTRACTOR	1	EA	-	B-LINE	4460 G NK	-
21	LOCKNUT, 2"	SITE N43	2	EA	5975-00-100-8776	-	-	EXCESS MATERIAL
22	CONNECTOR, BOX, EMT, 2"	SITE N43	4	EA	5975-00-905-0948	-	-	EXCESS MATERIAL
23	CONDUIT, EMT, 2" TRADE SIZE, 10 FOOT LENGTH	SITE N43	1	EA	5975-00-178-1221	-	-	EXCESS MATERIAL
24	CONDULET, 2", LR, IRON BODY WITH SS COVER	SITE N43	1	EA	-	CROUSE-HINDS	LR67-CG	EXCESS MATERIAL
25	END, WIREWAY, 4" X 4", GRAY, WITH KNOCK-OUT	CONTRACTOR	8	EA	-	B-LINE	44 E	-
26	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 8" X 8" X 120	CONTRACTOR	14	HD	-	B-LINE	88120 G NK	1 SPARE
27	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 8" X 8" X 24"	CONTRACTOR	1	HD	-	B-LINE	8824 G NK	-
28	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 8" X 8" X 12"	CONTRACTOR	2	EA	-	B-LINE	8812 G NK	-
29	ELBOW, WIREWAY, 90 DEG., GRAY, SIDE OPENING, 4" X 4"	CONTRACTOR	4	EA	-	B-LINE	44 L SIDE	-
30	SECTION, WIREWAY, SCREW COVER, GRAY, NO KO, 4" X 4" x 12"	CONTRACTOR	10	EA	-	B-LINE	4412 G NK	-
31	CHANNEL, UNISTRUT, 1 5/8" BOX X 10 FT, 304 SS, 12 GAUGE	CONTRACTOR	40	LG	-	UNISTRUT	P1000SS	CUT TO LENGTH
32	U-BOLT, 304 SS, FOR 2" PIPE, 3/8"-16 THREAD, W HEX NUTS	CONTRACTOR	24	EA	-	MCMASTER-CARR	8896T26	-
33	POST BASE FOR SINGLE 1-5/8" UNISTRUT,TYPE 304 STAINLESS	CONTRACTOR	100	EA	-	UNISTRUT	P2941SS	-
34	BOLT, 1/2" -13 X 1", HEX HEAD, STAINLESS TYPE 300, MIL-35307	CONTRACTOR	424	EA	-	MCMASTER-CARR	92245A713	-
35	WASHER, 1/2", FLAT, ROUND, 316 SS, OD=1.25 THICKNESS ~0.062"	CONTRACTOR	5	HD	-	MCMASTER-CARR	90107A033	-
36	WASHER, 1/2", LOCK, SPLIT, 316 SS, 0.733 OD, 11/64" THICK	CONTRACTOR	5	HD	-	MCMASTER-CARR	98437A130	-
37	ANCHOR, 1/2"-13 TREAD, DROP-IN, TYPE 316 SS, 3/4" LONG THREAD	CONTRACTOR	212	EA	-	FM STAINLESS FASTENERS	1/2 316 SS DROPINS	-
38	SCREW, CAP, 1/4"-20 X 2", TYPE 316 STAINLESS, PARTIAL THREAD	CONTRACTOR	128	EA	-	MCMASTER-CARR	92186A550	-
39	WASHER, 1/4", FLAT, ROUND,TYPE 316 STAINLESS, 5/8" OD	CONTRACTOR	200	EA	-	MCMASTER-CARR	90107A029	-
40	WASHER, 1/4", LOCK, SPLIT, TYPE 316 STAINLESS, .487 OD	CONTRACTOR	24	EA	-	MCMASTER-CARR	91475A029	-

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: 2009/04/02. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO, CODE 4.2 OR PEO C4I AND SPACE.

INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
3	COMSUBSOMEWHERE, ANYWHERE USA, AN/FAKE-1 FICTITIOUS NETWORK SYSTEM LABELING DETAILS	120-000-2080000
2	COMSUBSOMEWHERE, ANYWHERE USA, AN/FAKE-1 FICTITIOUS NETWORK SYSTEM ZMISCELLANEOUS INSTALLATION DETAILS	180-000-2080000
1	COMSUBSOMEWHERE, ANYWHERE USA, AN/FAKE-1 FICTITIOUS NETWORK SYSTEM INSTALLATION MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

UNLESS OTHERWISE NOTED, DIMENSION UNITSS ARE ARCHITECTURAL (IN INCHES OR FEET AND INCHES).

TOLERANCES ARE +/- 1/4" FOR VERTICAL POSITIONING OF DUCTS, AND +/- 1/8" FOR HORIZONTAL POSITIONING OF DUCTS AND CONDUITS.

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000
DEVELOPING AGENT
ADDRESS
ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBSOMEWHERE, ANYWHERE USA
AN/FAKE-1 FICTITIOUS NETWORK SYSTEM
CABLE ROUTING LAYOUT

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	160-000-2080000	-

SCALE: NONE | MASS (WEIGHT): N/A | SHEET 1 OF 6

ATTACHMENT 18A
(SHEET 1 OF 6)

CABLE ROUTING LAYOUT (ISP)
(DRAWING TYPE CODE 160)

PARTS LIST

FIND	DESCRIPTION	FURN BY	QTY	U/M	NSN	SUPPLIER OR MFGR.	PART NUMBER	REMARKS
41	WASHER, SQUARE, FOR 5/16" BOLT, TYPE 304 SS, 1-5/8" SQUARE	SSC SD	768	EA	-	MCMASTER-CARR	3133T25	EXCESS MATERIAL
42	ANCHOR, 1/4"-20 THREAD, DROP-IN, TYPE 316 SS, 7/16"THRD LENGTH	CONTRACTOR	204	EA	-	FM STAINLESS FASTENERS	1/4 316 SS DROPINS	-
43	CLAMP, CONDUIT, FOR USE WITH UNISTRUT & 3/4" EMT, SS	CONTRACTOR	52	EA	-	UNISTRUT	P1427SS	-
44	SCREW, CAP, 1/4"-20 X 5/8", FULL THREAD, 1", TYPE 316 SS	CONTRACTOR	76	EA	-	MCMASTER-CARR	93190A539	-
45	CLAMP, CONDUIT, FOR 2" EMT, STAINLESS	CONTRACTOR	4	EA	-	UNISTRUT	P1431SS	-
46	NUT, SPRING, #10-24, STAINLESS, FOR 1-5/8" CHANNEL	CONTRACTOR	12	EA	-	UNISTRUT	P1006-1024SS	-
47	SCREW, PAN-HEAD, PHILLIPS, #10-24, X 3/4", 316 SS	CONTRACTOR	12	EA	-	-	-	-
48	WASHER, #10, LOCK, SS	CONTRACTOR	5	HD	-	-	-	-
49	WASHER, #10, FLAT, SS	CONTRACTOR	5	HD	-	-	-	-
50	NUT, SPRING, 1/4"-20, STAINLESS, FOR 1-5/8" CHANNEL	CONTRACTOR	3	HD	-	-	-	
51	NUT, SPRING, 1/2"-13, STAINLESS, FOR 1-5/8" CHANNEL	CONTRACTOR	210	EA	-	UNISTRUT	P1010SS	-
52	SCREW #10-32, 316 SS, 1/2"	CONTRACTOR	5	HD	-	MCMASTER-CARR	91735A829	FOR MOUNTING DUCT
53	NUT, #10-32, HEX HEAD, 3/8" WIDTH, TYPE 316 SS, ASME B18.6.3	CONTRACTOR	5	HD	-	MCMASTER-CARR	90257A411	-
54	PILLOW, FIRESTOP, LARGE, SELF-LOCKING, 3" X 6" x 9"	SSC SD	9	EA	-	3M	FB 369-SL	MIN ORDER = 20
55	PUTTY, FIRESTOP, STICK, 1.4" DIA X 11"	CONTRACTOR	60	EA	-	3M	MP+	MIN ORDER = 10
56	PILLOW, FIRESTOP, MEDIUM, SELF-LOCKING, 2" X 6" X 9"	CONTRACTOR	3	EA	-	3M	FB 269-SL	MIN ORDER = 16
57	PUTTY, PAD, FIRESTOP, 4" X 8" X1/8"	CONTRACTOR	30	EA	-	3M	MPP+4X8	MIN ORDER = 100
58	SCOTCH VINYL ELECTRICAL TAPE, BLACK, 3/4" X 66'	SSC SD	2	RO	-	3M	SUPER 33+	-
59	SCOTCH VINYL ELECTRICAL COLOR CODING TAPE, 1/2" X 20'	SSC SD	10	RO	-	3M	35-RED-1/2	-
60	COLD GALVANIZING COATING	SSC SD	1	GL	-	GALVIN PRODUCTS INC.	GALVAX	
61	END FLANGE, WIREWAY, GRAY, 4" X 4"	CONTRACTOR	23	EA	-	B-LINE	44 GF	-
62	END CAP FOR 1-5/8" UNISTRUT CHANNEL	CONTRACTOR	16	EA	-	B-LINE	P2240	-
63	CLOSURE STRIP, PLASTIC, GRAY, FOR UNISTRUT CHANNEL	CONTRACTOR	1	EA	-	B-LINE	P1184	-
64	CONDUIT, EMT, 3/4" TRADE SIZE	CONTRACTOR	31	LG	-	-	-	-
65	CONNECTOR, COMPRESSION, BOX, 3/4" EMT, WITH LOCKNUT, INSULATED	CONTRACTOR	62	EA	-	T&B	5221	-

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	160-000-2080000	-

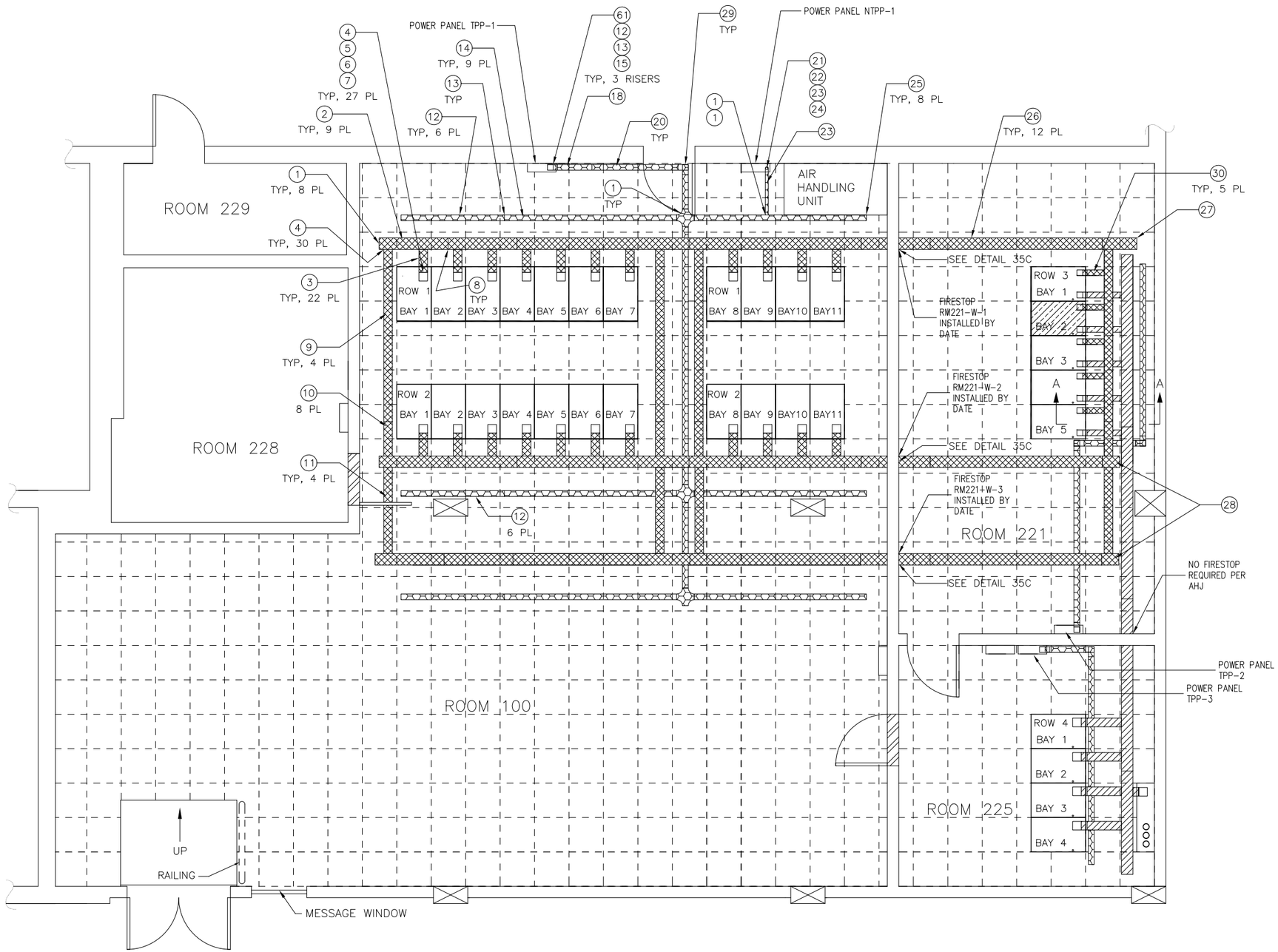
SCALE: NONE SHEET 2

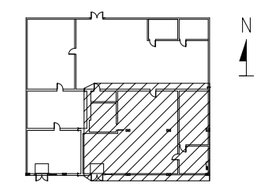
ATTACHMENT 18A
(SHEET 2 OF 6)

CABLE ROUTING LAYOUT (ISP)
(DRAWING TYPE CODE 160)

NOTES:

A. SEE LEGEND ON SHEET 1 SHOWING WHICH HATCH PATTERNS ARE USED FOR RED DUCT, BLACK DUCT, AND POWER DUCT AND CONDUIT.





KEY PLAN

COMSUBSOMEWHERE BLDG XXX

NOT TO SCALE

12" 0 1' 2' 3' 4' 5' 10'

GRAPHIC SCALE

0.4" = 1'-0"

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	160-000-2080000	-

SCALE: 1/30 SHEET 3

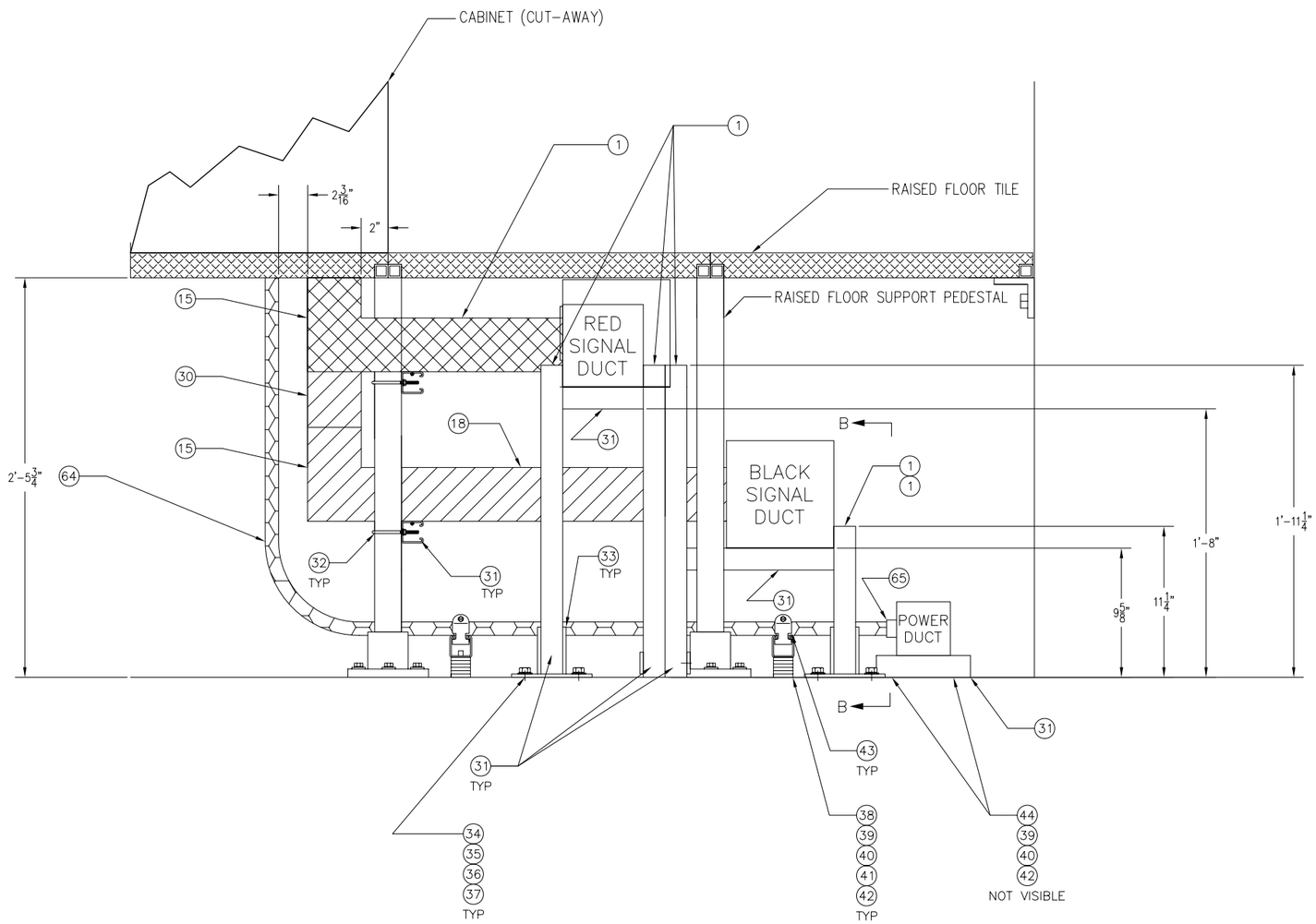
ATTACHMENT 18A (SHEET 3 OF 6)

CABLE ROUTING LAYOUT (ISP)

(DRAWING TYPE CODE 160)

NOTES:

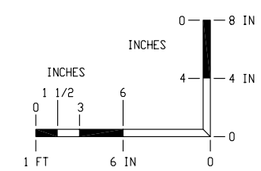
A. SEE LEGEND ON SHEET 1 SHOWING WHICH HATCH PATTERNS ARE USED FOR RED DUCT, BLACK DUCT, AND POWER DUCT AND CONDUIT.



VIEW A-A

CROSS-SECTIONAL VIEW OD DUCT SERVING CRYPTO BAYS

SHOWING UNISTRUT CHANNEL SUPPORT FRAMING
AND
DUCT ELEVATIONS



GRAPHIC SCALE
3" = 1'-0"

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	160-000-2080000	–
SCALE: 1/4				SHEET 4	

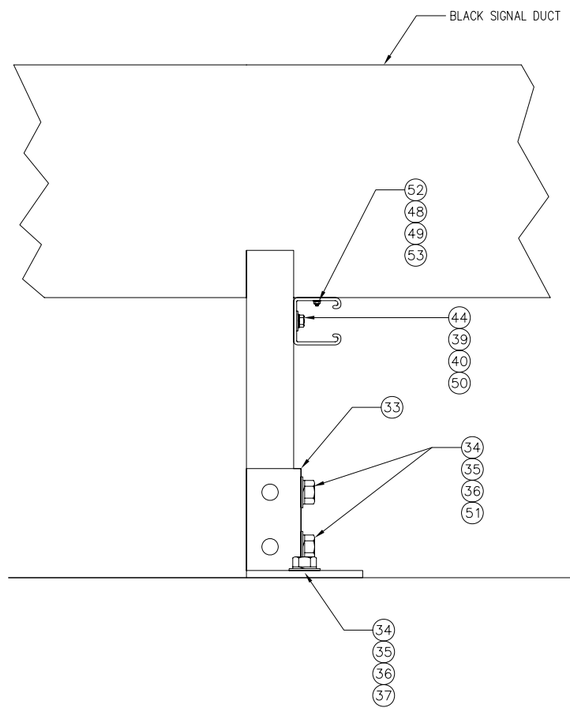
ATTACHMENT 18A
(SHEET 4 OF 6)

CABLE ROUTING LAYOUT (ISP)
(DRAWING TYPE CODE 160)

NOTES:

A. TWO-INCH LARGE FIRESTOP PILLOWS WILL COMPRESS TO FILL UP TO A 2 INCH SPACE.
TWO-INCH MEDIUM AND SMALL FIRESTOP PILLOWS WILL COMPRESS TO FILL UP TO A 1.5 INCH SPACE.
INSTALL BLANK PANELS WHERE UPS'S ARE SHOWN.

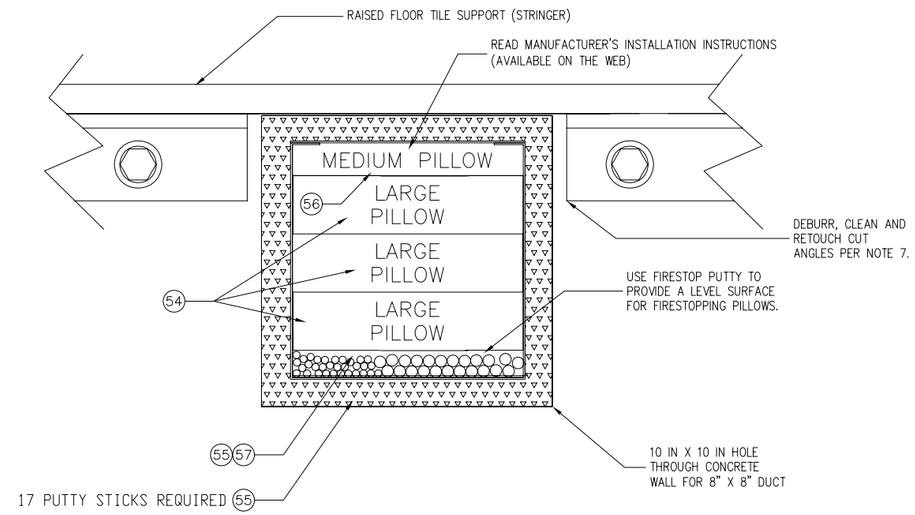
B. 3M MOLDABLE PUTTY+ IS USED TO SEAL ANY SMALL FIRESTOP OPENINGS GREATER THAN 1/16".



VIEW B-B

DUCT SUPPORT FRAMING INSTALLATION DETAIL

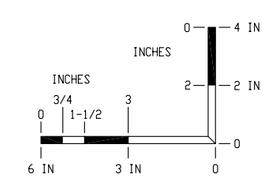
TYPICAL POST BASE AND UNISTRUT CROSS-MEMBER
INSTALLATION DETAIL



DETAIL 35-C

VIEW OF TYPICAL WALL PENETRATION

FIRESTOP INSTALLATION DETAIL
FOR
8 INCH BY 8 INCH DUCT



GRAPHIC SCALE

6" = 1'-0"

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	160-000-2080000	–
SCALE: 1/2				SHEET 5	

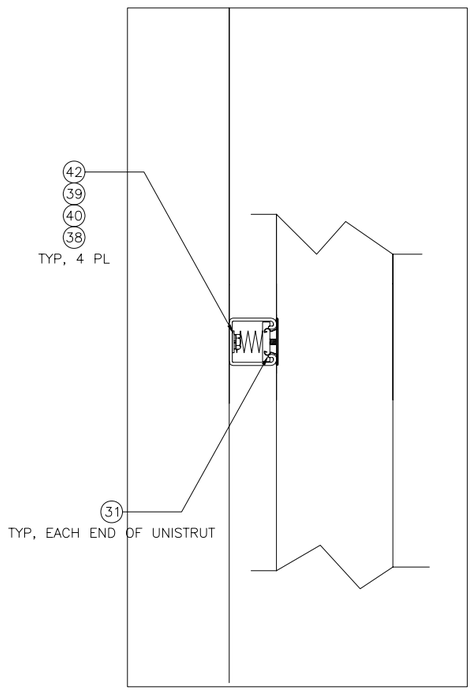
ATTACHMENT 18A
(SHEET 5 OF 6)

CABLE ROUTING LAYOUTS (ISP)
(DRAWING TYPE CODE 160)

NOTES:

A. 4" X 4" WIREWAY DUCT COVER IS NOT SHOWN.

B. ANCHORS ARE INSTALLED APPROXIMATELY ONE INCH FROM EACH END OF EACH UNISTRUT SECTION.

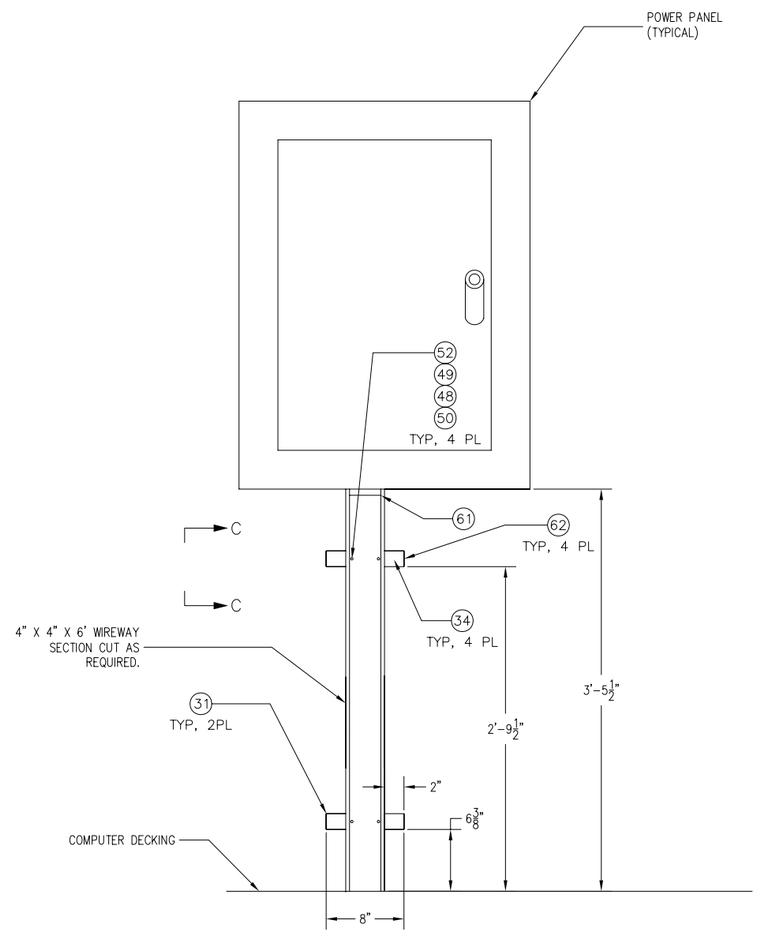


VIEW C-C

VERTICAL DUCT SUPPORT

TYPICAL POWER RISER SUPPORT INSTALLATION DETAIL

SCALE: 6" = 1'-0"



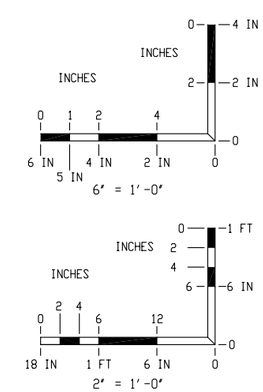
TYPICAL POWER RISER

INSTALLATION DETAIL

FOR

4 INCH BY 4 INCH POWER WIREWAY DUCT

SCALE: 2" = 1'-0"



GRAPHIC SCALES

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	160-000-2080000	-

SCALE: AS SHOWN SHEET 6

ATTACHMENT 18A
(SHEET 6 OF 6)

CABLE ROUTING LAYOUTS (ISP)
(DRAWING TYPE CODE 160)

GENERAL NOTES:

1. THIS EXAMPLE IS BASED ON A TRUE IDP DRAWING. IT HAS BEEN MODIFIED TO FIT THE IRD FORMAT STYLE. NOT ALL OF THE ORIGINAL SHEETS ARE INCLUDED IN THIS EXAMPLE.
2. REF 1 LISTS ALL DRAWINGS PERTAINING TO THIS PROJECT.

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST	1	28687-080000-A160-000-2080000-000-	-
CABLE ROUTING/DUCT PLAN - BLDG 112 FIRST FLOOR	2	"	
CABLE ROUTING/DUCT PLAN - BLDG 112 SECOND FLOOR	3	"	
CABLE ROUTING - BLDG 3169 CONFERENCE ROOM 4	4	"	
CABLE ROUTING - BLDG 3190 ROOM 18	5	"	
CONDUIT ROUTING LAYOUT - BLDG 5545, KILO WHARF	6	"	
CONDUIT ROUTING LAYOUT - WHARF ROMEO AND WHARF SIERRA	7	"	
CONDUIT ROUTING LAYOUT - WHARF VICTOR	8	"	
MANHOLE/HANDHOLE FOLDOUTS (1 OF 4)	9	"	
MANHOLE/HANDHOLE FOLDOUTS (2 OF 4)	10	"	
MANHOLE/HANDHOLE FOLDOUTS (3 OF 4)	11	"	
MANHOLE/HANDHOLE FOLDOUTS (4 OF 4)	12	"	
PIER RISER CONDUIT ENTRANCE LAYOUTS (1 OF 3)	13	"	
PIER RISER CONDUIT ENTRANCE LAYOUTS (2 OF 3)	14	"	
PIER RISER CONDUIT ENTRANCE LAYOUTS (3 OF 3)	15	"	
BUILDING ENTRANCE BOX LAYOUTS (1 OF 2)	16	"	
BUILDING ENTRANCE BOX LAYOUTS (2 OF 2)	17	"	

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

ITEM	DESCRIPTION	NSN	SUPPLIER OR MFGR.	PART NUMBER	QTY	U/M	FURN. BY	REMARKS
1	PULL BOX FOR GUAM BLDG 1803				1	EA	SSC-SD	
2	ENCLOSURE, STAINLESS STEEL WALL-MOUNT, 36.00" x 24.00" x 12.00" HOFFMAN		HOFFMAN	C-SD362412SS6	9	EA	SSC-SD	
3	HANDLE, PADLOCK, FOR HOFFMAN CONCEPT ENCLOSURES		HOFFMAN	C-WHPTO	11	EA	SSC-SD	
4	DOOR STOP KIT, HOFFMAN		HOFFMAN	A-DSTOPK	11	EA	SSC-SD	
5	DATA POCKET, HOFFMAN		HOFFMAN	A-DP2	11	EA	SSC-SD	
6	PANEL, STEEL, FOR 36" x 24" CONCEPT ENCLOSURE		HOFFMAN	C-P3624	9	EA	SSC-SD	
7	PANEL, STEEL, FOR 42" X 36" CONCEPT ENCLOSURE		HOFFMAN	C-P4236	2	EA	SSC-SD	
8	MOUNTING KIT, ADJUSTABLE, FOR HOFFMAN CONCEPT ENCLOSURES		HOFFMAN	C-AM124	11	EA	SSC-SD	
9	PLUG, INNERDUCT ORGANIZER FOR 3 x 1-1/4" INNERDUCTS IN 4" DUCT		CONDUX	8093467	64	EA	SSC-SD	
10	ENCLOSURE, STAINLESS STEEL WALL-MOUNT, 42.00" x 36.00" x 12.00" HOFFMAN		HOFFMAN	C-SD423612SS6	2	EA	SSC-SD	
11	CLOSURE, SPLICE (COYOTE), FIBER OPTIC, 6" x 22" 144 FIBER/ 4 TRAY CAPACITY		PREFORMED LINE PRODUCTS	8006560	2	EA	SSC-SD	
12	TRAY, SPLICE, 36 SPLICE, FOR COYOTE CLOSURES		PREFORMED LINE PRODUCTS	80805110	8	EA	SSC-SD	
13	TAPE, SEALANT LOCK, 1-1/2" x 12",		PREFORMED LINE PRODUCTS	80801953	2	RO	SSC-SD	
14	SEALING CEMENT, FOUR OUNCE CAN		PREFORMED LINE PRODUCTS	80802377	2	EA	SSC-SD	
15	UMBILICAL RECEPTACLE, PIGTAIL		PACKARD HUGHES	1123790H	15	EA	SPAWAR	
16	CONDUIT WITH INTEGRAL BELL, 4" SCHEDULE 40 PVC, 20 FOOT SECTIONS, SUN RESISTANT		CARLON	49015-020	17100	FT	SSC-SD	
17	CONDUIT WITH INTEGRAL BELL, 2" SCHEDULE 40 PVC, 20 FOOT SECTIONS, SUN RESISTANT		CARLON	49011-020	1000	FT	SSS-SD	
18	CONDUIT WITH INTEGRAL BELL, 4" SCHEDULE 80 PVC, 10 FOOT SECTIONS, SUN RESISTANT		CARLON	49415-010	130	FT	SSS-SD	
19	CONDUIT WITH INTEGRAL BELL, 2" SCHEDULE 80 PVC, 10 FOOT SECTIONS, SUN RESISTANT		CARLON	49411-010	20	FT	SSC-SD	
20	ELBOW, 4", SCHEDULE 9 40 90-DEGREE 3 FOOT RADIUS, BELLED END		CARLON	UA9FNB	34	EA	SSC-SD	
21	END BELL, (SCHEDULE 40), 2" PVC		CARLON		10	EA	SSC-SD	
22	END BELL, (SCHEDULE 40), 4" PVC		CARLON	E997N	124	EA	SSC-SD	
23	TERMINAL ADAPTER FOR 4" CONDUIT		CARLON	E943N	46	EA	SSC-SD	
24	SEALANT RTV SILICONE SEALANT GE #102, MIL-A-46106, WHITE PASTE		MG CHEMICALS	RTV102-300ML	16	CA	SSC-SD	
25	CEMENT REGULAR GRADE FOR PVC, GREY, WITH DAUBER		CARLON	VC9961P	1	GL	SSS-SD	USE TO ATTACH END BELLS
26	TERMINAL ADAPTER FOR 2" CONDUIT		CARLON	E943J	11	EA	SSS-SD	
27	LOCKNUT, CONDUIT, 2"	5975 -00-100-8776			12	EA	SSC-SD	
28	WASHER, FOR SEALING LOCKNUT, 2"		CARLON	E943JW	12	EA	SSC-SD	
29	LOCKNUT, 4" SEALING		BRIDGEPORT	UPC # 78174700150	46	EA	SSC-SD	
30	BUSHING, 4"				46	EA	EFA-GU	
31	BUSHING, INSULATED, FOR 2" RIGID METAL CONDUIT	5975 -00-665-0648			12	EA	EFA-GU	
32	COUPLING, SPLIT INNERDUCT, REUSABLE, AL, 1-1/4"		CONDUX	8676712	76	EA	SSC-SD	
33	SPLIT INNERDUCT, 1-1/4", CORRUGATED		CARLON	A6D2E1JNNBxxxx	160	FT	SSC-SD	
34	PLUG, DUCT, 1-1/4" BLANK UNIVERSAL		CARLON	MAEPG4	77	EA	SSC-SD	
35	PLUG, DUCT, 4", NONMETALLIC EYE NUT, WATER & AIR TIGHT		CONDUX	8067840	108	EA	SSC-SD	
36	PLUG, DUCT, 2", NONMETALLIC EYE NUT, WATER & AIR TIGHT		CONDUX	8067820	21	EA	SSC-SD	
37	PLUG, FOR 1-1/4" INNERDUCT WITH OFS 12/12 & 24/24 ARMORED CABLE (0.57-0.70 CABLE RANGE)		CONDUX	08043913	75	EA	SSC-SD	
38	CABLE, 12SM/12MM(62.5/125), HYBRID FIBER OPTIC, ARMORED, LOOSE TUBE, RISER RATED		OFS	ATXUGN2OT-024-12/12-3B	7400	FT	SSC-SD	3 REELS: 3400, 1500, & 2500
39	CABLE, 24SM/24MM(62.5/125), HYBRID FIBER OPTIC, ARMORED, LOOSE TUBE, RISER RATED		OFS	ATXUGN2OT-048-24/24-3B	2400	FT	SSC-SD	ONE REEL
40	CABLE, 48SM/48MM(62.5/125), HYBRID FIBER OPTIC, ARMORED, LOOSE TUBE, RISER RATED		OFS	ATXUGN2OT-096-48/48-3B	5400	FT	SSC-SD	2 REELS: 2300 & 3100 FT
41	ROPE, PULL, 1000 LB. TEST, 3/4" DIA.	4020 -00-968-1350			17000	FT	SSC-SD	
42	ENCLOSURE, TYPE 4X, 316L STAINLESS, PREMIER SERIES, 60" x 36" x 12",		B-LINE	603612-SDSS6	2	EA	EFA-GU	SEE BLDG PENETRATION DETAILS FOR QTY
43	INNERDUCT, HDPE, 1-1/4",SDR-13.5, LUBED, BLACK, 1130 POUND PULLTAPE, SMOOTH/RIBBED INSIDE		CARLON	A6B9D6ANNBxxxx	7500	FT	EFA-GU	P/O NEW 3-WAY RUNS
44	INNERDUCT, HDPE, 1-1/4",SDR-13.5, LUBED, BLUE, 1130 POUND PULLTAPE, SMOOTH/RIBBED INSIDE		CARLON	A6B9D6BNNBxxxx	7500	FT	EFA-GU	
45	INNERDUCT, HDPE, 1-1/4",SDR-13.5, LUBED, ORANGE, 1130 POUND PULLTAPE, SMOOTH/RIBBED INSIDE		CARLON	A6B9D6JNNBxxxx	7500	FT	EFA-GU	
46	PLUG, FOR 1-1/4" INNERDUCT WITH OFS 48/48 ARMORED CABLE (0.70-0.90 CABLE RANGE)		CONDUX	08043914	32	EA	EFA-GU	
47	TIES, WEATHER RESISTANT, LOCKING, 30.5" LONG		PANDUIT	PLT9H-0	200	EA	EFA-GU	
48	TIES, WEATHER RESISTANT, RELEASABLE, 14.5 LONG		PANDUIT	PRT4H-0	200	EA	EFA-GU	
49	TIES, WEATHER RESISTANT, LOCKING, 14.5" LONG		PANDUIT	PLT4H-0	200	EA	EFA-GU	
50	CABLE MARKER STRAP, POLYPROPYLENE		PANDUIT	CM4S-L2	70	EA	EFA-GU	
51	PEN, MARKING, PERMANENT, BLACK		PANDUIT	PFX-0	2	EA	EFA-GU	
52	MANHOLE, MINI, GUAM MADE, COMPLETE WITH ALL ACCESSORIES		SPAWAR GU	MINI-MANHOLE	14	EA	EFA-GU	
53	SEALANT KIT, DUCT, SCOTCHCAST 4416				6	KT	EFA-GU	
54	IGLOO TRAFFIC BARRIER CAGE KIT, FOR 12" X 24" X 36" ENCLOSURES, WITH INSTLN MATERIALS		SPAWAR GU	IGLOO-12X24X36ENCL	9	EA	EFA-GU	ALL CORROSION RESISTANT
55	IGLOO TRAFFIC BARRIER CAGE KIT, FOR 12" X 36" X 42" ENCLOSURES, WITH INSTLN MATERIALS		SPAWAR GU	IGLOO-12X36X42ENCL	2	EA	EFA-GU	ALL CORROSION RESISTANT

LEGEND:

FURN BY - FURNISHED BY
U/M - UNIT OF MEASURE
SS - STAINLESS STEEL
KO - KNOCK-OUT
LG - LENGTH
HD - HUNDRED
MFGR - MANUFACTURER
RO - ROLL
TYP - TYPICAL
PL - PLACES
GL - GALLON
////////// - INDICATES NEW TRENCH

DISTRIBUTION AUTHORIZED TO U. S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS FOR ADMINISTRATIVE OR OPERATIONAL USE. DATE OF DETERMINATION: 2009/04/02. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO, CODE 4.2 OR SPAWAR FACILITY GUAM.

INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
1	GUAM BLII PIERSIDE UPGRADE INSTALLATION MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

UNLESS OTHERWISE NOTED, DIMENSION UNITSS ARE ARCHITECTURAL (IN INCHES OR FEET AND INCHES).

TOLERANCES ARE +/- 1/4" FOR VERTICAL POSITIONING OF DUCTS, AND +/- 1/8" FOR HORIZONTAL POSITIONING OF DUCTS AND CONDUITS.

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 31590
SPAWARSYSCEN PAC WESTPAC
C4ISR FACILITY
GUAM

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

GUAM
BLII PIERSIDE UPGRADE
CABLE ROUTING LAYOUT

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	160-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 17

ATTACHMENT 18B
(SHEET 1 OF 3)

CABLE ROUTING LAYOUT (OSP)
(DRAWING TYPE CODE 160)

NOTES:
(THIS SHEET ONLY)

1. CONDUIT/CABLES THIS LINE:
   (N) (4) 4" PVC CONDUIT SCHEDULE 40
   (N) (3) 1 1/4" INNERDUCT
   (N) (1) 12/12 FIBER OPTIC CABLE, (F8-3169-01)

2. CONDUIT/CABLES THIS LINE:
   (N) (4) 4" PVC CONDUIT SCHEDULE 40
   (N) (3) 1 1/4" INNERDUCT
   (N) (2) 12/12 FIBER OPTIC CABLE (F8-3169-01)
   (F8-3169-02)

3. CONDUIT/CABLES THIS LINE:
   (N) (4) 4" PVC CONDUIT SCHEDULE 40
   (N) (3) 1 1/4" INNERDUCT
   (N) (1) 48/48 FIBER OPTIC CABLE (F8-3169-01)

4. CONDUIT/CABLES THIS LINE:
   (N) (4) 4" PVC CONDUIT SCHEDULE 40
   (N) (3) 1 1/4" INNERDUCT
   (N) (1) 48/48 FIBER OPTIC CABLE (F8-3169-01)
   (N) (1) 24/24 FIBER OPTIC CABLE (F8-3169-04)

5. CONDUIT/CABLES THIS LINE:
   (N) (4) 4" PVC CONDUIT SCHEDULE 40
   (N) (3) 1 1/4" INNERDUCT
   (N) (2) 48/48 FIBER OPTIC CABLE (F8-3169-01)
   (F8-3169-05)

6. CONDUIT/CABLES THIS LINE:
   (N) (4) 4" PVC CONDUIT SCHEDULE 40
   (N) (3) 1 1/4" INNERDUCT
   (N) (2) 48/48 FIBER OPTIC CABLE (F8-3169-01, F8-3169-05)
   (N) (1) 24/24 FIBER OPTIC CABLE (F8-3169-06)

7. CONDUIT/CABLES THIS LINE:
   (N) (4) 4" PVC CONDUIT SCHEDULE 40
   (N) (6) 1 1/4" INNERDUCT
   (N) (1) 24/24 FIBER OPTIC CABLE (F8-3169-06)
   (N) (1) 12/12 FIBER OPTIC CABLE (F8-3169-07)
   (N) (2) 48/48 FIBER OPTIC CABLE (F8-3169-01, F8-3169-05)

8. ROMEO WHARF PIER RISER BERTH 01
   (N) FIBER OPTIC SPLICE ENCLOSURE
   (N) (1) 24SM/24MM FIBER OPTIC CABLE FOR
   PIER RISER ROMEO-01

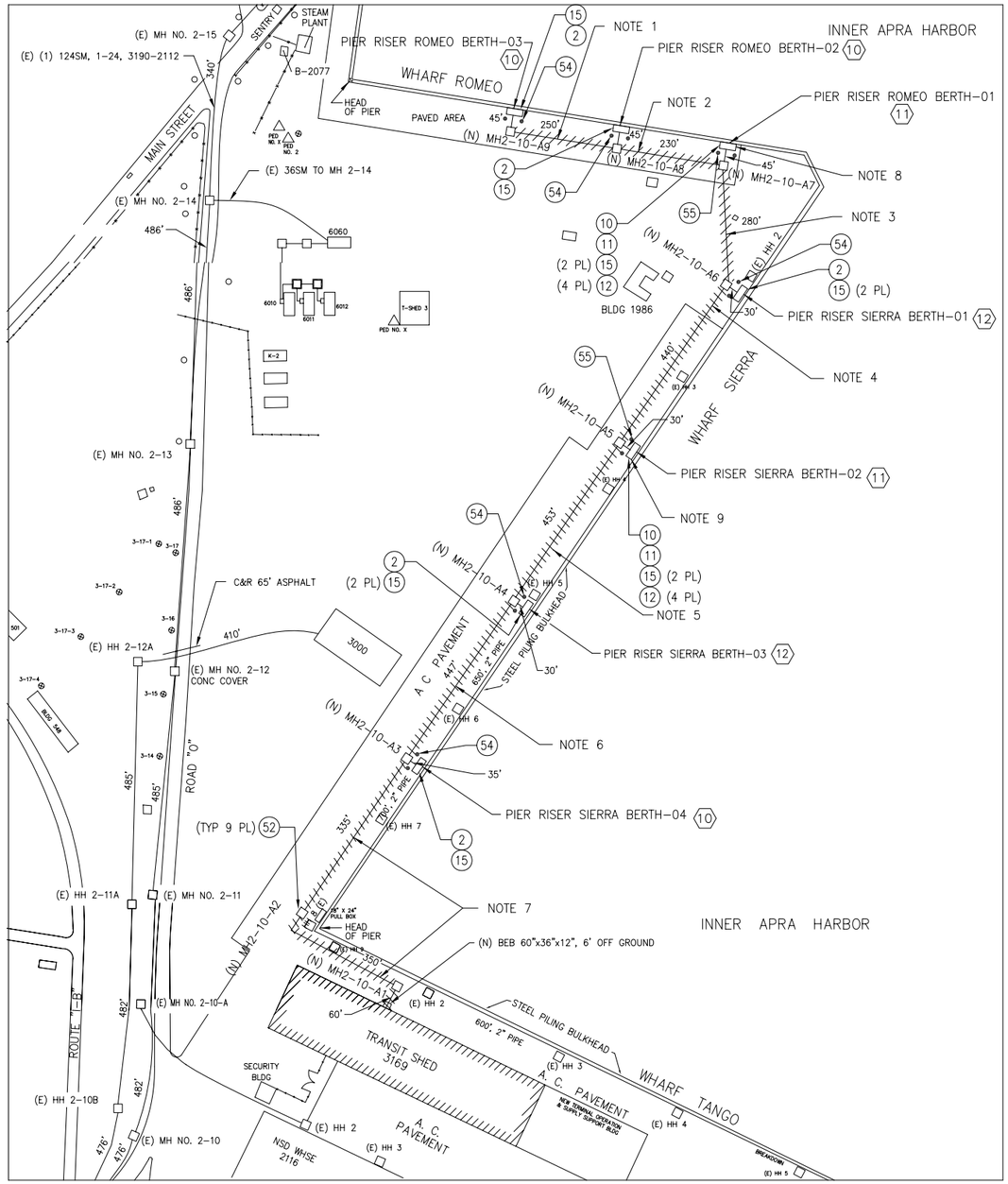
9. SIERRA WHARF PIER RISER BERTH 02
   (N) FIBER OPTIC SPLICE ENCLOSURE
   (N) (1) 24SM/24MM FIBER OPTIC CABLE FOR
   PIER RISER SIERRA-05

(10) T1
1-12 (SM), 13-24 (MM)

(11) T1
1-48 (SM), 49-96 (MM)

(12) T1
1-24 (SM), 25-48 (MM)

DISTRIBUTION LIMITED TO DEPARTMENT OF DEFENSE AGENCIES AND THEIR CONTRACTORS. OTHER REQUEST FOR THIS DOCUMENTATION SHALL BE REFERRED TO THE INSTALLATION ACTIVITY AT SPAWARSYSCEN PAC WESTPAC C4ISR FACILITY CODE 256 (IA 31590), OR SPAWAR SYSTEMS COMMAND CODE 04M.



WHARF ROMEO AND WHARF SIERRA CONDUIT ROUTING LAYOUT
NOT TO SCALE

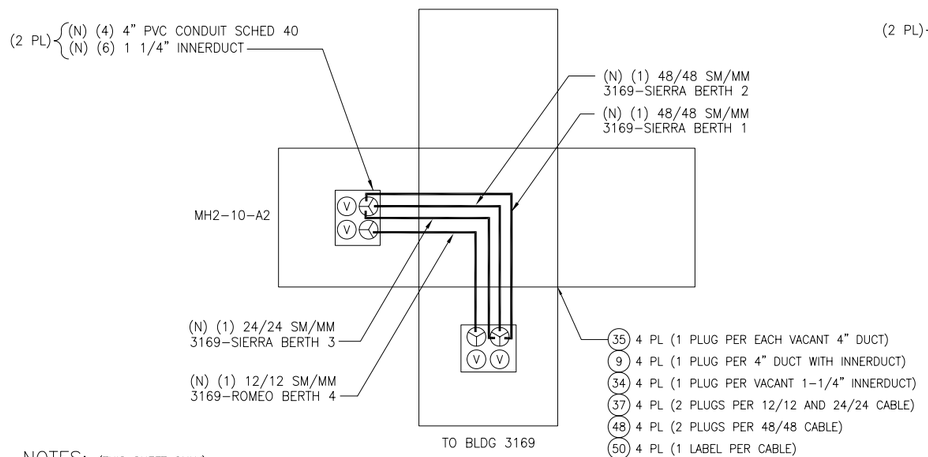
INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	160-000-2080000	-

SCALE: NONE SHEET 7

ATTACHMENT 18B
(SHEET 2 OF3)

CABLE ROUTING LAYOUT (OSP)
(DRAWING TYPE CODE 160)



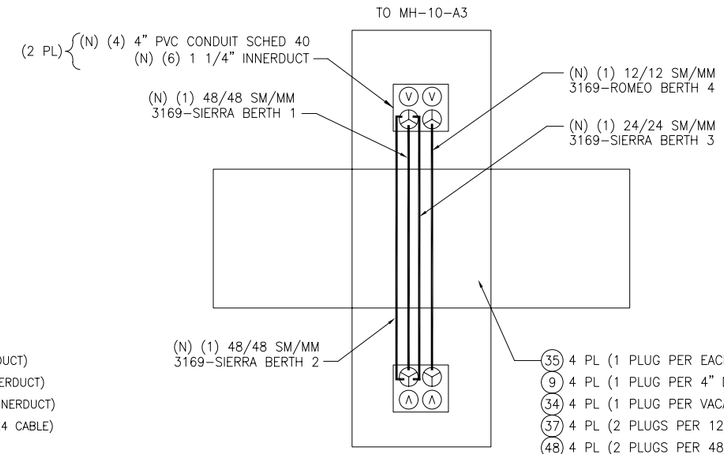
(35) 4 PL (1 PLUG PER EACH VACANT 4" DUCT)
(9) 4 PL (1 PLUG PER 4" DUCT WITH INNERDUCT)
(34) 4 PL (1 PLUG PER VACANT 1-1/4" INNERDUCT)
(37) 4 PL (2 PLUGS PER 12/12 AND 24/24 CABLE)
(48) 4 PL (2 PLUGS PER 48/48 CABLE)
(50) 4 PL (1 LABEL PER CABLE)
(32) 8 PL (2 INNERDUCT COUPLERS PER CABLE)
(33) CUT SPLIT INNERDUCT TO FIT
(22) 8 PL (1 END BELL PER 4" DUCT)
(47)(49) AS NEEDED

(N) MH2-10-A1

SEE NOTE 1

NOTES: (THIS SHEET ONLY)

1. ALL NEW MANHOLES ARE ITEM 52, DESIGNED AND INSTALLED BY SPAWARSYSFACPAC GUAM.
2. PUT 2" CONDUIT ON SIDE NEAREST TO CABLE TV BOX.
3. USE ITEM 51 WITH ITEM 50. SEE LABELING DETAILS.
4. ALL VACANT CONDUITS HAVE ITEM 41.
5. USE ITEM 24 TO SEAL ALL MANHOLE PENETRATIONS.

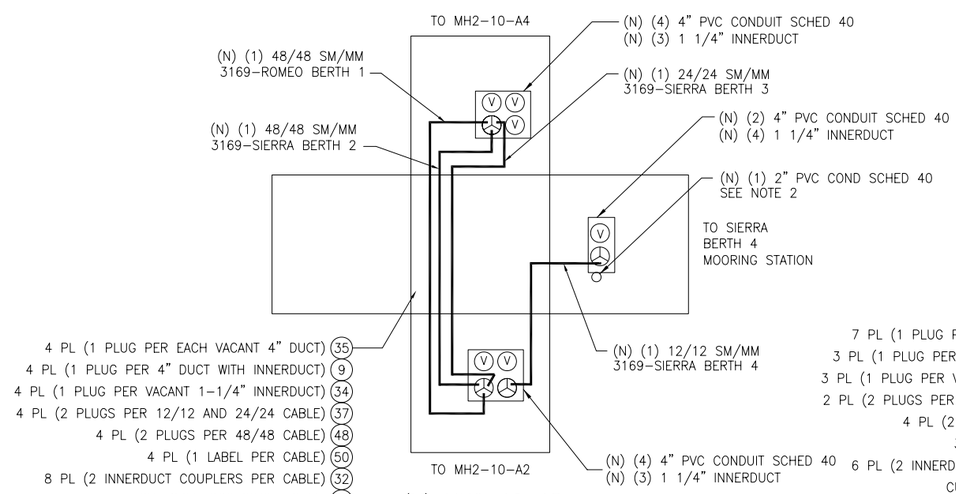


(35) 4 PL (1 PLUG PER EACH VACANT 4" DUCT)
(9) 4 PL (1 PLUG PER 4" DUCT WITH INNERDUCT)
(34) 4 PL (1 PLUG PER VACANT 1-1/4" INNERDUCT)
(37) 4 PL (2 PLUGS PER 12/12 AND 24/24 CABLE)
(48) 4 PL (2 PLUGS PER 48/48 CABLE)
(50) 4 PL (1 LABEL PER CABLE)
(32) 8 PL (2 INNERDUCT COUPLERS PER CABLE)
(33) CUT SPLIT INNERDUCT TO FIT
(22) 8 PL (1 END BELL PER 4" DUCT)
(47)(49) AS NEEDED

(N) MH2-10-A2

SEE NOTE 1

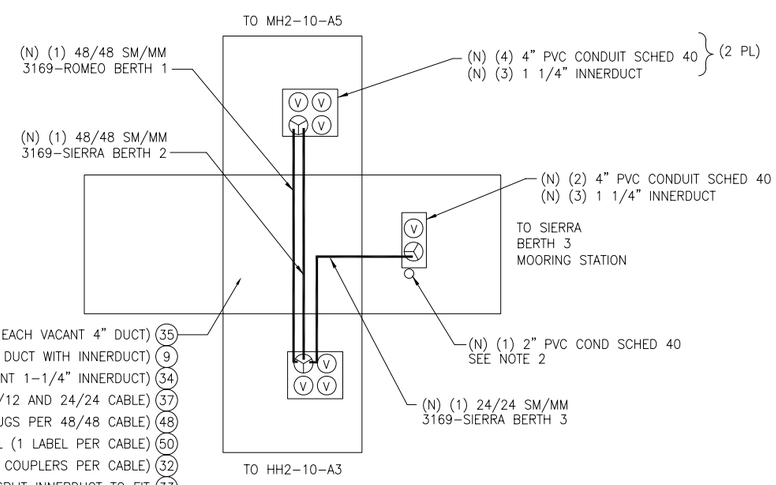
DISTRIBUTION LIMITED TO DEPARTMENT OF DEFENSE AGENCIES AND THEIR CONTRACTORS. OTHER REQUEST FOR THIS DOCUMENTATION SHALL BE REFERRED TO THE INSTALLATION ACTIVITY AT SPAWARSYSCEN PAC WESTPAC C4ISR FACILITY CODE 256 (IA 31590), OR SPAWAR SYSTEMS COMMAND CODE 04M.



4 PL (1 PLUG PER EACH VACANT 4" DUCT) (35)
4 PL (1 PLUG PER 4" DUCT WITH INNERDUCT) (9)
4 PL (1 PLUG PER VACANT 1-1/4" INNERDUCT) (34)
4 PL (2 PLUGS PER 12/12 AND 24/24 CABLE) (37)
4 PL (2 PLUGS PER 48/48 CABLE) (48)
4 PL (1 LABEL PER CABLE) (50)
8 PL (2 INNERDUCT COUPLERS PER CABLE) (32)
CUT SPLIT INNERDUCT TO FIT (33)
(ONE PLUG FOR VACANT 2" DUCT) (36)
(1 END BELL FOR 2" DUCT) (21)
10 PL (1 END BELL PER 4" DUCT) (22)
AS NEEDED (47)(49)

(N) MH2-10-A3

SEE NOTE 1



7 PL (1 PLUG PER EACH VACANT 4" DUCT) (35)
3 PL (1 PLUG PER 4" DUCT WITH INNERDUCT) (9)
3 PL (1 PLUG PER VACANT 1-1/4" INNERDUCT) (34)
2 PL (2 PLUGS PER 12/12 AND 24/24 CABLE) (37)
4 PL (2 PLUGS PER 48/48 CABLE) (48)
3 PL (1 LABEL PER CABLE) (50)
6 PL (2 INNERDUCT COUPLERS PER CABLE) (32)
CUT SPLIT INNERDUCT TO FIT (33)
(1 END BELL FOR 2" DUCT) (21)
10 PL (1 END BELL PER 4" DUCT) (22)
AS NEEDED (47)(49)
(ONE PLUG FOR VACANT 2" DUCT) (36)

(N) MH2-10-A4

SEE NOTE 1

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	080000	A	160-000-2080000	-

SCALE: 1/30 SHEET 9

ATTACHMENT 18B
(SHEET 3 OF 3)

CABLE ROUTING LAYOUT (OSP)
(DRAWING TYPE CODE 160)

NOTES:

A. SEE LEGEND ON SHEET 1 FOR LISTING OF DRAWINGS PERTAINING TO THIS INSTALLATION.

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST	1	28687-080000-A170-000-2080000-000-	-
BAY NO. 43 CABINET ASSEMBLY DETAILS	2	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

ITEM	DESCRIPTION	FURN BY	QTY	U/M	NSN	SUPPLIER OR MFGR.	PART NUMBER	REMARKS
1	SCREW, TRUSS HEAD, 10-32 X 1/2"	GOVT	100	EA		COML		
2	SLIDING SHELF	GOVT	1	EA		SOWATHAN	J-26421	
3	SREW PAN HD 10-32 X 1/2"	GOVT	4			COML		
4	POWER SUPPLY	GOVT	1	EA		A&J	AJ150-2314	

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INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
3	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, LABELING DETAILS	120-000-2080000
2	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MISC INSTALLATION DETAILS	180-000-2080000
1	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

UNLESS OTHERWISE NOTED, DIMENSION UNITSS ARE ARCHITECTURAL (IN INCHES OR FEET AND INCHES).

TOLERANCES ARE NOT USED, BUT ALL ITEMS MUST BE LOCATED IN THE EXACT RACK UNIT POSTIONS SHOWN IN THE DRAWING.

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000

DEVELOPING AGENT ADDRESS ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
MECHANICAL ASSY & MOUNTING DETAILS

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	171-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 2

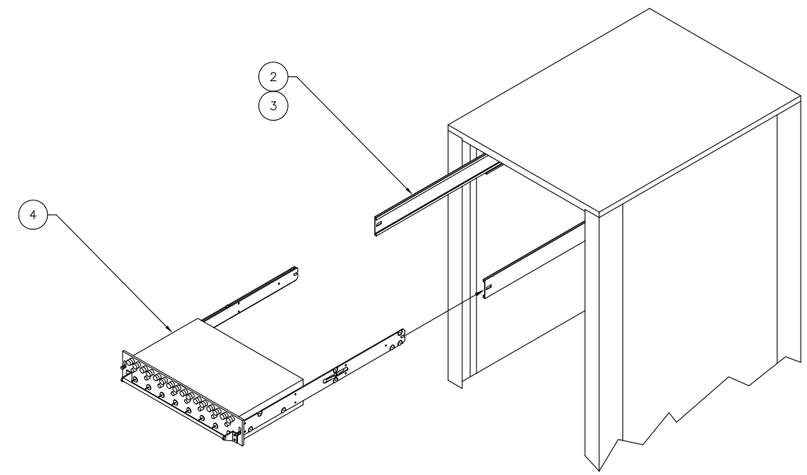
ATTACHMENT 19 MECHANICAL ASSY & MOUNTING DETAILS

(DRAWING TYPE CODE 170)

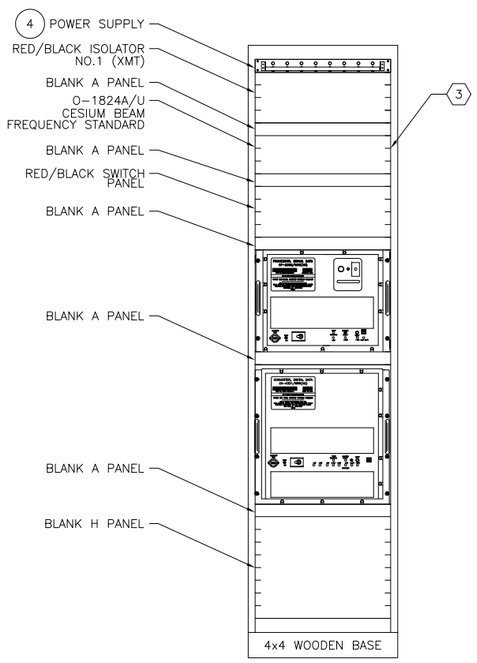
(SHEET 1 OF 2)

NOTES:

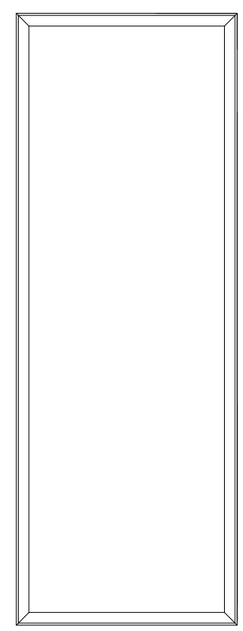
1. SHOWN WITH EQUIPMENT REMOVED FOR CLARITY.
2. INSTALL GROUNDING WIRE FROM EQUIPMENT GROUNDING STUD TO CHASSIS BUS BAR USING 12AWG THHN (PC 37).
3. EXISTING SITE EQUIPMENT.



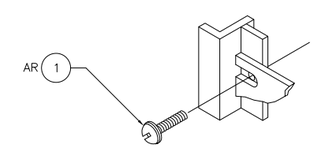
EQUIPMENT MOUNTING DETAIL
TYPICAL
NOT TO SCALE



FRONT VIEW



RIGHT SIDE VIEW



EQUIPMENT MOUNTING DETAIL
TYPICAL
NOT TO SCALE

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	AS-BUILT ID	IA	DRAWING NO.	REV
F	28687	000000	A	171-000-2080000	–

SCALE: NONE SHEET 2

ATTACHMENT 19 MECHANICAL ASSY & MOUNTING DETAILS
(DRAWING TYPE CODE 170)
(SHEET 2 OF 2)

GENERAL NOTES:

1. CABINETS SHALL BE AT LEAST 30 INCHES DEEP.
2. EQUIPMENT CABINETS SHALL BE PERMANENTLY ANCHORED TO BUILDING STRUCTURE.
3. FOR INSTALLATIONS AT NAVAL SHORE SECURTIY GROUP LOCATIONS EQUIPMENT CABINETS SHALL BE INSTALLED ATOP A 4 X 4 WOOD FOUNDATION IAW SPAWAR INSTRUCTION 010108A (PARA 6.9.2).
4. SIZE FOUNDATION TO MATCH THE BOTTOM OF CABINET PURCHASED. GLUE WOOD TOGETHER USING ITEM 18 AND CLAMPS AS REQUIRED. DO NOT BOLT WOODEN PIECES TOGETHER IF THIS WILL CAUSE ANY INTERFERENCE WITH MOUNTING THE FOUNDATION TO THE FLOOR OR MOUNTING THE CABINET TO THE FOUNDATION.
5. IF SEISMIC ACTIVITY IS A CONCERN USE 5/8" HARDWARE INSTEAD OF 3/8" HARDWARE TO SECURE FOUNDATION TO FLOOR.
6. IF RAISED FLOOR IS MORE THAN 60 CM FROM TRUE FLOOR, USE 5/8" THREADED ROD AND HARDWARE TO SECURE FOUNDATION.
7. ATTACH COVE BASE, ITEMS 9 & 10 USING ITEM 11 AFTER CABINET IS MOUNTED.
8. USE ITEMS 19 AND 5 OR ITEMS 20 AND 15 TO ATTACH CABINET TO FOUNDATION.
9. COVER THREADED ROD WITH ITEM 21 TO PROTECT CABLES FROM TO FOUNDATION.

SHEET INDEX

CONTENTS	SH NO.	FILE NAME	REV
TITLE BLOCK, REFERENCES, SHEET INDEX, GENERAL NOTES AND PARTS LIST	1	28687-080000-A180-000-2080000-000-	-
MISCELLANEOUS INSTALLATION DETAILS	2	"	-

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

PARTS LIST

FIND	DESCRIPTION	FURN BY	QTY	U/M	NSN	SUPPLIER OR MFGR.	PART NUMBER	REMARKS
1	WOOD, 4" X 4", S4S PRESSURE TREATED, FIRERESIST	IAF	4	EA	-	LOCAL YARD	-	CUT TO FIT
2	ROD, THREADED, 3/8"-16 X 10 FT	IAF	1	LG	5306-00-903-3535	-	-	-
3	BOLT, 3/8-16 X 4-1/2"	IAF	A/R	EA	-	-	-	FOR NON-RAISED FLOORS
4	BOLT, 3/8-16 X 3"	IAF	A/R	EA	-	-	-	-
5	WASHER, FLAT, 3/8" CRES	IAF	A/R	EA	5310-00-595-6057	-	-	-
6	WASHER, LOCK, SPLIT, 3/8", CRES	IAF	A/R	EA	5310-00-984-7042	-	-	-
7	NUT, 3/8"-16, HEX HEAD, CRES	IAF	A/R	EA	5310-00-913-8881	-	-	-
8	ANCHOR, DOUBLE EXPANSION SHIELD, 3/8"-16	IAF	S/R	EA	5340-00-807-5434	-	WS-6513-1	4 UNLESS 5/8 HW USED.
9	MOLDING, BLACK, COVE BASE, 4" X 4'	IAF	2	EA	5680-00-477-6071	ALLSTATE	-	CUT TO FIT
10	OUTSIDE CORNER, COVE BASE, 4", BLACK	IAF	1	EA	-	ALLSTATE	-	WWW.ALLSTATERUBBER.COM
11	ADHESIVE, COVE BASE	IAF	1	GL	8040-01-035-7849	-	-	OR EQUIVALENT
12	ANCHOR, 5/8"-11, 2-1/2", 7/8" DRILL DIAMETER	IAF	S/R	EA	-	CHATSWORTH	06001-004	4 UNLESS 3/8 HW USED.
13	ANCHOR SETTING TOOL	IAF	1	EA	-	CHATSWORTH	06003-001	-
14	THREADED ROD, 5/8"-11 UNC-2A, 8 FT, GOLD OVER ZINC	IAF	A/R	LG	-	CHATSWORTH	11440-005	CUT TO FIT
15	WASHER, FLAT, 5/8"	IAF	A/R	GL	-	CHATSWORTH	04002-001	-
16	WASHER, LOCK, 5/8"	IAF	A/R	LG	-	CHATSWORTH	04003-001	-
17	NUT, HEX HEAD, 5/8"-11, GOLD OVER ZINC FINISH	IAF	A/R	GL	-	CHATSWORTH	20142-111	-
18	GLUE, WOOD	IAF	4	OZ	-	ELMERS	-	-
19	BOLT, LAG, 3/8" X 3"	IAF	S/R	EA	5305-00-145-1064	-	-	4 UNLESS 5/8 BOLTS USED
20	BOLT, LAG, 5/8" X 2"	IAF	S/R	EA	-	CHATSWORTH	02006-002	4 UNLESS 3/8 BOLTS USED
21	COVER, THREADED ROD, ID IS 0.630", LENGTH = 10 FT	IAF	A/R	EA	-	CHATSWORTH	11085-001	CUT TO FIT

LEGEND:

LG - LENGTH
GL - GALLON
A/R - AS REQUIRED
IAF - INSTALLING ACTIVITY FURNISHED
UNC 2A - UNIFIED COARSE THREAD CLASS 2A
CRES - CORROSION RESISTANT
M/W - MATES WITH
S4S - SURFACED FOUR SIDES
S/R - SEE REMARKS

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INSTALLATION DESIGN PLAN

NO.	DRAWING TITLE	DWG NO.
3	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, LABELING DETAILS	120-000-2080000
2	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MISC INSTALLATION DETAILS	180-000-2080000
1	COMSUBGRU 10 KINGS BAY, GA AN/WRR-12 SLVR INSTALLATION, MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

UNLESS OTHERWISE NOTED, DIMENSION UNITSS ARE ARCHITECTURAL (IN INCHES OR FEET AND INCHES).

TOLERANCES ARE +/- 1/16" FOR COUNTER BORE DEPTH AND HOLE DIAMETERS. HOLE CENTERS SHALL BE WITHIN 1/4" OF TRUE CORNER CENTERS.

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000
DEVELOPING AGENT ADDRESS ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

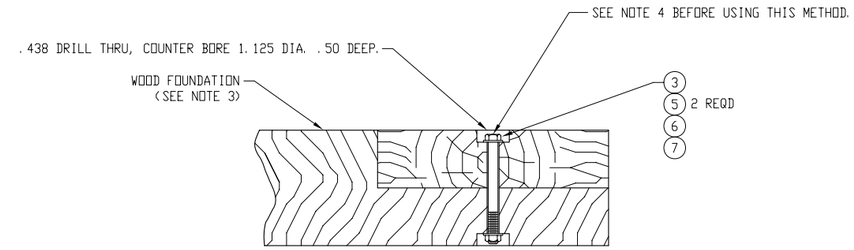
SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
MISCELLANEOUS INSTALLATION DETAILS

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	180-000-2080000	-

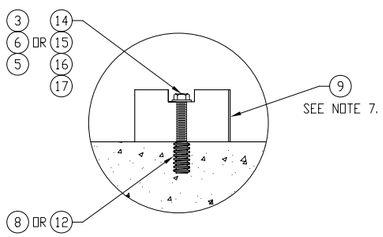
SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 2

ATTACHMENT 20 MISCELLANEOUS INSTALLATION DETAILS
(SHEET 1 OF 2) (DRAWING TYPE CODE 180)



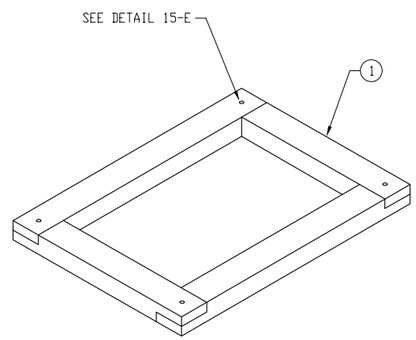
DETAIL 15-E

4 X 4 FOUNDATION
ASSEMBLY (4 PL)

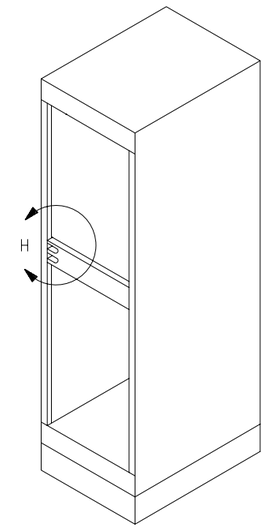


OPTIONAL DETAIL

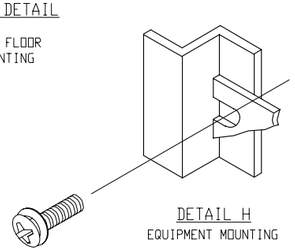
FOR SOLID FLOOR
DECK MOUNTING



4 x 4 WOOD FOUNDATION

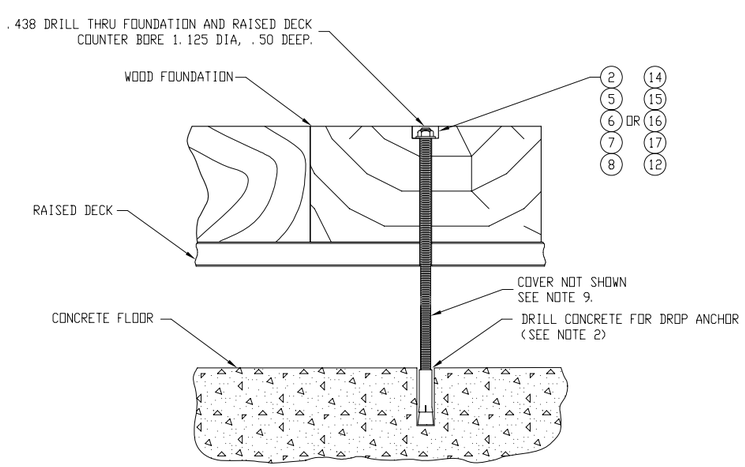


EQUIPMENT CABINET ON FOUNDATION



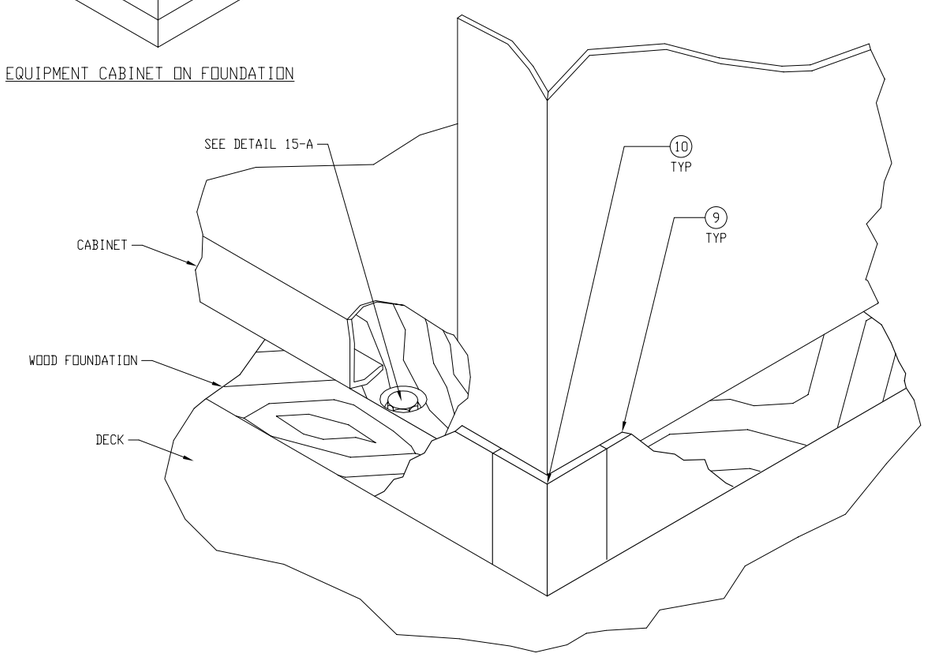
DETAIL H

EQUIPMENT MOUNTING



FOUNDATION/COMPUTER
DECK MOUNTING

DETAIL 15-A



CABINET FOUNDATION MOUNTING AND COVERING DETAIL

INSTALLATION DESIGN PLAN

SIZE	CAGE CODE	IA	AS-BUILT ID	DRAWING NO.	REV
F	28687	A	000000	180-000-2080000	–

SCALE: NONE SHEET 2

ATTACHMENT 20 MISCELLANEOUS INSTALLATION DETAILS

(SHEET 2 OF 2)

(DRAWING TYPE CODE 180)

KG-194 STRAPPING

FUNCTION	OPTION	STRAP			LOCATION
RESYNC LEVEL (RSYL)	☒ 1 DIFFERENTIAL	E12 TO E14	E5 TO E7		RED I/O BOARD GFV
	☐ 2 NOT USED	E12 TO E11	E5 TO E6		
	☐ 3 SINGLE ENDED (POS)	E12 TO E11	E5 TO E3		
	☐ 4 SINGLE ENDED (NEG)	E12 TO E10	E5 TO E3		
	☐ 5 SINGLE ENDED (BAL)	E12 TO E14	E5 TO E3		
TXPT	☒ 1 CENTER TAPPED TO GND	E2 TO E1	E5 TO E3		
	☐ 2 NOT CENTER TAPPED TO GND	E2 TO E4			
PHASE SELECT (ø SEL)	☒ 1 REAR SELECTED/NORMAL	E32 TO E30			
	☐ 2 INVERTED	E32 TO E31			
PHASE MONITOR (ø MON)	☒ 1 ENABLED	E28 TO E27			
	☐ 2 REAR SELECTED/DISABLED	E28 TO E26			
REMOTE ACUATE (RACTE)	☐ 1 CONNECTED	E23 TO E24			
	☒ 2 NOT CONNECTED	E22 TO E24			
TRAFFIC (TRFC INHB)	☐ 1 INHIBIT	E8 TO E6			TRANSMIT BOARD GQY
	☒ 2 NOT INHIBIT	E8 TO E7			
SYNCHRONIZATION (SYNC)	☒ 1 COORPERATIVE	E2 TO E1			
	☐ 2 NON-COOPRERATIVE	E2 TO E4			
CLOCK	☒ NORMAL	E10 TO E11			
	☐ TEST (FOR TESTING ONLY)	E10 TO E9			
KEY GENERATOR (MODE)	☒ 1 PRIMARY	E30 TO E29			RECEIVE BOARD GFX
	☐ 2 SECONDARY	E30 TO E28			
DISPLAY (DISPL)	☒ 1 BRIGHT	E5 TO E6	E10 TO E9	E2 TO E1	
	☐ 2 DIM	E5 TO E3	E10 TO E8	E2 TO E4	
UPDATE COUNTER (RDOUT)	☐ 1 PROGRAM CONTROLLED	E12 TO E14			
	☒ 2 CONTINUOUS	E12 TO E11			
CLOCK (CLK)	☒ 1 INTERNAL	E32 TO E31			
	☐ 2 EXTERNAL (DEPOT MAINTENANCE ONLY)	E34 TO E32			
RESYNC TIME OUT (T.O.)	☒ 1 2 TO THE ø POWER	E24 TO E23	E20 TO E19	E16 TO E15	
	☐ 2 2 TO THE 10th POWER	E24 TO E26	E20 TO E19	E16 TO E15	
	☐ 3 2 TO THE 14th POWER	E24 TO E23	E20 TO E22	E16 TO E15	
	☐ 4 2 TO THE 16th POWER	E24 TO E26	E20 TO E22	E16 TO E15	
	☐ 5 2 TO THE 17th POWER	E24 TO E23	E20 TO E19	E16 TO E18	
	☐ 6 2 TO THE 18th POWER	E24 TO E26	E20 TO E19	E16 TO E18	
	☐ 7 2 TO THE 20th POWER	E24 TO E23	E20 TO E22	E16 TO E18	
	☐ 8 NO TIME OUT	E26 TO E23	E20 TO E22	E16 TO E18	
RESYNC ACHIEVED (RSA)	☒ 1 HIGH LEVEL	E46 TO E45			BLACK I/O BOARD GFW
	☐ 2 LOW LEVEL	E46 TO E48			
RESYNC COMMAND (RSYC)	☒ 1 DIFFERENTIAL	E5 TO E6	E1 TO E3	E14 TO E16	
	☐ 2 SINGLE ENDED	E5 TO E7	E1 TO E2	E14 TO E13	
RESYNC CMD INPUT (RSYC)	☒ 1 CONNECTED	E9 TO E10			
	☐ 2 NOT CONNECTED	E9 TO E11			
RESTART (RSTR)	☐ 1 IN	E25 TO E26			
	☒ 2 OUT	E25 TO E23			
ZEROIZE (Z VAR)	☐ 1 IN	E21 TO E22			
	☒ 2 OUT	E21 TO E19			
CHANGE KEY (CHNG VAR)	☐ 1 IN	E17 TO E18			
	☒ 2 OUT	E17 TO E15			
RECEIVE CIPHER TEXT (RXCT)	☒ 1 CENTER TAPPED TO GND	E44 TO E43			
	☐ 2 NOT CENTER TAPPED TO GND	E44 TO E42			
BLACK STATION CLOCK (BSC)	☒ 1 CENTER TAPPED TO GND	E39 TO E40			
	☐ 2 NOT CENTER TAPPED TO GND	E39 TO E41			
RX CIPHER TEXT CLOCK (RXCT CL)	☒ 1 CENTER TAPPED TO GND	E38 TO E37			
	☐ 2 NOT CENTER TAPPED TO GND	E38 TO E36			
RXCT CL PHASE (ø RCTC)	☒ 1 NORMAL	E32 TO E31	E33 TO E34		
	☐ 2 INVERTED	E33 TO E31	E32 TO E34		
FULL OPERATE (FULL OPR)	☒ 1 HIGH LEVEL	E49 TO E50			
	☐ 2 LOW LEVEL	E49 TO E47			
ALARM (ALM)	☒ 1 HIGH LEVEL	E30 TO E28			
	☐ 2 LOW LEVEL	E30 TO E29			

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED

NO.	DRAWING TITLE	DWG NO.
1	COMSUBGRU 10 KINGS BAY, GA AS/WRR-12 SLVR INSTALLATION, MASTER DRAWING	020-000-2080000

REFERENCE DRAWING(S)

SPAWAR APPROVAL

	SIGNATURE	DATE
PE/ISEA		
REVIEWER		
APPROVAL		
APPD FOR SPAWAR		DATE

DEVELOPING AGENT LOGO

CAGE CODE 00000

DEVELOPING AGENT ADDRESS ADDRESS

DSGN	DATE
CHKD	DATE
APVD	DATE

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INSTALLATION DESIGN PLAN

SPACE AND NAVAL WARFARE SYSTEMS COMMAND

COMSUBGRU 10 KINGS BAY, GA
AN/WRR-12 SLVR INSTALLATION
MISC SYSTEM CONFIGURATION DETAILS

SIZE	CAGE CODE	AS-BUILT ID	IA CODE	DRAWING NO.	REV
F	28687	080000	A	190-000-2080000	-

SCALE: NONE MASS (WEIGHT): N/A SHEET 1 OF 1

ATTACHMENT 21 (SHEET 1 OF 1)

MISC SYSTEM CONFIGURATION DETAILS (DRAWING TYPE CODE 190)

IDEA
CAD STANDARDS

****** This Document is based on the use of *AutoCAD 2000* and later. ******

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APPENDICES:

A: FEEDBACK REPORT FOR SUBMITTING IMPROVEMENTS TO THE CAD STANDARD

RECORD OF CHANGES

REV	DATE	DESCRIPTION	APPROVED
Original	03JUL02	Original Issue.	M. Alcamo
A	05FEB03	Revision A issued to add **Record of Changes** page (this page) and the following: Page 1 - Contents updated to reflect Record of Changes page. Renumbered all pages to suit above. Section 2.1 - Alphabetized list.	C. Johnson
B	07FEB05	Revision B issued to accomplish the following changes: **Section:** Throughout — Removed the prefix, "PY_" from the standard dimstyle and textstyle names. 3.1 a) — Added the sentence, "Placing all sheets of a drawing in a single file is the preferred format." 3.1 b) — Added the sentence, "Use this method if using the preferred format would result in a drawing file of excessive size." 3.2 b) bullet 1 — Added the sentence, "This is the preferred format." 5.1 a) — Removed LTscale from the list of properties to be set to ByLayer. 5.2 e) — Added item e). 5.3 e) & f) — Re-sequenced items f) and g) to account for absence of item e). 8 (all) — Removed line-item-references to "Common Layers" in discipline-specific Layer list descriptions. 8 (Mechanical, Piping & Machinery) — Changed the color of layer PIPING_EXST to 21. Modified the scope of layer PIPING_EXST to include existing fittings and valves. Changed the color of layer PIPING_FITTINGS to 52. Added definition for layer PIPING_FITTINGS. Modified the scope of layer PIPING_RMV to include fittings and valves. Corrected line weight for layer PIPING_RMV (from 0.25mm to 0.40mm). 8 (Mechanical, Ventilation) — Corrected line weight for layer VENT_RMV (from 0.25mm to 0.40mm). Added layer EQUIP_RMV. 8 (Electrical, Power, Block Wire, & Assembly) — Changed the linetype of layer EQUIP_EXST to HIDDEN. Changed the linetype of layer CABLE_EXST to HIDDEN.	K. Petersen

1. Purpose

The purpose of this document is to provide basic guidance for developing Ship Installation Drawings (SIDs) utilizing AutoCAD 2000 and later. Use of this guidance will ensure CAD Standardization between Puget Sound Naval Shipyard (PSNS), Norfolk Naval Shipyard (NNSY) and Newport News Shipbuilding (NNS). A significant benefit of CAD Standardization is that it promotes the exchange and reuse of drawing files between the three Shipyards.

2. Attachments (supporting files)

2.1 AutoCAD Template Files. The Standard Template files will be used because of their added functionality. The Standard Template files are:

a) Template file for A-size drawings
b) Template file for B-size drawings
c) Template file for C-size drawings
d) Template file for D-size drawings
e) Template file for F-size drawings
f) Template file for H-size drawings

3. Standard Guidelines for Drawings

3.1 File Naming

a) When a single file contains all the sheets of a drawing, the file name shall be its 7-digit NAVSEA drawing number, e.g. 1234567.dwg. Placing all sheets of a drawing in a single file is the preferred format.

b) When a file does not contain all the sheets of a drawing, the file name will include what sheet(s) the file contains, e.g. 1234567SH01.dwg or 1234567SH01-05.dwg. Use this method if using the preferred format would result in a drawing file of excessive size.

c) For revisions, append the file name with REV and the revision letter as appropriate, e.g. 1234567REVA.dwg or 1234567SH01REVA.dwg.

3.2 File Contents

a) All drawings shall be set-up to plot from Layout and at scale 1:1 (drawing sheet is actual size, not scaled 24 times, etc).

b) A separate Layout shall be used for each drawing sheet.
- A file may contain multiple Layouts, one for each sheet of the drawing. This is the preferred format.
- A drawing file may contain a single Layout, using a separate file for each sheet.

c) Delete any unused Layouts from the file.

d) No objects shall extend or reside beyond the drawing sheet border.

e) Except for isolated instances, Dimensions shall be Associative.

f) Except for isolated instances, object properties shall be set to ByLayer
- Color = ByLayer
- Linetype = ByLayer

- Lineweight = ByLayer

g) Use only original AutoCAD fonts
- Do not use True Type or other custom fonts.

h) Drawing Layers will be per the discipline specific standard layers found in Section 8.
- To help manage the layers of other disciplines better when overlaying files, a prefix may be added to the standard layer names. If used, the following discipline prefix letters may be added to the standard layer names:
  G_ = Global or common Layers
  H_ = Hull (Structural) Layers
  P_ = Piping (Mechanical, Piping)
  M_ = Machinery (Mechanical, Machinery)
  V_ = Ventilation (Mechanical, Ventilation)
  EA_ = Electrical, Antenna
  ER_ = Electrical, Arrangements
  EL_ = Electrical, Lighting & Cableways
  EP_ = Electrical, Power, Block Wire & Assembly

i) See *Drafting Concept* for additional information.

3. 3 Standard Line Weights

a) Light lines = 0.15mm
b) Medium lines = 0.25mm
c) Heavy lines = 0.40mm

3.4 Template Configuration

Note: The *STD_F.dwt* template originated from AutoCAD 2000 *Acad.dwt* with the following changes:

a) Text Style TEXT
- Font Name = monotxt.shx
- Height = 0.00 (controlled by dimension style)
- Width Factor = 0.80

b) Dimension Style DIM
1) Lines and Arrows
- Dimension Lines Lineweight = 0.15mm
- Extension Lines Lineweight = 0.15mm

2) Text
- Text Appearance - Text Style = TEXT
- Text Appearance - Text Height = 0.15625

3) Fit (when using AutoCAD 200)
- Scale – Scale dimensions to layout (Paperspace)

4) Primary Units
- Linear Dimensions - Unit Format = Fractional
  (May toggle to Architectural for dimensions over 72 inches.)
- Linear Dimensions - Precision = 1/16
- Linear Dimensions –Fraction Format: User option. When rolling over, maintain existing.
- Measurement Scale - Scale Factor = 1.0

c) Standard Layers (Common)

- Common Standard Layers are included in the standard Template file.
- Common Standard Layers are shown in Section 8.

d) Properties (graphics)
- Color, Linetype and Lineweight = ByLayer

e) Four Layout Spaces
1) Layout names (01, 02, 03, and 04)
2) Graphics include one standard F-Sheet form per layout
3) Page Setup (all layouts)
- Plot Device
  (1) Plotter configuration - Name = None
  (2) Plot style table – Name = monochrome.ctb (modified for color = Black)
- Layout Settings
  (1) Plot area – Extents
  (2) Plot scale – Scale lineweights
  (3) Plot options – Plot with plot styles

4. Block Libraries

4.1 Standard Blocks.

a) Blocks used in drawings will conform to this CAD Standard. In particular, blocks created on Layer 0 will take on the correct characteristics (color, lineweight and font) of the layer they are inserted on. Additionally, above a set minimum (ex, 1" NPS), blocks should be actual size which will then be scaled appropriately for the view scale they are shown at.

b) The 3 Shipyards are encouraged to share, collaborate and standardize on Blocks to the maximum extent possible.

5. Drafting Concept

5.1 Start all drawings with the standard Template File, ex.) *STD_F.dwt*:

a) Use pre-defined Layers (with Color, Linetype, and Lineweight set to ByLayer).
b) Use pre-defined Dimension & Text Styles.
c) Use Dimension Overrides when necessary.
d) Dimensions under 72 inches shall be displayed in inches *without* inch marks.
e) Dimensions 72 inches and over, shall be displayed as Feet-Inch (6'-0"). This can be accomplished either by toggling to Architectural display or by using a second DIM Style.
f) Use pre-defined detailing Blocks and Symbols when appropriate.

5.2 Model Space Usage:

a) Model Space shall be used to create all ship geometry at <u>actual</u> size (1 foot = 1 foot).
b) It is OK to have multiple representations of the same object. For example, it's not practical to show a foundation in an arrangement view and use those same graphics to dimension it also.
c) Adhere to the layer standards in this document.
d) Do Not place any *annotation* in Model Space.
e) Reference graphics, such as center lines, datum lines or frame reference lines, may be located either in Model Space or Paper Space at the discretion of the drawing developer.

5.3 Paper Space Usage:

a) Drawing shall be plotted from Layout Space (scale 1:1 = sheet is actual size).
b) Use Viewports to display Model geometry at scale and Lock the Viewport.
c) Select the appropriate Mode for the type of *detailing* being done.
d) Associative Dimensions (actual measurements) shall be placed in an active Viewport (Layout Space, Model ON for ACAD 2000, Model OFF for ACAD 2002) with Dimension Style = *DIM* and Layer = *Dimension*.
e) Annotation (non-measurements) shall be placed entirely in Paper Space (Layout Space, Model OFF) with Dimension Style = *DIM* and Layer = *Annotation*.

Note: Annotation (non-measurements) consists of Labels, Piece Bubbles, Weld Symbols, Section Arrows, etc.

f) Add/Subtract Layout tabs as necessary for the number of sheets in the drawing.

5.4 Digital Photos and Embedded Objects:

a) Digital photographs are an effective means to provide information in our drawings. They are particularly useful to show Removals because the picture clearly shows what the actual material is to be removed. Guidelines for using digital photos include:

- They should be inserted in the Layout Space at the desired paper size. Consideration must be given to ensure they are legible at reduced paper sizes.
- They must be adequately annotated so they are self sufficient as to what is being shown.
- When multiple photographs from within the same space are inserted, a Key Plan view will be provided to show from what direction each picture was taken.

6. Drawing Revisions and Roll-Overs

6.1 <u>Revisions</u> to drawings not following this Standard will be accomplished as follows:

a) Edit the drawing following the existing method and style.
b) Drawing shall be set-up to plot from *Layout*.
c) Assign appropriate Lineweights to all layers as necessary.
d) Convert plot style to CTB type if it isn't already.

6.2 <u>Rolling over</u> an existing drawing which does not conform to this Standard:

a) There are two ways to 'roll-over' existing drawings into new drawings:
    1) The preferred method to roll-over an existing drawing is as follows:
        a) Insert prior version graphics into a new Template file.
            - Open a new standard template file.
            - Open old drawing.
            - Use the windows Cut command and cut graphics from old drawing.
            - Use the windows Paste command and paste graphics into new template.
            - Convert object Layers (Colors, Linetypes, and Lineweights) to match CAD Standard layer definitions. This step is not mandatory, but it is highly recommended. It typically takes only about 20 minutes per drawing to accomplish this.
            - It is <u>not</u> recommended to convert existing text to TEXT text style or to convert existing dimensions and leaders to DIM dimension style.

b) Drawing shall be plotted from Layout Space (scale 1:1 = sheet is actual size).

2) When there are only trivial changes required to be made between hulls:
   - Rename the file to the new drawing number per the naming convention called out in Section 3.1.
   - Modify the rest of the drawing as required.
   - Set up drawing to allow plotting from Layout Space (scale 1:1 = sheet is actual size).

   This method only incorporates the Batch Plotting feature of the Standard and does not take advantage of the other features of the Standard.

7. Feedback Reports

7.1 Feedback Reports:

The purpose of this initiative is not only Standardization to maximize reusability, it is also to institutionalize continuous improvements in the drawing process. With all three Shipyards using AutoCAD, improvements made by each Shipyard can be shared between Shipyards. Where appropriate, the CAD Standard will be revised to incorporate improvements agreed to by the three Shipyards. *Appendix A* is a Feedback Report which will be used to record and track suggestions for improving the CAD Standard. The process for use of the Feedback Report is as follows:

a) Anyone from the three Planning Yards can initiate a Feedback Report to suggest a change or improvement to a design process. The Originator will fill in the top portion of the form, including ***Name, Code, Date, Phone number, E-mail address and Subject***. They will then fill in the top three sections (***Background, Problem, and Recommendation***), as applicable, to describe their suggestion and then route the Report to their SID Standardization and Best Practices representative.

b) The originating Shipyard will evaluate the suggestion, and if the suggestion is recommended for approval or further investigation, the ***Forwarding Comments*** are filled in and it is forwarded to the Process Master at PSNS.

c) The Process Master can then do further investigation and comment on it. It will then be distributed to all three Shipyards for evaluation/comment.

d) If all three Shipyards agree, the suggestion will be taken for action and/or incorporated as a standard item.

e) The PSNS Process Master is responsible for final resolution of all Feedback Reports and maintaining a tracking system of suggestions made and resulting actions taken.

8. Standard Layers – Common (all disciplines)

LAYER	COLOR	LINETYPE	LINEWEIGHT mm (inch)	PLOT (y/n)
ANNOTATION	4 (Cyan)	Continuous	0.25 (0.010)	Yes
BORDER	11	Continuous	0.40 (0.016)	Yes
CENTERLINE	40	CENTER	0.15 (0.006)	Yes
CONSTRUCTION	5 (Blue)	Continuous	0.00 (0.000)	No
DIMENSION	1 (Red)	Continuous	0.25 (0.010)	Yes
HATCH	41	Continuous	0.15 (0.006)	Yes
TEXT	2 (Yellow)	Continuous	0.25 (0.010)	Yes
VIEWPORTS	5 (Blue)	Continuous	0.00 (0.000)	No

Layer Usage

ANNOTATION	Piece Bubbles, Labels, View Titles, Section Arrows
BORDER	Border of drawing sheet
CENTERLINE	All Centerlines
CONSTRUCTION	Elements needed for design, but not to be plotted
DIMENSION	Measurements (i.e. linear dimension, radial dimension, etc.)
HATCH	Cross-Hatch
TEXT	Notes, List of Material, References
VIEWPORTS	All Viewports

Note: When copying graphics from an existing file that does not adhere to these layer standards, a decision shall be made whether to change (clean-up using change, rename, merge, etc.) or to retain existing layer names. In either case, all layers shall have defined Lineweight values.

Standard Layers – Structural

LAYER	COLOR	LINETYPE	LINEWEIGHT mm	(inch)	PLOT (y/n)
ANNOTATION	4 (Cyan)	Continuous	0.25	(0.010)	Yes
BORDER	11	Continuous	0.40	(0.016)	Yes
CENTERLINE	40	CENTER	0.15	(0.006)	Yes
CONSTRUCTION	5 (Blue)	Continuous	0.00	(0.000)	No
DIMENSION	1 (Red)	Continuous	0.25	(0.010)	Yes
HATCH	41	Continuous	0.15	(0.006)	Yes
TEXT	2 (Yellow)	Continuous	0.25	(0.010)	Yes
VIEWPORTS	5 (Blue)	Continuous	0.00	(0.000)	No
EXST_PHANTOM1	9	PHANTOM	0.15	(0.006)	Yes
EXST_PHANTOM2	254	PHANTOM	0.15	(0.006)	Yes
EXST_HIDDEN1	111	HIDDEN	0.15	(0.006)	Yes
EXST_HIDDEN2	113	HIDDEN	0.15	(0.006)	Yes
EXST_SOLID	31	Continuous	0.15	(0.006)	Yes
HATCH_BOUNDARY	8	Continuous	0.00	(0.000)	No
NEW_SOLID1	141	Continuous	0.40	(0.016)	Yes
NEW_SOLID2	3 (Green)	Continuous	0.40	(0.016)	Yes
NEW_SOLID3	30	Continuous	0.40	(0.016)	Yes
NEW_HIDDEN1	201	HIDDEN	0.25	(0.010)	Yes
NEW_HIDDEN2	181	HIDDEN	0.25	(0.010)	Yes

Layer Usage

EXST…1	Existing structure, vent, piping, or equipment
EXST…2	Same as EXST…1 (allows additional layer separation)
EXST_SOLID	New equipment for which drawing provides foundation for
NEW…1	Objects being fabricated new and/or shown in the list of material
NEW…2	Same as NEW…1 (allows additional layer separation)
NEW…3	Same as NEW…1 (allows additional layer separation)
HATCH_BOUNDARY	Boundary for associate hatch (not plotted)

Standard Layers – Mechanical, Piping & Machinery

LAYER	COLOR	LINETYPE	LINEWEIGHT mm	(in)	PLOT (y/n)
ANNOTATION	4 (Cyan)	CONTINUOUS	0.25	(0.010)	Yes
BORDER	11	CONTINUOUS	0.40	(0.016)	Yes
CENTERLINE	40	CENTER	0.15	(0.006)	Yes
CONSTRUCTION	5 (Blue)	CONTINUOUS	0.00	(0.000)	No
DIMENSION	1 (Red)	CONTINUOUS	0.25	(0.010)	Yes
HATCH	41	CONTINUOUS	0.15	(0.006)	Yes
TEXT	2 (Yellow)	CONTINUOUS	0.25	(0.010)	Yes
VIEWPORTS	5 (Blue)	CONTINUOUS	0.00	(0.000)	No
PIPING_NEW_SGL1	6 (Magenta)	CONTINUOUS	0.40	(0.016)	Yes
PIPING_NEW_DBL1	6 (Magenta)	CONTINUOUS	0.25	(0.010)	Yes
PIPING_NEW_SGL2	5 (Blue)	CONTINUOUS	0.40	(0.016)	Yes
PIPING_NEW_DBL2	5 (Blue)	CONTINUOUS	0.25	(0.010)	Yes
PIPING_EXST	21	PHANTOM	0.25	(0.010)	Yes
PIPING_HIDDEN	61	HIDDEN	0.25	(0.010)	Yes
PIPING_RMV	160	CONTINUOUS	0.40	(0.010)	Yes
PIPING_FITTINGS	52	CONTINUOUS	0.25	(0.010)	Yes
EQUIP_NEW	3 (Green)	CONTINUOUS	0.25	(0.010)	Yes
EQUIP_EXST	2 (Yellow)	PHANTOM	0.25	(0.010)	Yes
EQUIP_HIDDEN	111	HIDDEN	0.25	(0.010)	Yes
BHD_STRUCT	8 (Dark Gray)	CONTINUOUS	0.25	(0.010)	Yes
OVHD_STRUCT	9 (Light Gray)	PHANTOM	0.25	(0.010)	Yes

Layer Usage

PIPING_NEW_SGL1 New single line piping being installed

PIPING_NEW_DBL1 New double line piping being installed

PIPING_NEW_SGL2 Alternate new single line piping being installed (hot/cold potable water, chilled water supply/return, etc.)

PIPING_NEW_DBL2 Alternate new double line piping being installed (hot/cold potable water, chilled water supply/return, etc.)

PIPING_EXST Any previously existing piping, fittings and valves shown on drawing

PIPING_HIDDEN All hidden lines on piping (new or existing)

PIPING_RMV Any previously existing piping, fittings and valves being removed

PIPING_FITTINGS New fittings and valves

EQUIP_NEW All new equipment being installed

EQUIP_EXST Any previously existing equipment shown on drawing

EQUIP_HIDDEN All hidden lines on equipment, new or existing

BHD_STRUCT Bulkheads, Decks, Line of Shell in plan and elevation views

OVHD_STRUCT Overhead beams (transverse and longitudinal) in plan views

Standard Layers – Mechanical, Ventilation

LAYER	COLOR	LINETYPE	LINEWEIGHT mm	(in)	PLOT (y/n)
ANNOTATION	4 (Cyan)	CONTINUOUS	0.25	(0.010)	Yes
BORDER	11	CONTINUOUS	0.40	(0.016)	Yes
CENTERLINE	40	CENTER	0.15	(0.006)	Yes
CONSTRUCTION	5 (Blue)	CONTINUOUS	0.00	(0.000)	No
DIMENSION	1 (Red)	CONTINUOUS	0.25	(0.010)	Yes
HATCH	41	CONTINUOUS	0.15	(0.006)	Yes
TEXT	2 (Yellow)	CONTINUOUS	0.25	(0.010)	Yes
VIEWPORTS	5 (Blue)	CONTINUOUS	0.00	(0.000)	No
VENT_NEW	2 (Yellow)	CONTINUOUS	0.40	(0.016)	Yes
VENT_EXST	1 (Red)	PHANTOM	0.25	(0.010)	Yes
VENT_TEXTILE	73	CONTINUOUS	0.25	(0.010)	Yes
VENT_HIDDEN	3 (Green)	HIDDEN	0.25	(0.010)	Yes
VENT_INSUL	6 (Magenta)	CONTINUOUS	0.25	(0.010)	Yes
VENT_ACOUSTIC	61	ACOUSTIC*/PHANTOM	0.25	(0.010)	Yes
VENT_RMV	152	CONTINUOUS	0.40	(0.010)	Yes
EQUIP_NEW	3 (Green)	CONTINUOUS	0.25	(0.010)	Yes
EQUIP_EXST	2 (Yellow)	PHANTOM	0.25	(0.010)	Yes
EQUIP_HIDDEN	111	HIDDEN	0.25	(0.010)	Yes
EQUIP_RMV	160	CONTINUOUS	0.40	(0.010)	Yes
BHD_STRUCT	8 (Dark Gray)	CONTINUOUS	0.25	(0.010)	Yes
OVHD_STRUCT	9 (Light Gray)	PHANTOM	0.25	(0.010)	Yes

Layer Usage

VENT_NEW	New vent being installed
VENT_EXST	Any previously existing vent shown on drawing
VENT_TEXTILE	New textile vent being installed
VENT_HIDDEN	Any hidden lines on vent, new or existing
VENT_INSUL	Vent insulation markings
VENT_ACOUSTIC	Acoustically insulated vent, new or existing
VENT_RMV	Any previously existing vent being removed
EQUIP_NEW	Fans, FCU's, FCA's, Cooling Coils, Heaters, Controllers, Thermostats
EQUIP_EXST	Any previously existing equipment shown on drawing
EQUIP_HIDDEN	All hidden lines on equipment, new or existing
EQUIP_RMV	Any previously existing equipment being removed
BHD_STRUCT	Bulkheads, Decks, Line of Shell in plan and elevation views
OVHD_STRUCT	Overhead beams (transverse and longitudinal) in plan views

* Linetype ACOUSTIC is not a standard AutoCAD linetype.

Standard Layers – Electrical, Antenna

LAYER	COLOR	LINETYPE	LINEWEIGHT mm	(in)	PLOT (y/n)
ANNOTATION	4 (Cyan)	Continuous	0.25	(0.010)	Yes
BORDER	11	Continuous	0.40	(0.016)	Yes
CENTERLINE	40	CENTER	0.15	(0.006)	Yes
CONSTRUCTION	5 (Blue)	Continuous	0.00	(0.000)	No
DIMENSION	1 (Red)	Continuous	0.25	(0.010)	Yes
HATCH	41	Continuous	0.15	(0.006)	Yes
TEXT	2 (Yellow)	Continuous	0.25	(0.010)	Yes
VIEWPORTS	5 (Blue)	Continuous	0.00	(0.000)	No
ANTENNA	6 (Magenta)	Continuous	0.25	(0.010)	Yes
LIGHTS	161	Continuous	0.25	(0.010)	Yes
RAILING	8 (Gray)	Continuous	0.25	(0.010)	Yes
SHIP	8 (Gray)	Continuous	0.25	(0.010)	Yes
WEAPONS	2 (Yellow)	Continuous	0.25	(0.010)	Yes
FOUNDATIONS	1 (Red)	Continuous	0.25	(0.010)	Yes

Layer Usage

ANTENNA	Antennas
LIGHTS	Navigation and signal lights
RAILING	Hand rails
SHIP	Ships structure
WEAPONS	Weapons and associated fire control equipment
FOUNDATIONS	Antenna and weapon foundations

Standard Layers – Electrical, Arrangements

LAYER	COLOR	LINETYPE	LINEWEIGHT mm	(in)	PLOT (y/n)
ANNOTATION	4 (Cyan)	Continuous	0.25	(0.010)	Yes
BORDER	11	Continuous	0.40	(0.016)	Yes
CENTERLINE	40	CENTER	0.15	(0.006)	Yes
CONSTRUCTION	5 (Blue)	Continuous	0.00	(0.000)	No
DIMENSION	1 (Red)	Continuous	0.25	(0.010)	Yes
HATCH	41	Continuous	0.15	(0.006)	Yes
TEXT	2 (Yellow)	Continuous	0.25	(0.010)	Yes
VIEWPORTS	5 (Blue)	Continuous	0.00	(0.000)	No
EQUIP_NEW	6 (Magenta)	Continuous	0.25	(0.010)	Yes
EQUIP_EXST	6 (Magenta)	Phantom	0.15	(0.010)	Yes
CLEARANCE	6 (Magenta)	Phantom	0.15	(0.010)	Yes
VENT	5 (Blue)	Phantom	0.25	(0.010)	Yes
PIPE	3 (Green)	Phantom	0.25	(0.010)	Yes
CABLEWAY	30 (Orange)	Phantom	0.25	(0.010)	Yes
LIGHTING	2 (Yellow)	Continuous	0.25	(0.010)	Yes
FOUNDATION	1 (Red)	Continuous	0.25	(0.010)	Yes
FURNITURE_NEW	3 (Green)	Continuous	0.25	(0.010)	Yes
FURNITURE_EXST	3 (Green)	Phantom	0.15	(0.010)	Yes
BHD_STRUCTURE	8 (Dark Gray)	Continuous	0.15	(0.006)	Yes
OVHD_STRUCTURE	9 (Light Gray)	Phantom	0.15	(0.006)	Yes

Layer Usage

EQUIP_NEW New Equipment

EQUIP_EXST	Existing Equipment
CLEARANCE	Equipment clearance line
VENT	Vent
PIPE	Pipe
CABLEWAY	Cableways
LIGHTING	Lighting
FOUNDATION	Equipment foundations
FURNITURE_NEW	New Furniture
FURNITURE_EXST	Existing Furniture
BHD_STRUCTURE	Bulkheads, Decks, Line of Shell in plan and elevation views
OVHD_STRUCTURE	Overhead beams (transverse and longitudinal) in plan views

Standard Layers – Electrical, Lighting & Cableways

LAYER	COLOR	LINETYPE	LINEWEIGHT mm	(in)	PLOT (y/n)
ANNOTATION	4 (Cyan)	Continuous	0.25	(0.010)	Yes
BORDER	11	Continuous	0.40	(0.016)	Yes
CENTERLINE	40	CENTER	0.15	(0.006)	Yes
CONSTRUCTION	5 (Blue)	Continuous	0.00	(0.000)	No
DIMENSION	1 (Red)	Continuous	0.25	(0.010)	Yes
HATCH	41	Continuous	0.15	(0.006)	Yes
TEXT	2 (Yellow)	Continuous	0.25	(0.010)	Yes
VIEWPORTS	5 (Blue)	Continuous	0.00	(0.000)	No
CABLE	1 (Red)	Continuous	0.40	(0.016)	Yes
LIGHTING	2 (Yellow)	Continuous	0.25	(0.010)	Yes
CW_EXIST	1 (Red)	Phantom	0.15	(0.006)	Yes
CW_NEW	2 (Yellow)	Continuous	0.25	(0.010)	Yes
PIPE	3 (Green)	Phantom	0.15	(0.006)	Yes
VENT	6 (Magenta)	Phantom	0.15	(0.006)	Yes
BHD_STRUCTURE	8 (Dark Gray)	Continuous	0.25	(0.010)	Yes
OVHD_STRUCTURE	9 (Light Gray)	Phantom	0.15	(0.006)	Yes

Layer Usage

CABLE	Cables
LIGHTING	Lighting Equipment
CW_EXIST	Existing Cableways
CW_NEW	New Cableways
PIPE	Outline of Piping
VENT	Outline of Vents
ARR	Outline of Equipment & Furniture
BHD_STRUCTURE	Bulkheads, Decks, Line of Shell in plan and elevation views
OVHD_STRUCTURE	Overhead beams (transverse and longitudinal) in plan views

Standard Layers – Electrical, Power, Block Wire, & Assembly

LAYER	COLOR	LINETYPE	LINEWEIGHT mm	(in)	PLOT (y/n)
ANNOTATION	4 (Cyan)	Continuous	0.25	(0.010)	Yes
BORDER	11	Continuous	0.40	(0.016)	Yes
CENTERLINE	40	CENTER	0.15	(0.006)	Yes
CONSTRUCTION	5 (Blue)	Continuous	0.00	(0.000)	No
DIMENSION	1 (Red)	Continuous	0.25	(0.010)	Yes
HATCH	41	Continuous	0.15	(0.006)	Yes
TEXT	2 (Yellow)	Continuous	0.25	(0.010)	Yes
VIEWPORTS	5 (Blue)	Continuous	0.00	(0.000)	No
EQUIP_NEW	6 (Magenta)	Continuous	0.25	(0.010)	Yes
EQUIP_EXST	6 (Magenta)	HIDDEN	0.15	(0.006)	Yes
CABLE_NEW	1 (Red)	Continuous	0.40	(0.016)	Yes
CABLE_EXST	1 (Red)	HIDDEN	0.15	(0.006)	Yes
WIRE	3 (Green)	Continuous	0.25	(0.010)	Yes
COMPARTMENT	2 (Yellow)	Phantom	0.40	(0.016)	Yes

Layer Usage

EQUIP_NEW	New Equipment, Polylines can be used for equipment (.70mm)
EQUIP_EXST	Existing Equipment
CABLE_NEW	New Cable, Polylines can be used for cable (.56mm)
CABLE_EXST	Existing Cable
WIRE	Wiring
COMPARTMENT	Compartment Boundaries

APPENDIX A

ROUTING CODES	INITIALED	
	BY	DATE
PSNS C/270.45		

SID STANDARDIZATION AND BEST PRACTICES FEEDBACK REPORT

ORIG:	**S/Y CODE:**	**DATE:**
PHONE:	**E-MAIL:**	
SUBJ:		
PSNS USE		
SER:	***DATE IN:***	***DATE COMP:***

Background:

Problem:

Recommendation:

Forwarding Comments:

PSNS USE: ACTION TAKEN:

SID STANDARDIZATION AND BEST PRACTICES FEEDBACK REPORT (CONTINUATION PAGE)

Ser:

(Enter all information italicized in blue and delete any unused drawing categories.)

Date

MEMORANDUM FOR THE RECORD

Subj: APPROVAL OF SPAWAR DRAWINGS

1. This Memorandum of Record documents the approval of each SPAWAR drawing listed below for the installation identified with Tracking Number *##-####*. The Memorandum will accompany electronic unsigned copies of the drawings as evidence of approval.

28687-020-000-*Drawing Set Number*-*Revision*
28687-022-000-*Drawing Set Number*-*Revision*
28687-023-000-*Drawing Set Number*-*Revision*
28687-040-000-*Drawing Set Number*-*Revision*
28687-050-000-*Drawing Set Number*-*Revision*
28687-060-000-*Drawing Set Number*-*Revision*
28687-070-000-*Drawing Set Number*-*Revision*
28687-080-000-*Drawing Set Number*-*Revision*
28687-090-000-*Drawing Set Number*-*Revision*
28687-100-000-*Drawing Set Number*-*Revision*
28687-110-000-*Drawing Set Number*-*Revision*
28687-120-000-*Drawing Set Number*-*Revision*
28687-130-000-*Drawing Set Number*-*Revision*
28687-140-000-*Drawing Set Number*-*Revision*
28687-160-000-*Drawing Set Number*-*Revision*
28687-171-000-*Drawing Set Number*-*Revision*
28687-180-000-*Drawing Set Number*-*Revision*
28687-181-000-*Drawing Set Number*-*Revision*
28687-182-000-*Drawing Set Number*-*Revision*
28687-183-000-*Drawing Set Number*-*Revision*
28687-184-000-*Drawing Set Number*-*Revision*
28687-190-000-*Drawing Set Number*-*Revision*

Signed name of same approval official from "APPROVAL" block
Typed name
Typed organization and code

Signed name of same approval official from "APPD FOR SPAWAR" block
Typed name
Typed organization and code

APPENDIX S - PITCO REPORT

SPAWARSYSCEN PACIFIC 25647-033653
PITCO NO. 6E

Pre-Installation Test and Checkout (PITCO)

Report for DEL Computer Model Number: _____

Serial Number: _____

STEP		CONDITION
2.A.5	Packing Inspection	SAT / UNSAT _____ / _____
2.B.5	Visual Inspection	SAT / UNSAT _____ / _____
3.A.16	Hardware Strapping	SAT / UNSAT _____ / _____
3.B.9	Configuration Verification	SAT / UNSAT _____ / _____
3.C.12	Video Diagnostics	SAT/ UNSAT _____/ _____
3.C.12	Keyboard Test	SAT / UNSAT _____ / _____
3.C.13	Memory Test	SAT / UNSAT _____ / _____
3.C.13	Hard Drive Test	SAT / UNSAT _____ / _____
3.C.13	CD/DVD ROM Test	SAT / UNSAT _____ / _____
3.C.13	Time/Calendar Test	SAT / UNSAT _____ / _____

SPAWARSYSCEN SAN DIEGO 25647-033653
PITCO NO. 6E

Pre-Installation Test and Checkout (PITCO)
Report for AN/UYK-83A System Unit

STEP		CONDITION
3.C.17	System Unit Diagnostics	SAT / UNSAT
		_____ / _____
3.D.1	Interface Tests	SAT / UNSAT
	Port 1	_____ / _____
	Port 2	_____ / _____
	Port 3	_____ / _____
	Port 4	_____ / _____
	Port 5	_____ / _____
3.D.2	Functional Tests	SAT / UNSAT
	OTAM TEST	_____ / _____
	Relay Test	_____ / _____
	PSA Control Test	_____ / _____

Remarks:
_____

PITCO performed by: _____ Date: _____

QA performed by: _____ Date: _____

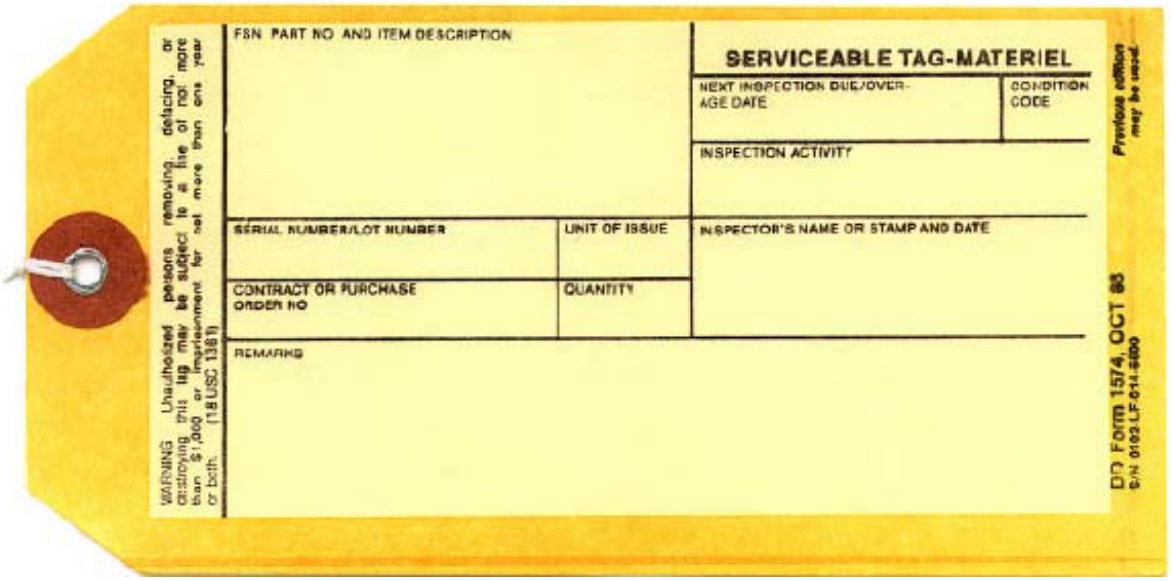

Figure S-1. PITCO Equipment Tag
DD Form 1574

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APPENDIX T
- BASELINE TEST (SAMPLE MESSAGE)

```
R 271815Z MAR 09
FM SPAWARSYSCEN ATLANTIC CHARLESTON SC
TO NCTAMS LANT NORFOLK VA
INFO COMNAVNETWARCOM NORFOLK VA
COMSPAWARSYSCOM SAN DIEGO CA
PEO C4I SAN DIEGO CA
SPAWARSYSCEN PACIFIC SAN DIEGO CA
BT
UNCLAS
MSGID/GENADMIN/SPAWARSYSCEN ATLANTIC CHARLESTON SC//
SUBJ/BASELINE TEST FOR CDX 2.1 AT NCTAMS LANT. TN: 09-0901//
REF/A/DOC/COMSPAWARSYSCOM SAN DIEGO CA/13MAR2009/V3//
REF/B/MSG/SPAWARSYSCEN ATLANTIC CHARLESTON SC/101636ZFEB2009//
NARR/REF A IS THE SPAWAR SHORE INSTALLATION PROCESS HANDBOOK VERSION
3.  REF B IS SSC ATLANTIC CHARLESTON BASE ELECTRONIC SYSTEM ENGINEERING
PLAN (BESEP).//
POC/TIM PROENGINEER/CIV/SPAWARSYSCEN ATLANTIC/CHARLESTON SC
/TEL:(843) 777-5207/EMAIL:TIMOTHY.PROENGIN@NAVY.MIL//
POC/BILL BABER/CIV/SPAWARSYSCEN ATLANTIC/CHARLESTON SC
/TEL:(757) 462-7168/EMAIL:WILLIAM.BABER@NAVY.MIL//
GENTEXT/REMARKS/1. IAW REF A AND AS DISCUSSED IN REF B, SSC ATLANTIC
CONDUCTED A BASELINE TEST TO ESTABLISH A FUNCTIONAL OPERATIONAL
BASELINE FOR ALL EQUIPMENT AND INTERFACES ISO THE CDX 2.1
INSTALLATION AT NCTAMS LANT DURING THE PERIOD OF 25-26 MAR
2009.
2. ALL EQUIPMENT AND INTERFACES TESTED SATISFACTORY WITH THE FOLLOWING
EXCEPTIONS:
A. CLASSIFIED SIPR PRINTER NO. 3. BROKEN PRINTER. RECOMMEND SITE
REPLACE OR REPAIR PRIOR TO SOVT.
B. COMMS CIRCUIT WITH NAVCOMTELSTA BAHRAIN. UNABLE TO PING. RECOMMEND
SITE TROUBLESHOOT AND REPAIR PRIOR TO SOVT.
C. UNCLASS WORKSTATION NO. 2. INCORRECT SOFTWARE CONFIG. NO ACTION
REQUIRED BY SITE. SSC ATLANTIC WILL INSTALL AND CONFIGURE.
3. ORIG WOULD LIKE TO THANK NCTAMS LANT FOR THEIR SUPPORT DURING
BASELINE TEST.//
BT
```

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APPENDIX V1 - INSTALLATION IN-BRIEF OUTLINE

1. **Introduce Team Members.**
   During the In-Brief introduce key members of the Installation Team to personnel at the site. Local contact information can be provided in case site personnel should need to contact you during off-duty hours.

2. **Review equipment/systems to be installed.**
   Explain what will be installed, what will removed, and what will be relocated if applicable. List equipment, systems, software and/or provide illustrations of the equipment elevations and floor plans.

3. **Explain schedule requirements for the installation.**
   Discuss the duration of the installation and the planned work hours. Explain the order of key tasks such as training, the System Operation Verification Test (SOVT), and cutover that will be accomplished.

4. **Identify potential impacts on the facility, personnel, and security.**
   Repeat information from those sections of the BESEP that explains what changes and impacts are expected. For example BESEP sections titled Facility Requirements, and Environmental and Safety Concerns are likely to contain information that may be appropriate to review again with the site personnel. Permanent and temporary changes to the facility, temporary work hazards, or material lay down requirements, and security access arrangements are all appropriate topics.

5. **Review Installation Team and Customer Responsibilities.**
   A good practice is to review the "Actions or Responsibilities" section of the BESEP with the site personnel. Arrange any storage or work space requirements. This is also another opportunity to arrange to have qualified site personnel to witness and participate in the SOVT, to perform operational cutover, and to accept the installation. Find out who will be receiving the training provided with the installation.

Special Note: The PE will prepare the Installation In-Brief using MS Power Point or some other comparable/suitable software. Hard copies of the In-Brief will be provided to the customer.

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APPENDIX V2 – INSTALLATION IN-BRIEF

CENTER for INFORMATION TECHNOLOGY PACIFIC TRAINING SUPPORT CENTER
San Diego

ISM Lab Upgrade Installation In-Brief

21 JUNE 2004

1

AGENDA

- Introduce SPAWAR Installation Team
- Installation Windows and Description
- Impact on Facility
- Installation Schedule
- Deliverables Prior to Start of Production
- Deliverables Upon Completion
- Disposition of Deinstalled Equipment
- Questions and Answers

2

Points of Contact

Name	Role	SSC SD Code/Org	Phone	E-mail
Don Beish	PE GCCS-M	2424	**553-4027**	beish@spawar.navy.mil
Brian Welch	PE ISNS	2634	**524-2782**	brian.welch@navy.mil
Alex Turner	PE NAVSSI	2314	**524-2109**	alex.turner@navy.mil
Roger Hower	Install Support	26001	**524-2569**	rhower@rcisd.com

4

Points of Contact for SPAWAR C4ISR Installations

West CONUS Regional Shore Installations Managers:

Rene Cruz

Office: (619) 524-3147
Mobile: (619) 204-2383
Email: rene.cruz@navy.mil

LCDR Tony Ramos

Office: (619) 524-2412
Mobile: (619) 895-2888
Email: antonio.ramos@navy.mil

3

IMPACT ON FACILITY

1. **Structural:**
   - ISNS: 1 new rack foundation for COTS rack (#9) to be moved from room 151 to room 148.
   - NAVSSI: 2 new rack foundations for Block 4 racks (#'s 10 &11) to replace current Block 2 racks.
   - GCCS-M: 2 new rack foundations in room 150 and 3 new rack foundations in room 151.

2. **Power & Air Conditioning:**
   - Only the GCCS-M installation will utilize additional circuit breakers for 3 racks to be installed in Room 151, Power Panel 11E, Breakers 12 and 14 through18.
   - Heat load after installations: Rooms 148/151= -92.7 BTU/HR and Room 150= - 1172.6 BTU/HR

6

INSTALLATIONS

Installation Window: 21 June – 24 August 2004 *

- **TN 03-1020 - ISNS** - provide TSC San Diego, CA with the capability to teach systems maintenance for ISNS with a GIG-E capability.
- **TN 04-0323 - NAVSSI** - install a single RTS, and single DCS Block 4 Non-IT 21 system.
- **TN 04-0436 - GCCS-M TTE (3.X)** - update one of the 2 existing ISM labs at TSC with the latest GCCS-M 3.x hardware and software.

Installation Window: 23 September – 21 December 2004

- **TN 04-0436 - GCCS-M TTE** - update one of the 2 existing ISM labs at TSC with the latest GCCS-M 4.x hardware and software.

5

ISM CLASS SCHEDULE : JULY

Monday	Tuesday	Wednesday	Thursday	Friday
JUN 28 Xylan Labs Routing Principles (23.1)	29 CISCO (24.1) MSS (27.1) CISCO Labs	30 CISCO Labs Practice PT's	JUL 1 Practice PT's	2 Practice PT's
5 HOLIDAY	6 Practice PT's	7 Module 3 Test Graded PT's	8 Graded PT's	9 UNIX (29.1) UNIX (29.2)
12 UNIX (29.3) HCI (15.1) UNIX J/S's	13 UNIX J/S's	14 UNIX J/S's	15 Module 4 Test	16 Graded PT WINNT Intro
19 Architecture Boot Process Installation (33.1)	20 Networking Services (34.1) Accts & Policy Mgmt (35.1)	21 Domain Controllers (36.1) File System (37.1) Cont Panel & Reg (38.1)	22 Print Capabilities (39.1), Disk Administration (40.1) Backup (41.1)	23 Performance Monitor (42.1) NTCSS II Optimized (43.1)
26 7-Bay (6.1) RAID (8.1)	27 Practice PT's	28 Practice PT's	29 Module 5 Test Graded PT's	30 Graded PT's

8

IMPACT ON FACILITY

3. **Floor Plan Configuration:**
   - Rooms 148/151: Due to relocation of one rack and the addition of three racks, recommend renumbering racks and circuit breakers to maintain logical order.
   - Room 150: Due to removal of two racks and the addition of one rack, recommend renumbering racks and circuit breakers to maintain logical order.

4. **Class Schedule:**
   - Practical lab exercises scheduled during installation (refer to following 2 slides). Will require coordination and possible shift work. POC: ET1 Swartz

7

INSTALLATION SCHEDULE

1. **ISNS: 01 – 30 July 2004**
   - Deinstall A+ server from rack #4: 1 day (01-02 July)
   - Cabling and Power: 7 days (06-14 July)
   - Equipment Installation/Relocation: 6 days (15-22 July)
   - Cutover/Testing/SOVT/OJT: 6 days (23-30 July)

2. **NAVSSI: 15 – 30 July 2004**
   - Deinstall of Block 2 Racks: 3 days (15-19 July)
   - Foundation Installation (3): 2 days (20-21 July)
   - Cabling and Power: 3 days (20-22 July)
   - Installation of Block 4 Racks: 3 days (23-27 July)
   - Cutover/Testing/SOVT/OJT: 3 days (28-30 July

10

ISM CLASS SCHEDULE : AUGUST

Monday	Tuesday	Wednesday	Thursday	Friday
AUGUST 2 OL / OA Racks SMT Intro to Comms ON-143(V)6	3 GFCP Patch Panel EDO CV-367E C2PC (161)	4 NAVSSI ADNS Comms S/W labs GFCP Labs	5 Comms S/W labs GFCP Labs	6 GFCP Labs C2PC Labs Practice PT's
9 Practice PT's	10 Practice PT's	11 Module 6 Test	12 Graded PT's	13 Graded PT's Course Review
16 System PT's	17 System PT's	18 Module 7 Test Graded System PT's	19 Graded System PT's	20 Graded System PT's
23 Field Day	24 Graduation	25	26	27

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DELIVERABLES PRIOR TO START OF PRODUCTION

1. Plan of Actions and Milestones (POA&M) - **Complete**
2. Site Survey Report - **Complete**
3. Training Base Electronic System Engineering Plan (BESEP) - **Complete**
4. Installation Design Plan (IDP) - **Complete**
5. Installation In-Brief – In Progress

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INSTALLATION SCHEDULE

3. GCCS-M:

- Room 150 (GCCS-M 3.X Upgrade) 06 July – 12 August 2004
  - Deinstall Racks 6,7 & 8: 5 days (06-12 July)
  - Foundation Installation (2): 3 days (13- 15 July)
  - Cabling and Power: 5 days (16-22 July)
  - Equipment installation: 3 days (23-27 July)
  - Software Load: 10 days (28 July-10 August)
  - Cutover/Testing/SOVT/OJT : 2 days (11-12 August)

- Room 151 (GCCS-M 4.X Install) 23 September – 21 December 2004
  - Foundation Installation (3): 4 days (23-28 September)
  - Cabling and Power: 10 days (29 September-13 October)
  - Equipment installation: 20 days (14 October-10 November)
  - Software Load: 20 days (12 November-10 December)
  - Cutover/Testing/SOVT/OJT: 7 days (13-21 December)

4. **Overall Interface/Integration Testing 13 – 18 August 2004** *

11

DISPOSITION OF DEINSTALLED EQUIPMENT

System:

- ISNS – Propose all deinstalled equipment be turned over to TSC for use as training aids.
- NAVSSI – All deinstalled equipment will be removed for disposition as directed by PMW 156.
- GCCS-M – All deinstalled equipment will be removed for disposition as directed by PMW 157.

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DELIVERABLES UPON COMPLETION

System

1. System Operational Verification Tests (for Individual Systems)
2. Overall Interface/Integration Test
3. 4790 CK for Installed/Removed Equipment *
4. Record of OJT (contained in SOVTs)
5. ILS Materials (as listed for Individual Systems in SOVTs)
6. Installation Out-Brief (23 August (20 December: GCCS-M 4.X))
7. As-Built Drawings (60 days after Out-Brief)

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APPENDIX W1 – SHORE SITE ILS CHECKLIST OUTLINE

Identification/Control:
Title/Description of Installation:
Installation Tracking Number:
Site/Installation Schedule (Name/Location/Date):

Configuration Management:
Nomenclature(s):
Drawing number(s):
Software title, version, (Date):
CDMD-OA Work File Submitted/Approved/ECD (Date):
4790 CK Form if applicable:

Supply Support/Support & Test Equipment (S&TE):
Spares provided at installation (Yes, see attached list, or see ULSS (Date). No, rationale/ECD)
Allowance Parts List provided at installation (Yes, see attached list, or see ULSS (Date). No, rationale/ECD)

NSN, CAGE&P/N NOMEN QTY PROVIDED APL (if applicable) DWG#

S&TE list provided at installation (Yes, see attached list, or see ULSS (Date). No, rationale/ECD)

SCAT NSN NOMEN QTY PROVIDED APL (if applicable) DWG#

Technical Manuals:
Tech Manuals provided at installation (Yes, see attached list, or see ULSS (Date). No, rationale/ECD)

TMIN# TITLE VERSION/DATE

Maintenance:
MIPs/MRCs provided at installation (Yes, see attached list, or see ULSS (Date). No, rationale/ECD)

MIP/MRC ID# DWG#

Warranty POCs (System/Subsystem/Component/Name/Org/Code/Phone/Email, or see ULSS (Date).)

ISEA POCs (System/Subsystem/Component/Name/Org/Code/Phone/Email, or see ULSS (Date).)

Help Desk POCs (System/Subsystem/Component/Name/Org/Code/Phone/Email, or see ULSS Date).)

Training:

Training provided at installation (Yes, see attached list. No, rationale/ECD)

TRAINING TYPE DURATION SYLLABUS TITLE/#/DATE

Other applicable training available (Yes, see attached list. No, rationale/ECD)

CIN TITLE LOCATION DURATION NEC CBT

APPENDIX W2 – SHORE SITE INSTALLATION COMPLETION REPORT (ICR) TEMPLATE

Project Tracking Number **Date:** **Sheet 1 of 4**
Project Title/Description:
Nomenclature:
Site: **Location:**

The completion of this form and associated signatures acknowledge receipt of deliverables, resolution of discrepancies, and acceptance of the installation. A sample completion message is enclosed with this report. Completion messages are used to report conditional or final acceptance. If conditional, the message should document all outstanding discrepancies. If after 30 days, the site has not released a completion message, the Installation Activity may release one in order to report completion. If any discrepancies are still outstanding after 30 days, the discrepancies will be noted along with the planned action and anticipated completion date. The first signature in this form is for the Installation Activity Project Engineer or On-Site Government Representative to certify that the installation was completed, successfully tested and transitioned to operational status, training conducted, and all Information Assurance (IA) and sustainment logistics support items were turned over to the site personnel identified. The second signature in this form acknowledges completion of the installation and accepts the installation. Discrepancies, such as pre-installation conditions, for which site acknowledges responsibility shall be noted.

1. The installation of *system name and variant name* is completed per the approved design documentation, tested per the approved System Operational Verification Test, and transitioned to operational status. Training was conducted, Information Assurance documentation, and logistics support items were provided to station personnel identified.

(Installation Activity Official's Signature) Date:
Official's Name
Official's Title
Email Address
Phone Number

2. The installation of *system name and variant name* is operational. The installation and testing was observed, system support documentation received, and training was provided to station personnel as noted below. All discrepancies have been resolved, acknowledged as site's responsibility, or accepted as minor conditions that do not affect operations or maintenance.

(Site Official's Signature) Date:
Official's Name
Official's Title
Email Address
Phone Number

1. **In-Brief:** The undersigned acknowledge that an In-Brief by a government representative was conducted with site personnel.

Activity Representative Printed Name: _____

Signature: _____ **Date:** _____

2. **Pre-Installation Baseline Test:** The undersigned acknowledge that a Pre-Installation Baseline Test was conducted and any pre-existing equipment or system maintenance issues were noted. Unless otherwise agreed, site acknowledges responsibility for pre-installation maintenance issues.

Activity Representative Printed Name: _____

Signature: _____ **Date:** _____

3. **System Operational Verification Test (SOVT) and Cutover:** The undersigned acknowledge that a SOVT was conducted in the presence of site personnel, and that the system configuration was documented in Appendix A, and if any discrepancies occurred during testing that they were documented in Appendix B. A successful "cutover" to operational status was completed.

Activity Representative Printed Name: _____

Signature: _____ **Date:** _____

4. **Logistics Support:** The undersigned site personnel acknowledge receipt of the items listed below:

Activity Representative's Printed Name	Activity Representative's Signature	Items No. Received	Activity Representative's Organization & Code
		Table 1: 1 - 4	
		Table 2: 1 -	
		Table 3: 1 -	
		Table 4: 1 -	
		Table 5: 1 -	

Table 1: Configuration Management				
Item No.	Item Description	Deliverable Media	QTY	Remarks
1	Red-Lined IDP Drawing Number: Date:	Paper, 11" x 17"		Master As-built to be provided in 60 days.

2	Software: (title, version) Date: (REV Date)			
3	CDMD-OA Work File (if applicable) Submitted/Approved Date: (Date)	Paper Validation Aid (VALAID) Report		
4	4790 CK Form (if applicable)	Paper		

Table 2: Supply Support/Support & Test Equipment (S&TE)							
Item No.	Item Nomenclature or Description	CAGE No. & Manufacturer or Supplier	Part No.	NSN	Serial No.	APL No. (if applicable)	QTY
1							

Table 3: Technical Manuals				
Item No.	TMIN or Document No. (if available), Title, Version/Date	Deliverable Media	QTY	Remarks
1				

Table 4: Maintenance						
Item No.	Item Description, ID No.	Name	Organization	Phone	Email	Remarks
1	MIP/MRC (If not provided, give reason)					
2	Item: Serial No: Warranty Expires – Date Warranty POC:					
3	System ISEA POC					
4	Subsystem ISEA POC					
5	Component ISEA POC					
6	Help Desk POC					

Table 5: Training					
Item No.	Item Description and Identification No. (if applicable)	Duration	Course Syllabus	Date	Remarks
1	On-The-Job Training				
2	Other Training Available: CIN, Title, Location, NEC No., CBT URL				

5. <u>Sample Completion Message:</u> A draft Completion Message is provided below.

ROUTINE

FM COMMAND NAME//N5//

TO SPAWARSYSCEN (ATLANTIC or PACIFIC) //4.2/TECH CODES//

INFO NAVNETWARCOM//N3//
SPAWARSYSCOM//4.2//
PEO (C4I, EIS, or SPACE) //PMW//

BT

UNCLAS//N04720//

A. SPAWAR SHORE INSTALLATION PROCESS HANDBOOK V3.0
B. SOVT FOR PROJECT XXXXXX

SUBJ: INSTALLATION OF SYSTEM NAME, VARIANT NAME, PROJECT TRACKING NUMBER XX-XXXX

1. SUBJ INSTALL WAS COMPLETED *(enter date)* IN ACCORDANCE WITH REF A. THERE ARE NO UNFINISHED WORK ITEMS. ALL TEST AND INSPECTIONS OF REF B WERE SUCCESSFULLY COMPLETED *(enter date if known)*. SYSTEM IS FULLY OPERATIONAL. COMMAND NAME ACCEPTS MAINTENANCE AND OPERATIONAL RESPONSIBILITY FOR EQUIPMENT INSTALLED BY SUBJECT PROJECT.

APPENDIX X1 - INSTALLATION IN-BRIEF OUTLINE

1. **Overview of the systems and capabilities installed.**
   Review what system and equipment was installed and what capability this gave the receiving command.

2. **Review installation results.**
   Explain what transpired during the System Operational Verification Test (SOVT). For example, discuss the safety and security walkthrough and any new safety or security features or requirements such as radiation hazards, virus protection, or intrusion detection. Review outstanding discrepancies (if any) and the action plan and expected completion dates.

3. **Review current operational status and readiness of the system and personnel.**
   Discuss what training was provided and to whom and what standby support the installation team has provided. Review what logistics support materials were turned over to the site and who received the materials. Present Installation Completion Report (ICR) with compiled results of the installation, SOVT, training, logistics, and turnover for customer signature.

4. **Review customer post installation responsibilities.**
   If you haven't already reviewed any outstanding discrepancies that are action to the customer, then do so. Request that site release an installation completion message. appropriate topics.

5. **Feedback.**
   A good practice is to give feedback to the site regarding those deserving site personnel that supported your installation. When appropriate explain their participation and how this aided the installation team in completing their mission. Lastly, explain that the Voice of the Customer (VOC) is important to SPAWAR and that we are interested in knowing how we did and if they observed any strengths or weaknesses in our processes or execution. Request that feedback, either positive or negative, be forwarded via email to the local SPAWAR Regional Shore Installation Manager.

Special Note: The PE will prepare the Installation Out-Brief using MS Power Point or some other comparable/suitable software. Hard copies of the Out-Brief will be provided to the customer.

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APPENDIX X2 – INSTALLATION OUT-BRIEF

SPAWAR

Tracking # 04-0772

Space and Naval Warfare Systems Facility Pacific, Guam

PRESENTED BY: Frank G. Salas
Date: 10JUL06

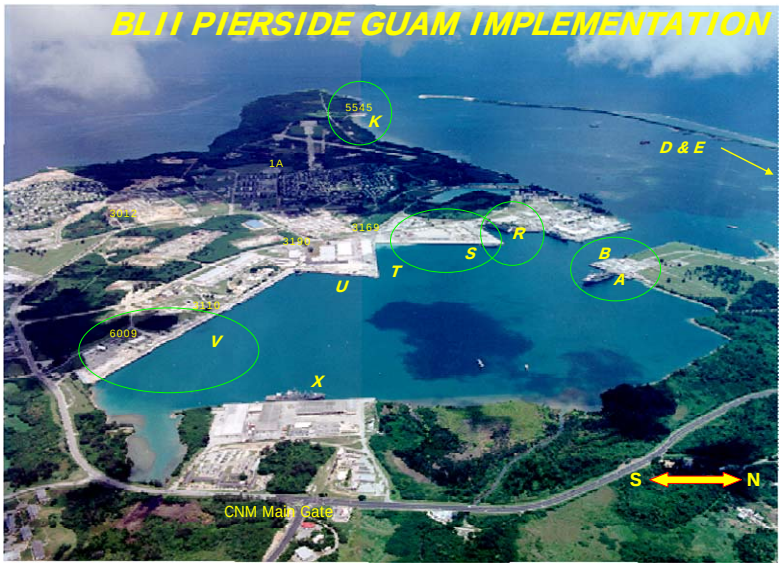
BUILDING 57 AMMON AVENUE
BARRIGADA, GUAM 96913

BLII PIERSIDE OUT-BRIEF

SPAWAR

Overview

Tracking # 04-0772

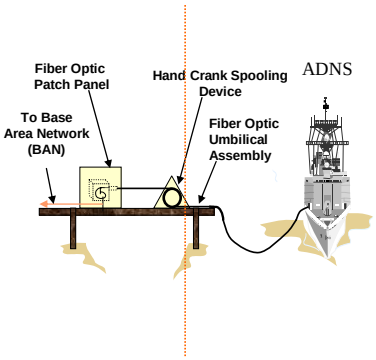


SPAWAR

Background

Tracking # 04-0772

Overall System Description



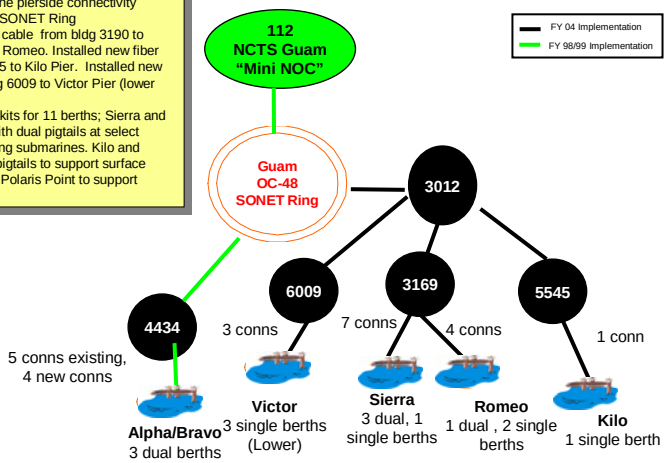
Basic Description of System:
Installs/modernizes OCONUS pier IT Infrastructure to IT21 standards
Installs/modernizes IT infrastructure to and within operational and logistical support buildings in support of additional ship connections.
Provides engineering and support to the initial fielding of installed IT infrastructure
Capability provided at the pier per connection
1.408 mbps NIPRNET
128 kbps SIPRNET

SPAWAR

Guam Logical Pier Connectivity

Tracking # 04-0772

- Installed all cabling and electronic equipment necessary to implement the pierside connectivity
- Utilized Guam's OC-48 SONET Ring
- Installed new fiber optic cable from bldg 3190 to berths on Sierra Pier and Romeo. Installed new fiber optic cable from bldg 5545 to Kilo Pier. Installed new fiber optic cable from bldg 6009 to Victor Pier (lower half).
- Installed new pier riser kits for 11 berths; Sierra and Romeo berths outfitted with dual pigtails at select locations to support nesting submarines. Kilo and Victor berths with single pigtails to support surface craft. Installed pigtails at Polaris Point to support nesting submarines.



POST INSTALLATION TASKS

Tracking # 04-0772

- **Safety and Security Walkthrough. Completed. No issues.**
- **SOVT Results**
  - **SSC SD SOVT team unable to complete SOVT due to spare ANCC-KG84A incorrect wiring and connection issues.**
  - **SSFP GU and NCTS BCO completed the repairs and troubleshooting.**
  - **Issues with timing the Polaris Point ATM switch were resolved through wiring and the system is ready for cutover.**
- **Operational Readiness**
  - **System tested satisfactorily at Romeo B1 and the BLII Pierside system was made fully operational at that time.**

POST INSTALLATION TASKS

Tracking # 04-0772

- **Training**
  - **ATM theory training was completed by Marconi contractors.**
  - **OJT training prior to SOVT was completed by Omer Nasori from the SSC SD SOVT team.**
- **ILS Materials**
  - **ULSS document will be provided by the SPAWAR BLII Piers PMO after project acceptance. A majority of ILS Materials and equipment have been received under this document draft.**

POST INSTALLATION TASKS

Tracking # 04-0772

- **Outstanding Work or Deficiencies**
  - **All outstanding work and deficiencies have been fixed or addressed by SPAWAR.**
- **Standby Support**
  - **Initial configuration support will be handled by the SPAWAR PMO.**
- **As-Built Drawings**
  - **Provided to NCTS BCO.**
- **Site Support**
  - **NCTS N2 and N3 provided support during the evolution of the installation. Joe San Nicolas provided excellent coordination between the various NCTS participants.**

Customer Responsibility

Tracking # 04-0772

- **Acceptance Message**
  - **Request NCTS N2 send out full acceptance and operational message for the new BLII Pierside system.**
- **Feedback**
  - **Please let us know how we performed, processes that need improving, concerns, and/or areas that need improvement.**
  - **Send your feedback to: makio@spawar.navy.mil, Regional Shore Installation Manager WESTPAC.**

APPENDIX Y – MILCON C4ISR/IT INTEGRATION PROCESS

1.0 Military Construction (MILCON) Command, Control, Communications, Computers, Intelligence and Reconnaissance/Information Technology (C4ISR/IT) Integration Process

The MILCON C4ISR/IT Integration process is designed to provide a systematic and orderly sequence of events for the development and implementation of a new C4ISR/IT centric facility and capability. This process is in direct support of DOD MILCON processes managed and directed by the Navy Facilities Engineering Command (NAVFAC), the Army Corps of Engineers (ACOE) or other DOD facility construction and management agencies.

1.1 Background

SPAWAR 4.0 is the Competency and Directorate with the assigned responsibility for defining and implementing Fleet Modernization policy and process for Team SPAWAR, which is defined as SPAWARSYSCOM, associated Program Executive Offices, and direct reporting SPAWAR System Centers. SPAWAR 4.0 has defined and implemented the MILCON C4ISR/IT Integration Process to manage large, high visibility, shore installation projects of significant importance to the warfighter. The process is illustrated in Figures Y-1 and Y-2. These projects are usually associated with MILCON projects. The process uses a set of requirements definition, design, and installation review events that results in the projects Full Operational Capability (FOC). Projects range in scope, size, and duration. The process is scalable and can be tailored to meet the shore C4ISR/IT customer's scope and requirements and, therefore, can be used for smaller projects of lesser duration, like Command Center upgrades. Often, MILCON and large C4ISR/IT projects require the coordination and collaboration of multiple Programs of Record (PORs), PEOs, SYSCOMS, sponsors, and other Joint or Federal agencies. When this situation occurs, an Echelon II MILCON C4ISR/IT Integration Program Management Office needs to be designated to manage the MILCON C4ISR/IT Integration Process. For example, SPAWAR 4.0D, normally acts as the overall program coordinator or MILCON C4ISR/IT Integration Program Management Office for COMSPAWAR assigned projects and assists other Echelon II in understanding and implementing the MILCON C4ISR/IT process.

1.2 Phases

The process can be broken into five distinct phases:

I. NAVFAC MILCON project development/approval and simultaneous SPAWAR long range C4ISR/IT planning, systems requirements definition, and budgeting;

II. NAVFAC design/RFP development and concurrent SPAWAR C4ISR/IT integrated systems design;

III. NAVFAC construction with parallel SPAWAR C4ISR/IT integrated systems development and acquisition;

IV. SPAWAR C4ISR/IT systems installation; and

V. Initial Operating Capability (IOC), Final Acceptance, Final "As-Builts", and FOC.

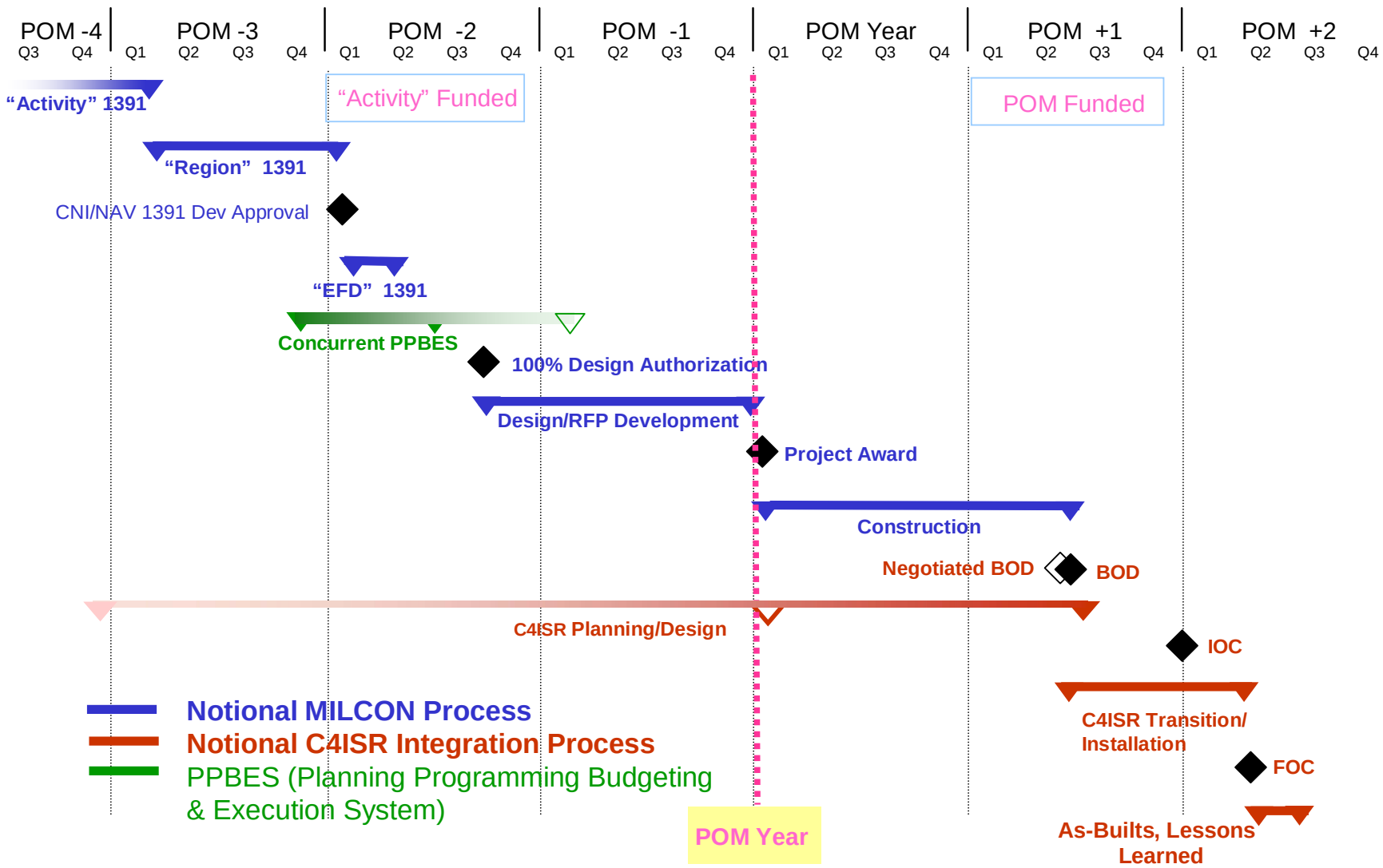


Figure Y-1. Notional MILCON C4ISR/IT Systems Integration Process

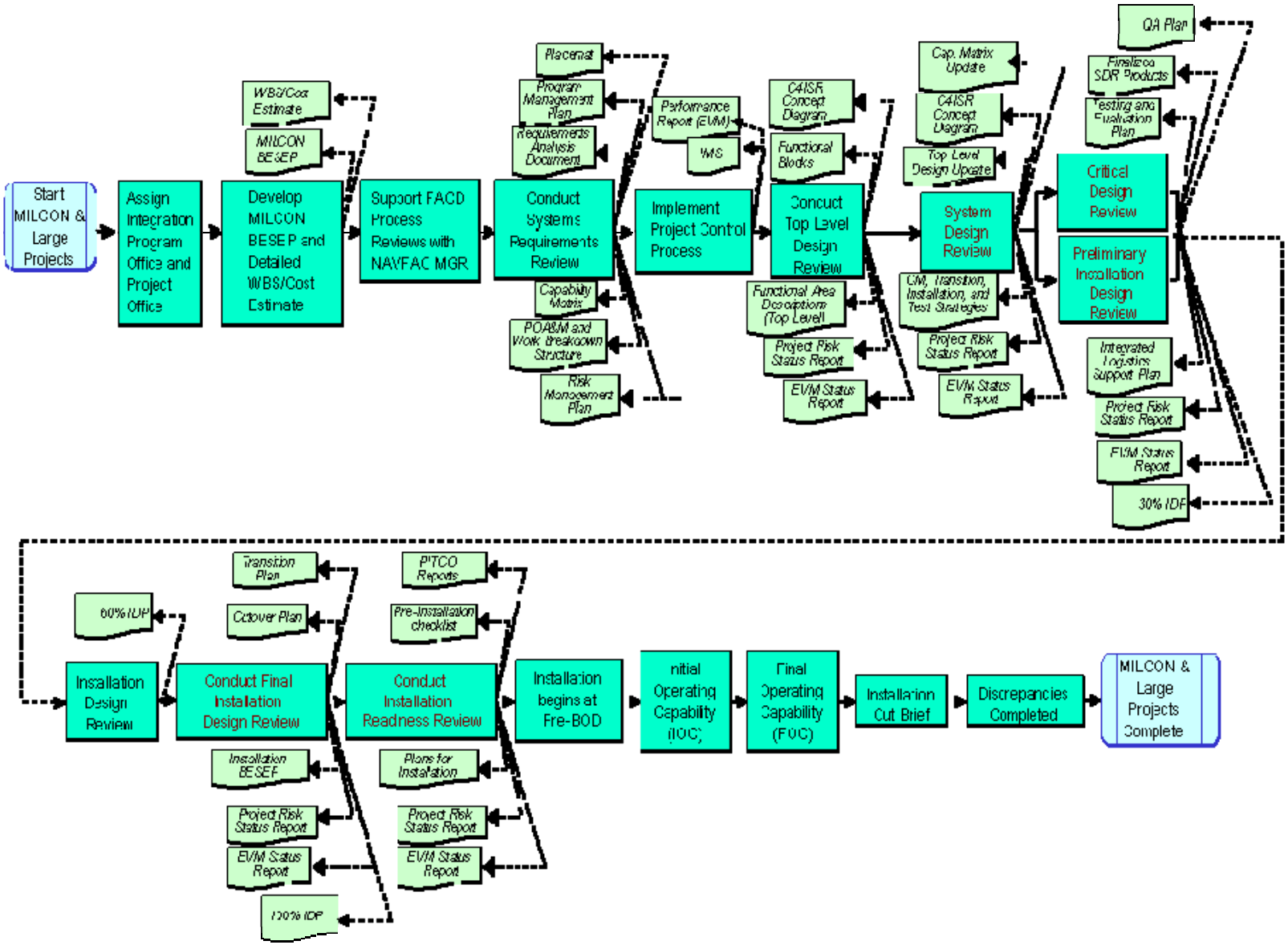


Figure Y-2. MILCON C4ISR/IT Integration Process

***1.2.1 Phase I*:** This phase should start with the MILCON Mission Sponsor's direct discussions with the local NAVFAC Regional staff at least three years prior to the Program Objective Memorandum (POM) year for the project. Early notification of the Resource Sponsors, such as OPNAV N6 and N8, is required for situational awareness. During this phase, the Mission Sponsor or Resource Sponsor should request the designation of a C4ISR/IT Project Office, usually an Echelon III SPAWAR Systems Center Organization. The Mission Sponsor should also identify the basic work scope of the project and the C4ISR/IT Project Office should prepare a Project Management Plan (PMP) that is approved by the Mission Sponsor and that identifies C4ISR/IT lines of authority and responsibility for all stakeholders. A consolidated C4ISR/IT Site Survey and the initial Site Requirements Plan, otherwise known as a MILCON Base Electronic System Engineering Plan (BESEP), is funded by the Mission Sponsor, and prepared by the C4ISR/IT Project Office.

Often, Mission Sponsors request SPAWAR assistance in finding and developing project C4ISR/IT requirements. Operational requirements definition is inherently a Mission Sponsor responsibility. Systems Design requirements definition is a SPAWAR responsibility.

Additionally, the initial C4ISR/IT integration cost estimate ROM (Rough Order of Magnitude) is developed, shared with the Resource Sponsors, and included as a part of the NAVFAC MILCON DD Form 1391 submission, approved via CNI, to Congress. During Phase I, an Echelon II MILCON/C4ISR/IT Integration Program Management Office should be designated to conduct coordination between the commands of NAVFAC, SPAWAR, Respective PEOs, and Mission and Resource Sponsors. C4ISR/IT programmatic and engineering issues among multiple Sponsors, PEOs, Joint Commands, other Government Agencies, other field activities, and other stakeholders must be resolved and a C4ISR/IT POM approved.

C4ISR/IT project budgeting and funding fall into two categories; Systems Procurement and Installation (P&I), and Project Transition and Integration (T&I). P&I costs comprise the total costs to design, procure, install, and test new acquisition systems for turn-over to the user. T&I costs comprise the overarching program management and systems engineering efforts required to ensure proper consolidation, integration and interoperability of the end to end capability to be hosted at the new facility. It also includes costs of planning and moving legacy C4ISR/IT systems (if applicable) from older facilities to the new MILCON facility. C4ISR/IT advanced planning, programming, and budgeting must be preformed along with the POM process for the MILCON. Funding to support the MILCON C4ISR/IT Integration Process must be identified from C4ISR/IT sponsors, vice NAVFAC MILCON sources. See OPNAVINST 11010.20 (series) or subsequent for more details. During this phase, all Echelon II authorities should be preparing and coordinating C4ISR/IT POM submits.

Phase I is completed when resources have been identified and CNIC/NAVFAC approves the project at its annual MILCON Planning Board.

***1.2.2 Phase II*:** This phase starts with CNIC/NAVFAC approval of the MILCON project and ends with a construction contract award. During this time, the SSC C4ISR/IT Project Office should continue to work closely with the Regional NAVFAC Office and their Architecture and Engineering (A&E) contractors performing the Functional Analysis Concept Development (FACD) process of management using percent complete construction design reviews (usually at 10%, 30%, 60%, 90% and Design Complete). The FACD process, also referred to as Charettes, is defined by UFC 1-300-09N.

The Echelon II C4ISR/IT Program Management Office and the Echelon III C4ISR/IT Project Office should be preparing initial C4ISR/IT T&I and P&I documents and detailed planning documents to coordinate and integrate all C4ISR/IT systems with the MILCON. Transition and acquisition documents, and milestone reviews associated with the MILCON C4ISR/IT Integration Process are discussed in paragraph 2.0. It is also during this phase that the System Requirements Package (SRP) or MILCON BESEP may need to be updated to reflect the further defined C4ISR/IT system implementation requirements.

***1.2.3 Phase III*:** Phase III starts with facility construction and ends at a Building Occupancy Date (BOD) or the date at which facility construction team allows the C4ISR/IT installers access to the facility for installations. The C4ISR/IT Project Office continues a close working relationship with the NAVFAC/USACE construction manager, actively participating in all construction progress reviews. Additionally, the C4ISR/IT Project Office continues detailed design of the integrated C4ISR/IT system, including backhaul cabling, networks, building backbone, NMCI integration/coordination, and Installation Design Plans (IDPs). It is during this phase that all remaining MILCON C4ISR/IT Integration Process documents and milestone reviews as discussed in paragraph 2.0 are completed. Planned installations must be coordinated and conducted within the guidelines of the Shore Installation Process and the C4ISR/IT Integration Process by working with sponsoring systems Program Offices and other Installation Activities.

***1.2.4 Phase IV*:** Phase IV commences at the effective C4ISR/IT installation start date. In some projects this date may be negotiated to actually occur prior to the BOD i.e. a pre-BOD. A pre-BOD is used to facilitate long-lead, pre C4ISR/IT installation efforts, such as C4ISR/IT unique infrastructure requirements not already covered by the MILCON. The installation and transition process must continue to follow the guidelines and standards as defined in the SIPH and in accordance with the C4ISR/IT Integration Process timelines established during the Phases I to III and approved by the Mission/Project sponsors.

***1.2.5 Phase V*:** This phase is a post installation, final acceptance phase that covers that period of time after IOC up to FOC when “As-Builts” are completed, Configuration Data is updated, and final SOVTs are signed. These processes are all in accordance with the Shore Installation Process as described in other sections of the SIPH.

A Notional MILCON C4ISR/IT Integration Process Timeline is shown in Figure Y-3 to illustrate how the five phases are typically implemented. In many cases, adjustments will need to be made to this schedule to accommodate, size and scope of project and unique project circumstances.

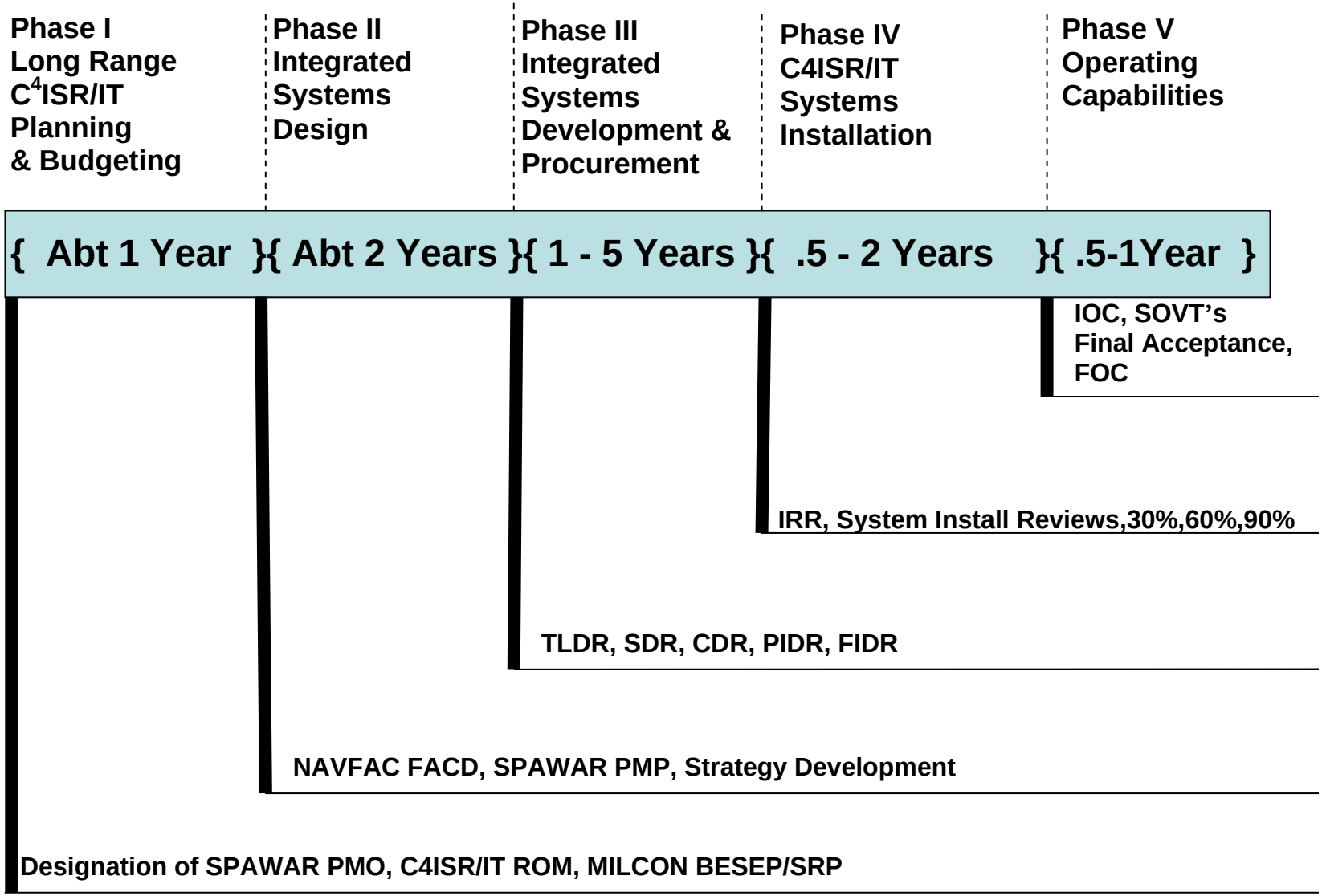


Figure Y-3. Notional MILCON C4ISR/IT Integration Phased Timeline

2.0 MILCON C4ISR/IT Integration Process Documentation and Reviews

Major process elements (documents, milestones, and reviews) are identified in this section. Some of these elements could be combined or eliminated for smaller, less complex projects. Decisions to combine or eliminate should be based on whether the intent of each process element and document is still satisfied. Although most C4ISR/IT MILCONs are more T&I than P&I, general documentation guidance for System Engineering Plans and Design Reviews can also be found in the DOD acquisition process. See Defense Acquisition Guidebook (DAG, http://akss.dau.mil/dag/.). The following documents and reviews are defined in this section:

a. MILCON Base Electronics Systems Engineering Plan (BESEP), also known as a Site Requirements Package (SRP).
b. Initial C4ISR Cost Estimate (ROM) for DD 1391
c. Systems Requirements Review (SRR)
d. Program Management Plan (PMP)
e. Requirement Analysis Document (RAD)
f. Capability Matrix
g. POA&M and Work Breakdown Structure
h. Systems Engineering Plan (SEP)
i. Integrated Master Plan (IMP)
j. Integrated Master Schedule (IMS)
k. Project Control Plan or Earned Value Management Plan (EVMP)
l. Top Level Design (TLD) Review.
m. System Design Review (SDR).
n. Critical Design Review (CDR).
o. Preliminary Installation Design Review (PIDR).
p. Final Installation Design Review (FIDR).
q. Installation Readiness Review (IRR).
r. Installation Status Review (ISR).
s. Building Occupancy Date (BOD).
t. Initial Operating Capability (IOC).
u. Full Operational Capability (FOC).

MILCON C4ISR/IT integration projects are not acquisition programs. The intent of the MILCON C4ISR/IT Integration Process reviews is to insert structure and rigor that is similar to the acquisition and engineering reviews without adding acquisition requirements to a T&I project.

2.1 MILCON BESEP (Site Requirements Package)

The MILCON BESEP should be started as soon as the sponsoring Command identifies a MILCON DD 1391 requirement and a SPAWAR Echelon III activity is identified to be the C4ISR/IT Project Management Office. Section 5.4 of the SIPH describes the standard "Installation BESEP". The "MILCON BESEP" or SRP is a different document that defines the physical, mechanical, electrical, safety, and security requirements for the MILCON. It is important that it clearly and succinctly defines the requirements in technical terms whenever possible to provide clear guidance during the MILCON design phase.

The content should be concise but sufficient to provide adequate information to the construction Design Agent. The areas or subjects that will be included are:

Part I. Introduction, Scope, and Responsibilities

Part II. Electronic Systems Design

1. System Descriptions
2. Floor Plans
3. Equipment Elevations
4. Installation Philosophy

Part III. Facility Requirements

1. Description
2. Civil Requirements
   a. Fencing
   b. Outside Lighting
   c. Trenching
   d. Roads/Pavement
3. Architectural/Structural Requirements
   a. Fire Protection
   b. Flooring
   c. Walls
   d. Ceiling
   e. Roof
   f. Doors
   g. Cable Trays/Ducts
   h. Ladders/Railings
   i. Lighting
   j. Antennas
4. Electrical Requirements
   a. Existing Power Service
   b. Power Requirements (Critical, Technical, Emergency, & UPS)
   c. Grounding/Bonding/Shielding
   d. Electrical Bonding Specifications
   e. Antennas
   f. Telephones

g. Fiber/Copper Cabling Specifications

5. Mechanical Requirements
   a. Equipment Cooling Requirements
   b. Building Cooling Requirements
6. Security Requirements
   a. Coded Lock Specifications
   b. Doors
   c. Walls
   d. Other Openings

2.2 Initial C4ISR/IT Cost Estimate (ROM) for DD 1391

There is no formal template or process for providing this estimate. However, it is critical that the cost estimate for the C4ISR/IT systems and integration planning/design be rigorously derived as a bottom up engineering estimate. The total estimated cost for the C4ISR/IT will be listed on the final DD 1391 that goes before Congress. However, the MILCON process will not program, budget, or fund the C4ISR/IT requirement. The DD 1391 identifies these required funds as coming from other appropriations. It is therefore critical that the C4ISR/IT estimate be broken down such that it can be vetted by the Team SPAWAR, appropriate Program Offices for the specific Programs of Record, and by the designated C4ISR/IT Integration Program Office.

C4ISR/IT programming and budget approval should be via SPAWAR and/or lead PEO chain of command. OPN and O&MN costs for planning, procurement and installation must be programmed in the POM separately by either the project Resource Sponsor, Mission Sponsor, or by individual Programs of Record (PORs). Each C4ISR/IT system requirement (P&I) as well as the T&I must be separately approved by the appropriate OPNAV Resource Sponsors. So, a P&I and T&I breakout is also required in the ROM. If at all possible, the cost estimate should be prepared in conjunction with or after the MILCON C4ISR/IT BESEP.

2.3 Systems Requirements Review (SRR)

The SRR is the first opportunity that the customer has to verify the C4ISR/IT Project Offices understanding of the project's requirements. The following deliverables are normally reviewed with the customer during the SRR in order to seek customer agreement with the defined requirements and management approach:

a. ***Program Management Plan (PMP).*** This plan provides the guidance for the management and execution of the project. It includes an understanding of who key stakeholders, resource sponsors, mission sponsors, Programs of Record Program Offices are and what fiscal, programmatic and engineering responsibilities each has in the project.

b. ***Requirements Analysis Document (RAD).*** This document identifies the functionality, systems, and capabilities required to meet the Top Level Operational Requirements.

c. ***Capability Matrix.*** This matrix provides a list of systems and capabilities traceable to the RAD.

d. ***POA&M and Work Breakdown Structure.*** This document provides the planned implementation schedule for the project broken down to the level of the IMA's approved Work Breakdown Structure.

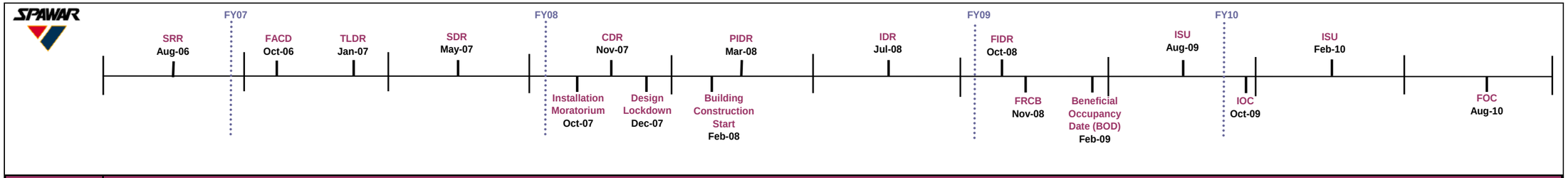
2.4 Systems Engineering Plan (SEP)

The SEP is detailed formulation of actions that should guide all technical aspects of the project. It is scaleable to each project and evolutionary across the project schedule. It should be updated at each subsequent milestone. Some of the major documents, reviews, and milestones that should be addressed in the SEP are:

a. Integrated Master Plan (IMP). The IMP provides an overarching framework against which all work is accomplished. It documents all the tasks required to deliver a high quality product and facilitate success throughout the products life cycle. During the initial stages of a program, the integrated plan is preliminary, and its purpose is to provide an understanding of the scope of work required and the likely structure of the program. It is constructed to depict a likely progression of work through the remaining phases, with the most emphasis on the current or upcoming phase (especially the period to be contracted for next). The integrated plan also serves to identify dependencies, which may be performed by different organizations. Figure Y-4 is a typical example of an IMP used with the MILCON C4ISR/IT Process. It is sometimes referred to as the "Placemat". It puts all process milestones and deliverables on a time line based on the required IOC. SPAWAR 4.0D can assist C4ISR/IT Project Offices develop Placemats that realistically reflect time required to complete each phase of the process.

b. Integrated Master Schedule (IMS). The integrated schedule begins with the IMP top-level dates—the starting points are the events, accomplishments, and deliverables that make up the plan. At a minimum, an Integrated Master Schedule shows the expected start and stop dates for each event and deliverable in the plan, but each deliverable should be broken down into lower-level tasks in the Work Breakdown Structure that will be used to manage the project on a day-to-day basis. The schedule can be expanded downward to the level of detail appropriate for the scope and associated risk for each work element.

c. Project Control Plan or Earned Value Management Plan (EVMP). Project control methodologies are fundamental to project management. Cost and Schedule are major metrics for project progress and early identification of problems. Even basic or normal installation projects described in Sections 1- 8, require cost and schedule management. However, as projects become more complex, more advanced methods are required to maintain project control. SPAWAR MILCON C4ISR/IT integration projects and other large scale projects require a detailed Work Breakdown Structure and an associated spend and funding plan be baselined for each major work element. Associated tracking of expenditures is required every two weeks. The requirement for EVM applies to cost or incentive contracts, subcontracts, intra-government work agreements, and other



SPAWAR Organizational Component	TEAM SPAWAR MILCON / C4ISR PLAN - VERSION dated 3 July 2006									
	P-XXX Naval Communications Center									
Milestones (Customer & Senior Mgmt Reviews)	SRR: Systems Requirements Review	TLDR: Top Level Design Review	SDR: System Design Review	CDR: Critical Design Review	PIDR: Preliminary Installation Design Review	IDR: Installation Design Review	FIDR: Final Installation Design Review	ISU: Installation Status Update	ISU: Installation Status Update	FOC: Final Operational Capability
C4ISR Project Team	• Develop SRR Products • Develop and Provide Project Risk Report	• Develop TLDR Products • Provide Project Risk Report • Develop and Provide EVM Status Report • Develop and Provide TLDR Brief	• Develop SDR Products • Provide Project Risk Report • Provide EVM Status Report • Develop and Provide SDR Brief	• Develop CDR Products • Provide Project Risk Report • Provide EVM Status Report • Develop and Provide CDR Brief	• Develop PIDR Products • Coordinate C&A / IATO Requirements for C4I & Site • Provide Project Risk Report • Provide EVM Status Report • Develop and Provide PIDR Brief	• Develop IDR Products • Provide Project Risk Report • Provide EVM Status Report • Develop and Provide IDR Brief	• Develop FIDR Products • Prepare FRCB Package • Provide Project Risk Report • Provide EVM Status Report • Develop and Provide FIDR Brief	• Conduct ISU • Develop and Provide QA Report • Provide Project Risk Report • Provide EVM Status Report	• Provide required training • Deliver ILS/ULSS package • Conduct ISU • Develop and Provide SOVT Report • Provide QA Report • Resolve and/or track SOVT discrepancies • Provide red-lined IDPs • Provide Project Risk Report • Provide EVM Status Report	• Deliver As-Built Package • Provide QA report • Provide Project Risk Report • Provide Final EVM Status Report • Develop Lessons Learned Documentation • Resolve and/or track SOVT discrepancies • Gain Product Acceptance from NCTAMS PAC
Key Products	1. SRR Products - Placemat - Program Management Plan - Requirements Analysis Document - Capability Matrix - POA&M/WBS - Risk Management Plan 2. Project Risk Report 3. SRR Brief	1. TLDR Products - C4ISR Concept Diagram - Concept of Operational Capabilities - Organizational Command Relationships - Functional Area Descriptions - Functional Block Diagrams (FBD) "As-Is" and "Target" 2. Project Risk Report 3. EVM Status Report 4. TLDR Brief	1. SDR Products - Capability Matrix update - Top Level Design poduct update - Configuration Management (CM) Strategy - Transition Strategy - Installation Strategy - Test Strategy 2. Project Risk Report 3. EVM Status Report 4. SDR Brief	1. CDR Products -Updated & Finalized SDR Products -Test and Evaluation Plan - ILS Plan - QA Plan - IA Strategy 2. Project Risk Report 3. EVM Status Report 4. CDR Brief	1. PIDR Products -30% IDP -Installation Design Checklist 2. Project Risk Report 3. EVM Status Report 4. PIDR Brief	1. IDR Products -60% IDP -Transition Plan -Cutover Plan -Draft SOVT Plan 2. Project Risk Report 3. EVM Status Report 4. IDR Brief	1. FIDR Products -100% IDP -Final SOVT Plan 2. FRCB Package 3. Project Risk Report 4. EVM Status Report 5. FIDR Brief	1. QA Report 2. Project Risk Report 3. EVM Status Report	1. ILS/ULSS Package 2. SOVT Report 3. QA Report 4. Discrepancies Tracking Report 5. Red-lined IDPs 6. Project Risk Report 7. EVM Status Report	1. Signed SOVT 2. As-Built Package 3. QA Report 4. Project Risk Report 5. Final EVM Status Report 6. Lessons Learned Documentation 7. Discrepancies Tracking Report 8. Facility walk-through 9. Product Acceptance
SPAWAR 04D / PMW790	• Review POR Products • Review POR Funding • Develop and Provide SRR Brief	• Review TLDR Products	• Review SDR Products • Approve Long-Lead Procurement Actions	• Review CDR Products	• Review PIDR Products	• Review IDR Products	• Review FIDR Products	• Review QA Report	• Review SOVT Report • Review QA Report • Coordinate responsibility for SOVT discrepancy resolution	• Review QA Report and obtain customer acceptance
Remarks	■ Obtain customer concurrence with System Requirements	■ Internal Review	■ Obtain customer concurrence with Top Level Design	■ Obtain customer concurrence with final system design and CDR products	■ Internal Review	■ Obtain customer concurrence with draft Installation Design products	■ Obtain customer concurrence with Final Installation Design products	■ Obtain customer feedback on production work to date	■ Obtain customer feedback on production work to date	■ Obtain customer acceptance

Figure Y-4. Sample Integrated Master Plan

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agreements that meet the dollar thresholds prescribed in USD (AT&L) policy memorandum dated March 7, 2005. The DoD application thresholds (total contract value including planned options in then-year dollars) are summarized below:

- $20 million or greater – EVM implementation compliant with ANSI/EIA-748 is required. No formal Earned Value Management System (EVMS) validation is required.
- $50 million or greater – EVM implementation compliant with ANSI/EIA-748 is required. An EVMS that has been formally validated and accepted by the cognizant contracting officer is required.

SPAWARINST 5000.19A also states that an EVM abbreviated Cost/Schedule Status Report (C/SSR) is required for contracts and subcontracts with values below the DoD thresholds and greater than $6.3 million. Applications to significant contracts of less value are at the discretion of the program manager or higher authority.

Appendix Z of the SIPH provides more details on applying project control requirements to the MILCON C4ISR/IT Integration Process. Projects that fall below the EVM threshold and where no single contract will exceed EVM thresholds, have the option of implementing a less rigorous Cost Schedule Control process discussed in Appendix Z.

2.5 System Design Reviews

The following describe the system design reviews and associated deliverables that support the design process. Depending on the size and scope of the project, some of these reviews and documents can be combined/consolidated. All the reviews and associated deliverables should be at least assessed by the project team before being combined/consolidated.

a. Top Level Design (TLD) Review. This is a review of the Top Level Design for the entire integrated C4ISR/IT requirement. This Top Level Design Review and associated deliverables document the approved C4ISR/IT plan to meet the customer's operational requirements. During the Top Level Design Review the following deliverables are usually provided:

- C4ISR/IT concept diagram
- Concept of C4ISR operational capabilities
- C4ISR/IT organization/command relationships
- Functional Area Descriptions (Top Level)
- "As-is" and "Targeted" Top-level functional block diagrams (i.e., simplified block diagrams, category 060)
- Project Risk Status Report
- Project Controls/Earned Value Status Report.

b. System Design Review (SDR). The SDR is the first opportunity the customer has to review the Top Level Design that was generated from the results of the SRR. This review provides another opportunity for the customer to make changes to the design. During the System Design Review the following deliverables are usually provided:

- Capabilities Matrix Update

- Top Level Design Update
- Configuration Management Strategy
- Transition Strategy
- Installation Strategy
- Test Strategy (including the Systems Operation Verification Testing)
- Project Risk Report
- Earned Value Status Report

c. ***Critical Design Review (CDR).*** The CDR is the culmination of the design process, and is important for large and small projects. It provides the customer with a final review of the IA's design and represents the customer's last opportunity to make changes to the design. At this point the system design is baselined and comes under the configuration management process. During the Critical Design Review the following deliverables are usually provided:

- Updated and finalized System Design Review Products (The Functional Area Description and the Functional Block Diagrams can be updated and compiled into a Final Systems Design Document (FSDD) for routing and signature by stakeholders.)
- Configuration Management Plan
- Quality Assurance Plan
- Procurement Plan
- Certification and Accreditation (C&A) Strategy
- SOVT Strategy
- Integrated Logistics Support (ILS) Strategy including training, manning, and maintenance analysis
- Project Risk Report
- Earned Value Status Report

2.6 Installation Reviews

The following describe the installation reviews and associated deliverables that support the installation process. See Appendix Q for the definition of 30% and 60% IDPs.

a. ***Preliminary Installation Design Review (PIDR).*** The PIDR can be held concurrently with the CDR for smaller projects. The primary product under review are 30% IDP drawings.

b. ***Installation Design Review (IDR)***. The PIDR provides the customer with the first look at the transition plans, cutover plans, test plans, and 60% IDP drawings.

c. ***Final Installation Design Review (FIDR).*** The FIDR marks the beginning of the pre-installation phase. The FIDR provides the customer with a transition plan, cutover plan, 100% IDP drawings, and installation BESEP. This is the customer's opportunity to review and approve the changes made to the transition plans, cutover plans, and test plans as a result of the PIDR. This is also the opportunity for the customer to approve

the installation plan and see in detail the potential operational impact to any ongoing operations.

c. ***Installation Readiness Review (IRR).*** The IRR is the point at which the customer and the Installation Activity (IA) assess risks and readiness of the facility, equipment, materials, and project personnel. The customer comments on the products presented at the FIDR have been incorporated and are presented to the customer for final review and occurrence. Also presented are PITCO reports, installation team assessments and schedules, and a completed pre-installation checklist. The results of this review are the plans for the staging of material and personnel for the planned commencement of the installation at BOD.

d. ***Installation Status Reviews (ISRs).*** ISRs are conducted during the installation, e.g 30%, 60%, and 90%. The customer and the Installation Activity (IA) assess the lessons learned in terms of installation performance of the facility readiness, equipment and materials timely availability, project personnel performance, and quality of completed installation work. The customer comments on the installation experience, product and progress, as observed. The IA conducts a quality assessment by a designated Quality Assessment Evaluator (QAE). The results of these ISR reviews should lead to continuous improvement of workmanship and the final installation product.

2.7 Beneficial Occupancy Date (BOD)

BOD applies to the building under construction and usually represents the first date the IA can enter the building to begin installation activities for the C4ISR/IT systems.

2.8 Initial Operating Capability (IOC)

This is the date at which the project will reach the Initial Operating Capability required by the customer.

2.9 Full Operational Capability (FOC)

This is the date at which the project will reach the full operational capability as defined by the Project Scope.

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APPENDIX Z - PROJECT CONTROLS

Shore Installation Project Controls Overview

1.0 Background

Project Control is the process of collecting and analyzing statistics and project performance data to effectively manage large, integrated C4I programs, like MILCONs and Command Centers. Project Controls fall under two general categories; Earned Value Management (EVM) for projects that require rigorous cost/schedule control and reporting, and Cost/Schedule Controls for all other situations. If a project falls below the established EVM thresholds discussed below, then a less rigorous Cost/Schedule Controls Systems process (C/SCS) shall be established. The detailed processes for both an EVM and C/SCS are described below. Usually, these Project Control Systems are managed by SPAWAR 4.0, or at an alternative Echelon II Level, with data provided by Echelon III.

1.1 Earned Value Management

Thresholds for the use of Earned Value Management on these projects will generally be established in accordance with DOD 5000.2-R and SPAWARINST 5000.19A. Although the prescribed thresholds suggest using the Earned Value Management (EVM) for projects with values in excess of $20 million (USD (AT&L) policy memorandum dated March 7, 2005, SPAWARINST 5000.19A states that an EVM abbreviated Cost/Schedule Status Report (C/SSR) is required for contracts and subcontracts with values below the DoD thresholds and greater than $6.3 million. Program and Project Management reserve the right to implement Earned Value on any project where the perceived risk might necessitate greater management visibility and/or control.

A key element of an Earned Value Management System (EVMS) is the Control Account Manager (CAM). A CAM is a key team member assigned to manage what are known as Control Accounts. A Control Account is a logical accumulation point in the Work Breakdown Structure (WBS) where cost collection will occur. The CAM is responsible for all aspects of work under his or her Control Accounts. These include technical, cost, and schedule performance. CAMs are also responsible for the variance analysis process, including performing the applicable analysis and writing the necessary responses. There are several key elements that are required for projects to develop an effective EVM system. They are:

- Work Breakdown Structure (WBS)
- Resource Loaded Project Plan (RLPP)
- Project Level Actual Data
- Charge Number Matrix
- Project Baseline
- Reporting Methodology.

Once the above items have been established, an Earned Value methodology must be chosen for each task in the RLPP. The Earned Value Management System will use a combination of discrete and Level of Effort (LOE) methodologies to measure accomplishment of work packages. Each work package will have its own unique earned value methodology. Any task

that is not LOE or a planning package and has duration in excess of 40 business days will be broken down into shorter discrete work packages (normally two week increments).

After the plan has been established and the Earned Value Management System set up, work authorizations must be developed to define work scope, budget, schedule, and charge numbers for team members. Initial work authorization will occur via a Program Office Directive (POD). The POD defines and/or revises program guidelines, funding and directives relative to the execution and management of all installation projects. Once authorized to proceed, the Project Manager and the CAMs in turn, prepare applicable Work Authorization Documents (WADs). If an individual has not been provided with an approved WAD, he or she is not authorized to charge the Control Account.

Project status will be collected on a biweekly basis to monitor cost, schedule, and technical status of the project. On a biweekly basis, the on-site Project Controller will meet with each CAM to update the respective section of the schedule. The inputs are provided to the Project Controller via a Schedule Status Input Sheet. Once the Project Controller receives a complete set of the input sheets, the data is entered into an applicable earned value calculation tool. The tool performs the earned value determination calculations and generates the appropriate draft performance reports. At the end of each month, the CAM uses these reports to compare the earned value for the period with the actual costs and the planned budget to determine the cost and schedule variances and to analyze trends. The CAM reviews the integrity and consistency of the data. Upon completion of the review, the Project Controller makes any necessary updates/corrections and finalizes the data. This final data is used to determine which Control Accounts have exceeded the predefined variance thresholds. This determination prescribes which CAMs need to perform variance analysis as defined later in this document.

EVM data will be presented monthly via a package of management reports. These reports will include a four-panel Project Summary Report (Quad chart), a tailored Cost/Schedule Status Report (C/SSR), a summary Project Schedule, cost/schedule performance measures, and applicable Variance Analysis Reports. An example EVM performance graph is shown in Figure Z-1 of this Appendix.

One of the key components of a successful EVMS is a baseline that coincides with the reality of the project. Many projects change and evolve over the course of their lifecycle; the EVM Performance Measurement Baseline must reflect these changes. Any changes proposed for a project once it is under EVM control should be done using a Project Change Request (PCR), which must be approved by the Program Manager and appropriate Stakeholders.

The Program Manager must also approve the establishment of, and the use of management reserve through the use of the PCR. The reserve will be held for unanticipated in-scope requirements in the project. It will also require a PCR. A PCR template is provided in Figure Z-2.

Project performance is continuously monitored and analyzed against the Resource Loaded Project Plan. Upon completion of the earned value determinations, the Project Controller issues Variance Analysis Reports (VARs) to the CAMs. The CAMs complete the VARs for the control accounts that exceed the established variance thresholds. Explanations are required for the cause

of each variance, the impact of the variance on the budget, schedule, technical performance, and the Estimate at Completion (EAC).

EAC calculations are necessary to assess the final project cost and assist in the determination of the funding requirements for the project. The EAC process also provides a measurement of the project performance and provides management with visibility into project issues. The EAC consists of cumulative-to-date actual costs plus the estimated cost for the authorized but unaccomplished portion of the project. Each quarter, the project will perform a grassroots EAC. This is a bottom-up review and assessment of costs for all remaining tasks on the project.

1.2 Cost/Schedule Controls Systems (C/SCS) Report

A decision to apply a less vigorous C/SCS report would apply to programs that fall beneath the EVM thresholds as noted above. This process is an easier, less expensive, and less exact method of providing program status.

All projects require a baseline funding and spend plan, with tracking and bi-weekly reporting of associated expenditures to the Echelon II level. Control accounts are created by the Project Controller in the financial system where project cost collection will occur. A spend plan is established by the Integration Program Office based upon authorized funding with projected funding through the life of the project.

Project status, collected on a bi-weekly basis, will be monitored against the established budgets. The inputs are entered into a consolidated spend plan tool which provides a top level status of actual cost and schedule data as compared to authorized and projected funding, spend plan forecast, an Estimate to Completion (ETC), and a resulting EAC. This tool is used to compare the actual costs and the planned budget to determine cost variances and to analyze trends.
Project cost data will be presented monthly via a package of management reports. These reports will include a four-panel Project Summary Report (Quad chart), and a tailored C/SCS report graph. An example C/SCS performance graph is shown in Figure Z-3.

EAC calculations are necessary to assess the projected final project cost and assist in the determination of the funding requirements for the project. The EAC process also provides a measurement of the project performance and provides management with visibility into project issues. The EAC consists of cumulative-to-date actual costs plus the estimated cost for the authorized but unaccomplished portion of the project. Each quarter, the project will perform a grassroots EAC. This is a bottom-up review and assessment of costs for all remaining tasks on the project

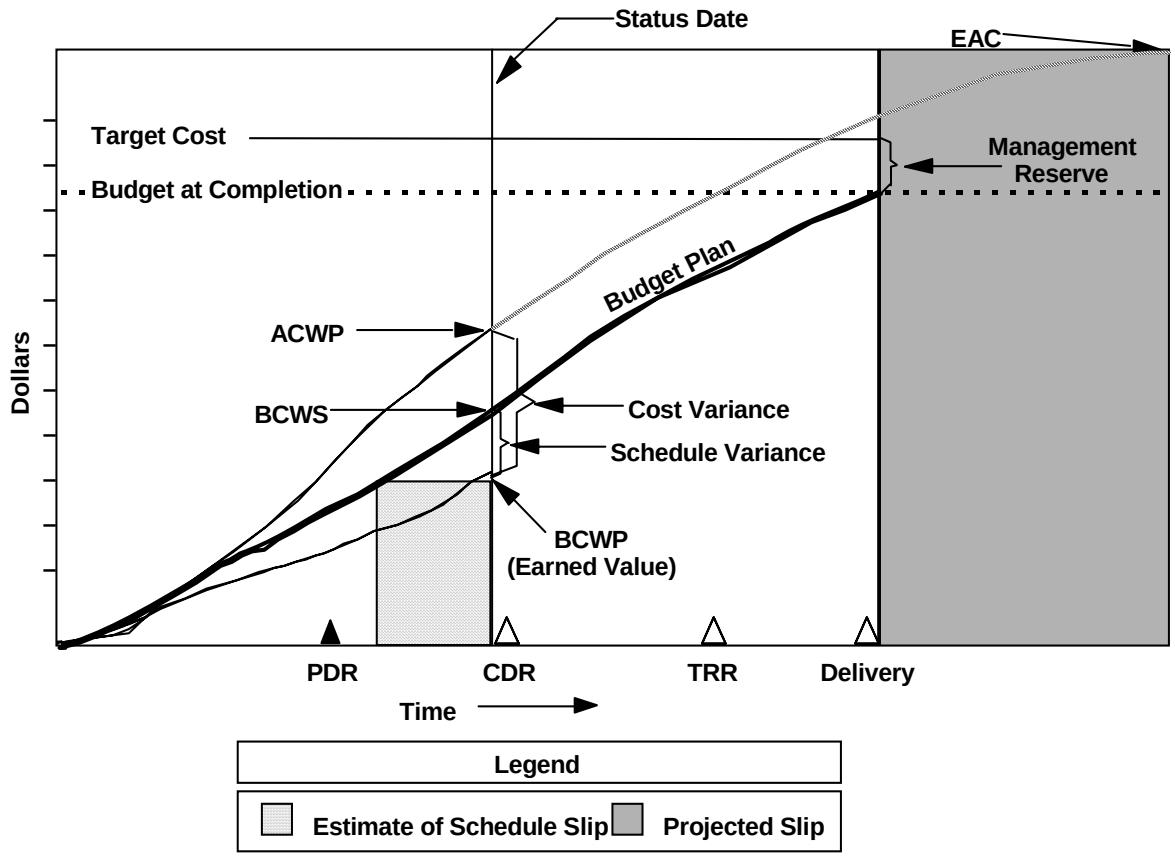

Figure Z-1. Typical Earned Value Management Performance Graph

PROJECT CHANGE REQUEST
TEMPLATE

PCR NO: _____

Date submitted: _____

1. **Task Description:**

2. **Task Justification:**

   a. Why is the task required?
   b. What is the impact if the task is not accomplished?

3. **Task Impacts:**

   a. What major project WBS elements are affected? (i.e., Prime Mission Product, Program Management, Systems Engineering, Platform Management, etc.)
   b. Detailed Cost/Schedule and Task Breakdown (POA&M)
   c. Specific Areas of Risk Affected (increased and decreased risk)
      - Technical
      - Cost
      - Schedule
      - Impact on Other Groups
   d. Risk Mitigation Requirements

4. **Implementation Recommendation:**

   a. Integrate into Master POA&M? Yes or No _____
   b. Budget to "Executing Agent" by date: _____
   c. Projected Start date: _____
   d. Support Agencies/Organizations and Tasks

Submitted by: _____ **Date:** _____
SSC Project Manager

Forwarded: _____ **Date:** _____
Integration Assistant Program Manager

Approved/
Disapproved: _____ **Date:** _____
Integration Program Manager

Figure Z-2. Project Change Request

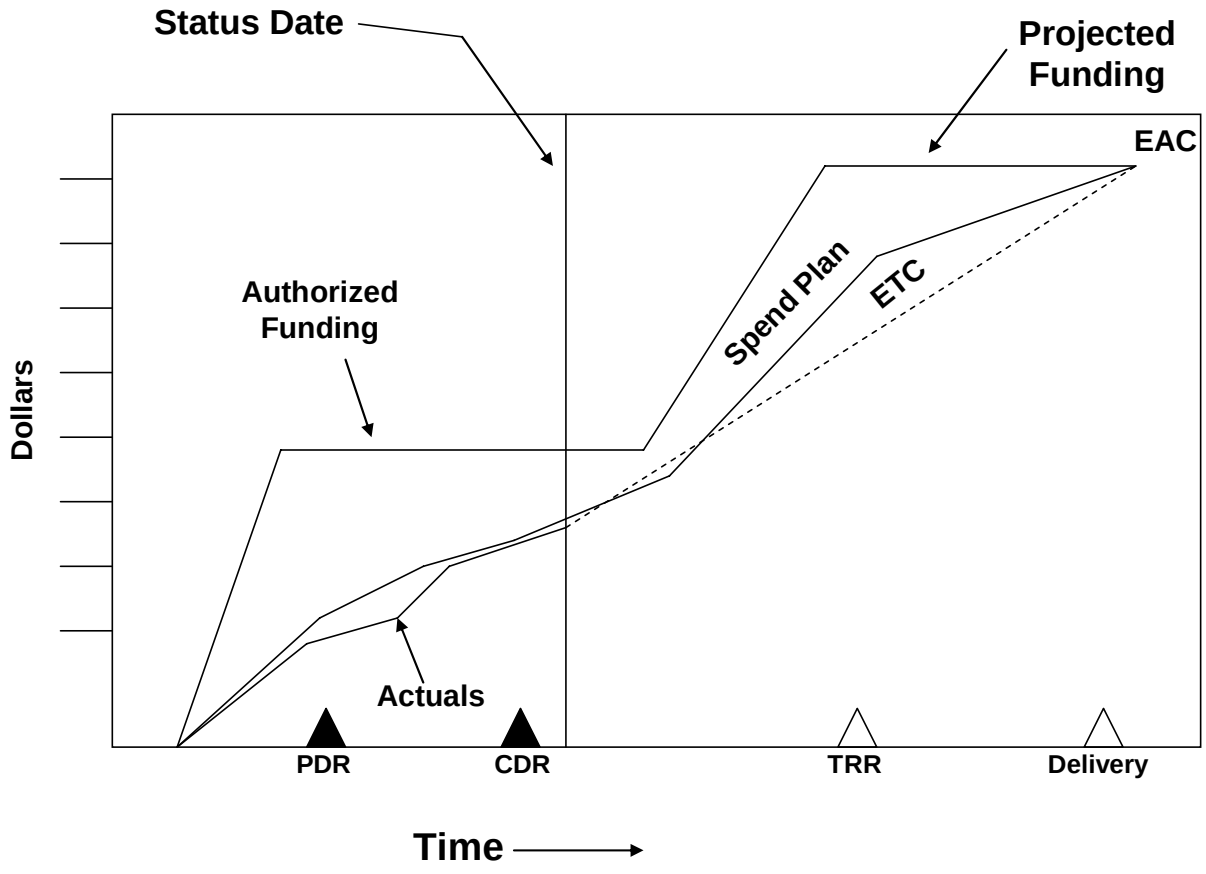

Figure Z-3. Typical Cost/Schedule Controls System Performance Graph

APPENDIX AA - ACRONYMS AND ABBREVIATIONS

4WCDP	4 Wire Conditioned Di-Phase
5D	Demand Driver Direct Digital Dissemination
A&F	Arming & Fusing
A&G	Aiming & Guidance
A&T	Acquisition Tracking & Control System
A/D	Analog/Digital
A/G	Air/Ground
A3P	Advanced Avionic Architecture & Policy
AA	Active Adjunct [sonar]
AAA	Anti-Aircraft Anti-Armor Weapon
	Automatic Anti-Aircraft
AAAD	All Arms Air Defense [UK]
AAAI	American Association for Artificial Intelligence
AAAV	Advanced Amphibious Assault Vehicle
AAC	Acquisition Advice Code
	Automatic Access Control
	Automatic Amplitude Control
AACA	Airborne Anti-Submarine Warfare (ASW) Coordination Aircraft
AACS	Airborne Astrographic Camera System
AACT	All Arms Classroom Trainer
AAD	Advanced Acoustic Decoy
AADPSP	Activity Automatic Data Processing Security Plan
AAFS	Advanced Aerial Fire Support System
AAGMS	Anti-Aircraft Missile System
AAH	Advanced Attack Helicopter
AAI	Administer Authority Identifier
AAIS	Advanced Automated Information Systems
ALL	Asynchronous Transfer Mode (ATM) Adapter Layer
AANT	Amphibious Assault Networking Technology
AAO	Authorized Acquisition Objective
AAP	Abbreviated Acquisition Program
	Advanced Acquisition Plan
AAS	Advanced Array Sensor
AASLBM	Airborne Anti-Submarine Launched Ballistic Missile
AASW	Air Anti-Submarine Warfare
AATC	Airborne Anti-Submarine Warfare Tactical Coordinator
AATC/DAIR	Amphibious Air Traffic Control/Direct Altitude and Identity Readout
AAV	Amphibious Assault Vehicle
AAWIM	Anti-Air Warfare Intentions Message
AAWS	Automatic Attack Warning Systems
AB	Agile Beam
	Adaptive Beam Former
ABF	Automatic Beam Forming
ABI	Automatic Bearing Instrumentation
ABIT	Airborne Industry Transmission
ABKS	Alternate Broadcast Keying Station
ABL	Allocated Baseline
ABM	Agile Beam Management
ABR	Airborne Relay
ABSURD	Airborne/Shipboard Universal Recovery Device
ABT	Automatic Bus Transfer
ABU	Alarm Buffer Unit
AC	Access Control
	Acknowledgement Code
	Active Component
	Alternating Current

	Analyst Console
	Application Context
	Automatic Control
ACAL	Acoustic Calibrate
ACAM	Accelerated Cap Advisory Message
ACAP	Air Command Acoustic Processing
ACAT	Acquisition Category
ACC	Access Control Center
	Acoustic
	Acoustic Contact Correlation
	Advanced Communication Center
	Air Combat Command
	Airspace Control Center
	Amphibious Control Center
	Area Control Center
	Area Coordination Center
	Army Communications Center
	Attack Control Console
ACCAT	Advanced Command Control Architecture Testbed
ACCC	Afloat Contingency Command Center
ACCEL	Acceleration
ACCESS	Afloat Consumption, Cost and Effectiveness Surveillance System
ACCIS	Alpha Command & Control Information System
	Automated Command & Control Information System
ACCM	Asynchronous Communication Channel Multiplexer
ACCMPS	Automated Command and Control Message Processing System
ACCS	Air Command and Control System
	Army Command and Control System
	Automated Communications Control System
ACCTS	Applications of Commercial Communication Technology Systems
ACD	Allocated Configuration Documentation
	Auxiliary Console Display
ACDM	Association for Configuration and Data Management
ACDS	Advanced Combat Direction System
	Air Combat Display System
	Automated Document Conversion System
ACE	Air Combat Element
	Analysis and Control Element
	Automated Communications Emulator
ACES	Accuracy Evaluation System
	Army Command & Control System
	Automatic Channel Evaluation Scan
ACETEF	Air Combat Environment Test & Evaluation Facility
ACF	Advanced Communications Function
	Alternate Command Facility
	Automatic Contact Follower
ACFDL	Anti-Submarine Warfare (ASW) Command & Fusion Development Laboratory
ACFT	Aircraft
ACTD	Advanced Concept Technology Demonstration
ACG	Acquisition Coordinating Group
ACI	Adjacent Channel Interference
	Allocated Configuration Identification
ACIC	Adaptive Co-site interference Cancellation
ACID	Active Change Initiating Document
ACINT	Acoustic Intelligence
ACIU	Automatic Digital Network (AUTODIN) Conference Interface Unit
ACIXS	Allied Command Information Exchange System
ACK	Acknowledge/Acknowledgement

ACL	Access Control List
	Allowance Components List
ACLICS	Airborne Communications Location Identification and Collection System
ACM	Asynchronous Channel Multiplexer
ACMC	Assistant Commandant of the Marine Corps
ACMS	Advanced Configuration Management System
	Advanced Communications Management System
	Automated Career Management System
	Automated Communications Management System
ACN	Advance Change Notice
ACNO	Assistant Chief of Naval Operations
ACO	Administrative Contracting Officer
	Alarm Cut Off
ACOC	Area Communications Operations Center
ACOE	Army Common Operating Environment
	Army Corps of Engineers
ACPT	Automated Corporate Planning Tool
ACQ	Acquisition
ACQN	Acquisition
ACS	Access Control System
	Active Control Station
	Advanced Communications Systems, Inc.
	Advanced Communications School
	Afloat Correlation System
	Air Control Supervisor
	Alternate Control Station
	Attitude Control Subsystem
ACSA	Allied Communications Security Agency
ACSC	AEGIS Combat Systems Center
ACSE	Access Control Service Element
	Association Control Service Element
	Association Control Service Entity
ACSN	Advance Change/Study Notice
ACT	Activate
	Advanced Concepts and Technology
	Architecture Characterization Template
ACTD	Advanced Concept Technology Demonstration
ACTION ’88	Attack Cost Through Improvements in Our Navy/Marine Corps
ACTN	Action
ACTRL	Acoustic Trail
ACTS	Advanced Communications Technology Satellite
	Automated Communications Test System
ACTY	Activity
ACU	Antenna Control Unit
ACUS	Area Common-User System
ACWP	Actual Cost of Work Performed
AD	Action Designator
AD/CAC	Automated Detection/Computer-Aided Classification
ADABAS	Adaptable Data Base System
ADACS	Attitude Determination and Control Subsystem
ADAPT	Analog Digital Automatic and Program Tester
	Architecture Design, Analysis, and Planning Tool
ADBKMP	Adaptation Data Beam Key Map Parameter
ADC	Acoustic Display Console
	Air Data Computer
	Analog-to-Digital Converter
ADCCP	Advanced Data Communication Control Procedure

ADCON	Advise All Concerned
ADD	Authorized Development Deviation
	Automatic Document Distribution
ADDAS	Automatic Digital Data Assembly System
ADDISS	Advanced Deployable Digital Imagery System
ADDS	Applied Digital Data Systems
ADDS-DP	Automated Data System – Development Plan
ADDSI	Applied Digital Data Systems Interface
ADEPT	Administrative Data Entry for Processing Transmission
ADF	Access Control Decision Function
ADI	Analog/Digital Interface
ADLIPS	Automatic Data Link Plotting System
ADM	Acquisition Decision Memorandum
	Advanced Development Model
ADMS	Advanced Digital Multiplex Systems
ADNS	Advanced Digital Network System
ADO	Advanced Development Objective
	Automatic Development Objective
ADP	Advanced Development Phase
	Automated Data Processing
ADP/T	Automated Data Processing (ADP)/Telecommunications
	Automatic Data Processing/Telecommunications
ADPC	Automated Data Processing Center
ADPCM	Adaptive Differential Pulse Code Modulation
ADPE	Automated Data Processing Equipment
ADPLO	Automated Data Processing Liaison Office
ADPS	Automated Data Processing System
ADPSO	Automated Data Processing Selection Office
ADPSWG	Automated Data Processing Standardization Working Group
ADPWG	Automated Data Processing Working Group
ADR	Acoustic Data Relay
ADRES	Advanced Reconnaissance Sensor
ADRSS	Automated Data Report Submission System
ADS	AEGIS Display System
	Antenna Distribution System
	Advanced Data System
	Automatic Defense System
	Automatic Digital Switch
ADTS	Automated Data Telecommunications System
ADU	Alphanumeric Display Unit
ADVCAP	Advanced Capability
AE	Acquisition Engineer
AEB	Active Electronic Buoy
AECCM	Active Electronic Countermeasures
AECN	Automated Electronic Courier Network
AED	Active Electronic Decoy
AEELS	Automatic Electronic Intelligence Emitter Location System
AEF	Access Control Enforcement Function
	Active Emitter File
AEGIS	Airborne Electronic Grid and Information System
AEI	Azimuth Error Indicator
AEM	Automatic Experiment Monitoring
AEM/S	Advanced Enclosed Mast/Sensor System
AEP	Applications Environment Profile
AEPCO	Advanced Engineering and Planning Corp.
AEPDS	Automated Emergency Proc Dissemination System
AEPS	Automated Environment Prediction System
AERP	Advanced Equipment Repair Program
AES	Advanced Electronics School

AFAO	Approved Force Acquisition Objectives
AFC	Advanced Force Commander
	Automatic Frequency Control
AFCCS	Anti-Submarine Warfare Force Command and Control System
AFLOATRAGRU	Afloat Training Group
AFNET	Air Force Integrated Data Telecommunications Network
	Air Force Network
AFP	Approval for Full Production
AFS	Active Fleet (Surface) Ships
AFSATCOM	Air Force Satellite Communications
AFSCF	Air Force Satellite Control Facility
AFSCN	Air Force Satellite Control Network
AFSTRS	Armed Forces Satellite Transmitted Radio Service
AFT	Automatic File Transfer
AFTCO	Air Force Telecommunications Certification Office
AFTEC	Air Force Test and Evaluation Center
AG	Antenna Group
AGC	Attack Group Commander
	Automatic Gain Control
AGCCS	Army Global Command and Control System
AGIPA	Adaptive Ground-Implemented Phase Array
AGMS	Automated Gateway Message System
AGW	Application Gateway
AHIP	Advanced Research Project Agency Network (ARPANET) Host Interface Protocol
AI	Artificial Intelligence
AIC	Application Identification Channel
AICS	Advanced Interior Communication System
AIDES	Analysts' Intelligence Display and Exploration System
AIF	Automated Installation File
AIG	Address Indicator Group
	Amplifier Interface Group
AIHS	Automated Information Handling System
AIIF	Automated Installation Intelligence File
AIL	Automated Integrated Language
AILSIN	Automated Integrated Language System Identification Number
AIM	Advanced Industrial Management
	Area Installation Manager
AIN	Advanced Intelligence Network
AINAC	Application/Identification Number Activity Code
AIP	Acquisition Improvement Plan
	Automatic Input Processing
AIPC	Automated Information Processing Center
AIR	Alternation Installation Requirements
AIR D/T	Acoustic Intercept Receiver Detect/Track
AIRES	Advanced Imagery Requirements and Exploitation System
AIRES 2	Advanced Imagery Requirements and Exploitation System 2
AIS	Acoustic Intercept System
	Alarm Indication Signal
	Automated Information Security
	Automated Information System
AISSO	Automated Information Systems Security Officer
AIT	Alteration Installation Team
	Automatic Identification Technology
AIU	Alarm Interface Unit
AJ	Anti-Jam
AJ UHF	Anti-Jam Ultra High Frequency
AJCC	Alternate Joint Communications Center
AJPO	Ada Joint Program Office

AKD	Automatic Key Distribution
AKDC	Automatic Key Distribution Center
ALCOM	All Commands
ALCON	All Concerned
ALDPS	Automated Logistics Data Processing System
ALDSSCS	All-Defense Special Security Communications System
ALE	Automatic Link Establishment
ALECS	Air Force Weapons Lab [Los Alamos, NM] Electronic Pulse Calibration Simulator
ALFA	Assessment of Long-Range Fleet Architecture
ALGOL	Algorithmic
ALI	Address List Indicator
ALICE	Adaptive Line Canceller and Enhancer
ALP	Approval for Limited/Low Rate Production
ALS/N	Ada Language System/Navy
ALSP	Aggregate Level Simulation Protocol
ALTROUTE	Alternate Route
ALTSFL	Alternate Spelling File
ALU	Arithmetic-Logic Unit
AM	Acquisition Manager
	Address Multiplier
	Alternating Magnetic
	Amplitude Modulation
AMARD	Abbreviated Mission Analysis and Requirements Documents
AMASS	Advanced Marine Airborne Signal Intelligence System
AMCC	Ashore Mobile Contingency Communications
AMES	Automated Message Entry System
AMF	Abbreviated Message Format
AMH	Allied Message Handling
	Application Message Handling
	Automated Message Handling
AMH ISME	Allied Message Handling International Subject Matter Experts
AMHS	Automated Message Handling System
AMI	Alternate Mark Inversion
AMIE	Automatic Digital Network Management Index
AMIS	Acquisition Management Information System
	Advanced Management Information System
AMLAS	Automated Message Loading and Analysis System
AMME	Automated Multimedia Exchange
AMP	Automated Message Processing
AMPE	Automated message Processing Equipment
	Automatic Message Processing Exchange
AMPS	Afloat Message Processing Subsystem
	Anti-Submarine Warfare Operations Center (ASWOC) Message Processing System
	Automated Message Processing System
AMSC	American Mobile Satellite Corporation
AMSS	Aeronautical Mobile Satellite Services
AMWG	Architecture Methodology Working Group
AN	Alternating Network
	Army/Navy
AN/TCC-39	Analog/Digital Telephone Switching Center for Joint Service Use
ANAF	Automatic Secure Voice Communications Network
ANAL	Analysis
ANC	Adaptive Noise Cancellation
	Alternate Network Controller
	Ashore Navigation Center
ANCC	Automated Network Control Center
ANCC/ATC	Automated Network Control Center/Automated Technical Control

ANDVT	Advanced Narrowband Digital Voice Terminal
ANGCEL	Angle Cell
ANMCC	Alternate National Military Command Center
ANMCC SD	Alternate National Military Command Center Software Directorate
ANNLY	Annually
ANORS	Anticipated not Operationally Ready Supply
ANS	Answer
	Applications Network Software
ANSI	American National Standards Institute
ANT	Antenna
ANTACCS	Advanced Navy Tactical Command and Control System
ANV	Advanced Naval Vehicle
AO	Action Officer
	Area of Operation
Ao	Amphibious Operations
	Operational Availability
AO&M	Administration, Operation, & Maintenance
AOD	As of Date
AOI	Area of Interest
AOO	Air Operations Officer
AOR	Allowance Override
	Area of Operational Responsibility
	Area of Responsibility
AOS	Advanced Operating System
AOSS	Advanced Research Project Agency (ARAP) Optical System Study
AOU	Approved for Operational Use
AP	Acquisition Plan
	Action Plan
	Advanced Procurement
	Application Processor
APA	Adaptive Phased Array
APADE	Automation of Procurement and Accounting Data Entry System
APAS	Advanced Passive Sensors
APATS	Automated Patch and Test System
APB	Acquisition Plan Baseline
APBA	Acquisition Plan Baseline Agreement
	Allocated Program Baseline Agreement
APBI	Advanced Planning Briefings for Industry
APC	Acquisition Planning Conference
	Adaptive Predictive Coding
	Assistant Project Coordinator
	Average Percent Complete
APCS	Anti-Submarine Warfare Operations Center (ASWOC) Power Control System
	Attached Processor Control Software
APD	Advanced Planning Document
	Avalanche Photo Diode
APDM	Amended Program Decision Memorandum
APDSMS	Advanced Point Defense Surface Missile System
APDU	Appreciation Protocol Data Unit
APF	Advice Project Funds
APG	Antenna Pedestal Group
API	Application Programming Interface
APL	A Programming Language
	Allowance Parts List
	Applied Physic Laboratory
APL/JHU	Applied Physics Laboratory/Johns Hopkins University
APLS	Automatic Landing and Positioning System
APM	Acquisition Project Manager

	Array Position Message
	Assistant Program Manager
	Assistant Project Manager
APME	Assistant Project Manager, Engineering
APML	Assistant Program Manager, Logistics
APMS	Automated Program Management Information System
APO	Acquisition Project Officer
	Annual Program Objectives
APP	Advanced Procurement Plan
	Appendix
	Application Portability Profile
APP'D	Applied
APPC	Advanced Program-to-Program Coordination
APPL	Approval
APPN	Advanced Pier-to-Pier Networking
	Appropriation
APPP	Acoustic Performance Prediction Program
APPS	Analytical Photogrammetric Processing System
APPV	Approval
APR	Agency Procurement Request
APRB	Acquisition Program Review Board
APS	Acquisition Planning System
	Acquisition Program Sponsor
	Afloat Planning System
	Asynchronous Protocol Specification
APTS	Acquisition Planning and Tracking System
	Automated Package Test System
APU	Auxiliary Power Unit
APWG	Acquisition Policy Working Group
AQL	Acceptable Quality Level
AR	Acquisition Request
	Automation Resources
ARA	Accelerated Readiness Analysis
	Attitude Reference Assembly
ARB	Acquisition Review Board
ARC	Acquisition Review Council
ARD	Automatic Release Date
ARF	Application Replacement Factor
ARG	Amphibious Readiness Group
	Annual Real Growth
ARGUS	Analytical Reports Gathering and Updating System
ARIA	Advanced Range Instrumentation Aircraft
ARIDPM	Adaptive Recursive Interpolated Differential Pulse Code Modulation
ARISTOTELES	Applications and Research Involving Space Technologies Observing Earths Fields from a Low Earth Orbiting Satellite
ARM	Analog Record Module
	Asynchronous Response Module
ARMMS	Automated Reliability and Maintainability Measurement System
ARMS	Automated Data Processing (ADP) Resources Management System
	Automation Resources Management System
ARP	Acquisition Review Panel
	Address Resolution Protocol
	Analytical Rework Program
ARPA	Advanced Research Project Agency
ARPANET	Advanced Research Project Agency Network
ARPCA	Automatic Voice Network Remotely Programmable Conference
ARQ	Automatic Repeat Query

	Automatic Repeat Request
ARR	Allocated Requirements Review
ARS	Advanced Records System
	Automated Relay System
	Automatic Reporting System
ARV	Acquisition Review Board
AS	Anti-Scintillation
	Application System
AS COMM	Anti-Submarine Communications
ASAP	As Soon As Possible
ASC	Advanced Systems Combat
	American Standards Committee
	Automatic Switching Center
ASCII	American Standard Code for Information Interchange
ASCK	Advanced Sonobouy Command Link
ASCOMM	Anti-Ship Warfare Communication System
ASCV	Automatic Secure Voice Communications
ASD	Assistant Secretary of Defense (SECDEF)
ASDAG	All Source Data Authentication Group
ASDP	Abbreviated System Decision Paper
ASDS	Advanced Synchronous Channel Multiplexer (SCM) Delivery System
ASE	Advanced Sensor Exploration
ASG	Anti-Submarine Warfare (ASW) Support Group
ASGD	Assigned
ASGMT	Assignment
ASI	Acquisition Streamlining Initiative
ASIC	Application-Specific Integrated Circuit
ASIP	All-Source Imagery Processing System (Marine Corps)
ASIS	Amphibious Support Information System
	Auxiliary Ships' Information System
ASIT	Adaptable Surface Interface Terminal
ASKARS	Automated Storage, Kitting, and Retrieval System
ASL	Assembly Language
ASM	Audio Switching Matrix
ASME	American Society of Mechanical Engineers
ASN	Assistant Secretary of the Navy
ASN (RD&A)	Assistant Secretary of the Navy (Research, Development & Acquisition)
ASP	Advanced Signal Processor
	Array Signal Processor
ASPAS	Acoustic Sensor Pattern Assessment System
ASPECTS	Automated Spectrum Plan Engineering Coordination Tracking System
ASPG	Automated Data Processing (ADP) Standards Policy Group
ASPism	Adaptive Signal Processing Simulation Test bed
ASPO	Acquisition Sponsor Project Officer
	Automated Systems Project Office
ASPPO	Armed Services Production Planning Offices
ASR	Acquisition Strategy Report
	Automatic Send/Receive
ASREQ	As Required
ASSERT	Administrative Data Entry for Processing Transmission (ADEPT) Subsystem for Scanning of Electronic Received Traffic
ASSIST	Acquisition Streamlining and Standardization Information System
	Automated Data Processing Equipment (ADPE) System Sizing and Simulation Tool
	Automated Special Security Information System Terminal
ASSMT	Assessment

ASSO	Assistant System Security Officer
ASSOC	Associated
ASSUR	Assurance
ASSY	Assembly
AST	Advanced Software Technology
ASTAB	Automated Status Board
ASTAC	Anti-Submarine Warfare Tactical Support Center
ASTM	American Society for Testing and Materials
ASTP	Advanced Space Technology Program
ASU	Antenna Switching Unit
ASV	Anti-Submarine Warfare Centers Command and Control System (ASWCCCS) Secure Voice
ASWCCCS	Anti-Submarine Warfare Centers Command and Control System
ASWCCS	Anti-Submarine Warfare Command and Control System
ASWCOM	Anti-Submarine Warfare Communications
ASWCS	Anti-Submarine Warfare Control System
ASWCSI	Anti-Submarine Warfare Combat System Integration
ASWG	Acquisition Strategy Working Group
ASWIXS	Anti-Submarine Warfare Information Exchange System
ASWM	Anti-Submarine Warfare Module
ASWOC	Anti-Submarine Warfare Operations Center
ASWS	Advanced Surveillance Work Station
ASWTNS	Anti-Submarine Warfare (ASW) Tactical Navigation System
ASYNC	Asynchronous
AT	Acceptance Trail
	Acquisition Team
AT&T	American Telephone & Telegraph
ATA	Advanced Tactical Aircraft
	Advanced Test Accelerator
	Army Technical Architecture
ATACS	Acquisition Tracking and Control System
ATAS	Advanced Target Acquisition Sensor
ATB	All Trunks Busy
ATC	Adaptive Transform Coding
	AEGIS Training Center
ATD	Advanced Technology Demonstration
	Advanced Technology Development
	Automatic Target Detection
ATDLS	Advanced Tactical Data Link System
ATDM	Asynchronous Time-Division Multiplexing
ATDMA	Advanced Time Division Multiple Access
ATDnet	Advanced Technology Demonstration Network
ATE	Automated Test Equipment
ATEC	Automated Technical Control [DCS]
ATET	Automatic Secure Voice Communications Network (AUTOSEVOCOM) Technical Evaluation Team
ATF	Amphibious Task Force
ATG	Afloat Training Group
AT1	Aviation Electronics Technician First Class
ATIDS	Automated Tactical Information Display System
ATIR	Annual Training Input System
ATIS	Automated Tactical Information System
	Automated Technical Information System
ATK	Attack
ATLAS	Abbreviated Test Language for All Systems
ATM	Abstract Test Method
	Adobe Type Manager
	Asynchronous Transfer Mode
ATMH	Automated Text Message Handling

ATMHS	Automated Text Message Handling System
ATO	Analyst Terminal Operator
	Authority to Operate
ATP	Acceptance Test Procedure
	Advanced Technology Program
	Advanced Tracking Prototype
	Automated Telecommunications Program
ATPRS	Acceptance Test Procedures Replacement System
ATR	Analog Tape Recorder
	Anti-Transmit Receive
	Austin Trumble Radio
ATS	Abstract Test Suite
	Advanced Tactical Support
	Approved Tracking System
	Automated Test System
ATSGAP	Automated Test Scenario Generation and Analysis Program
ATSS	Advanced Tactical Support System
ATT	Advanced Testing Technology
	Attached
ATTN	Attention
ATWCS	Advanced Tomahawk Weapon Control System
AU	Access Unit
	Analyzer Unit
AUS	Anti-Submarine Warfare Operations Center (ASWOC) Upgrade System
AUSTACCS	Australian Tactical Command and Control System
AUTEC	Atlantic Undersea Test and Evaluation Center
AUTH	Authorized/Authority
AUTHRA	Authority Granted
AUTO	Automatic
Auto-DAMA	Automatic Demand Assigned Multiple Access
AUTODIN	Automatic Digital Network
AUTOSEVOCOM	Automatic Secure Voice Communications Network
AUTOSEVOCOM II	Automatic Secure Voice Communications Network, Phase II
AUWS	Advanced Underwater Weapons System
AVAIL	Available/Availability
AVD	Alternate Voice Data
AVG	Average
AVP	Attached Virtual Processor
AVR	Advanced Very Low Frequency (VLF) Receiver
AVSS	Automated Voice Switching System
AWC	Assisting Work Center
AWE	Advanced Warfighting Equipment
AWG	Architecture Working Group
AWN	Automated Weather Network
AXCS	Advanced X.25 Communications Services
AZ	Azimuth
AZ/EL	Azimuth/Elevation
B-ISDN	Broadband Integrated Services Digital Network
B/L DIR	Base/Level Directory
B/S	Bits/Second
B1	Band 1
B2	Band 2
BA	Baseline Assessment
	Budget Activity
	Budget Authority
BAA	Broad Agency Announcement
BACN	Battlegroup Communications Network
BADD	Battlefield Awareness and Data Dissemination

BADGE	Base Air Defense Ground Equipment
BAFO	Best and Final Offer
BAM	Baseline Assessment Memorandum
BAN	Base Area Network
BAS	Battle Automation Systems
	Battlefield Automated System
	Black Analog Switch
BASIC	Beginner's All-Purpose Symbolic Instruction Code
BAWG	Baseline Assessment Working Group
BB	Broadband
BBS	Baseband Switch
	Bulletin Board System
BBSA	Baseband Signal Analyzer
BC	Battle Command
BCA	Broadcast Control Authority
	Buoyant Cable Antenna
BCBL	Battle Command Battle Lab
BCC	Base Communications-Computer Center
BCD	Binary-Coded Decimal
BCDSS	Battle Commander Decision Support System
BCE	Baseline Cost Estimate
BCIXS	Battle Cube Information Exchange System
BCM	Baseline Correlation Matrix
BCO	Base Communications Office
BCR	Baseline Change Request
BCS	Backbone Circuit Switch
	Block Check Sequence
	Broadcast Control Station
BCSN	Broadcast Channel Sequence Number
BCST	Broadcast
BCT	Basic Consolidated Telecommunications
BCU	Basic Control Unit
BCWP	Budgeted Cost of Work Performed
BCWS	Budgeted Cost of Work Scheduled
BD	Baud
BD1	Band 1
BD2	Band 2
BDCST	Broadcast
BDD	Before Due Date
BDE	Basic Design Engineering
BEC	Buffer and Executive Control
	Burst Error Coder
BELT	Basic Elint Tracker
BER	Basic Encoding Rules
	Bit Error Ratio
	Budget Execution Review
BERT	Bit Error Rate Tester
BESEP	Base Electronic System Engineering Plan
BETA	Battlefield Exploitation and Target Acquisition
BF	Battle Force
BF/BG	Battle Force/Battle Group
BFACS	Battlefield Functional Area Control Station
BFAM	Budget Formulation and Appropriation Method
BFC2	Battle Force Command and Control
BFE	Blacker Front End
BFIM	Battle Force Information Management
BFIMS	Battle Force Information Management System
BFL	Beam Forming Lens
BFN	Beam-Forming Network

BFO	Beat Frequency Oscillator
BFRL	Basic Facility Requirements List
BFSE	Battle Force Systems Engineering
BFTE	Battle Force Test and Evaluation
BFTT	Battle Force Tactical Training
BFTTS	Battle Force Tactical Training System
BFWC	Battle Force Weapon Coordination
BFY	Budget Fiscal Year
BG	Battle Group
BGAAWC	Battle Group Anti-Air Warfare Coordination
BGC	Battle Group Commander
BGDBM	Battle Group Database Management
BGIGS	Battle Group Interactive Gaming System
BGIXS	Battle Group Information Exchange Subsystem
BGO	Battle Group Orestes Circuit
BGP	Border Gateway Protocol
BGP-4	Border Gateway Protocol Version-4
BGPHES	Battle Group Passive Horizon Extension System
BGPHES-ST	Battle Group Passive Horizon Extension System –Shipboard Terminal
BGPUK	Battle Group Pack-Up Kit
BGTDBM	Battle Group Track Database Management
BH	Buffer Header
BHC	Burst Height Compensator
BIB	Bridge Interconnect Bus
BIC	Bus Interface Card
BICES	Battle Force Information Collection and Exploitation System
BICSI	Building Industry Consulting Service International
BIND	Berkeley Internet Domain
BIOS	Basic Input/Output System
BIPP	Briefing/Issues/Projects/Program
BIS	Board of Inspection and Survey
BISDN	Broadband Integrated Services Digital Network
BIT	Binary Digit
	Built-In Test
BITE	Built-In Test Equipment
BIU	Burst Interface Unit
BKS	Broadcast Keying Station
BL	Baseline
BLER	Block Error Rate
BLII	Base Level Information Infrastructure
BLK	Block
BLOS	Beyond Line-of-Sight
BLS	B-Level Secure
BLT	Basic Liability Termination
“BLUE $”	Navy Appropriations (Chief of Naval Operations (CNO) Sponsored)
BM/C3	Battle Management/Command, Control, and Communications
BMC	Broadcast Management Center
BMR	Baseline Module Requirements
BMT	Beam Management Terminal
BMTA	Backbone Message Transfer Agent
	Border Message Transfer Agent
BOA	Basic Ordering Agreement
	Broad Ocean Area
BOD	Beneficial Occupancy Date
BOF	Back Out Factor
BOH	Baseline Overhaul
BOM	Bit-Oriented Messages

	Bill of Materials
BONES	Block Oriented Network Simulator
BOOTP	Bootstrap Protocol
BOS	Basic Operating System
BP	Block Parity
BP/E	Budget Plan/Estimate
BPA	Blanket Purchase Agreement
BPAD	Bisynchronous Packet Assembler Disassembler
bpi	Bits Per Inch
BPI	Bytes Per Inch
BPN	Budget Project Number
BPO	Blanket Purchase Order
BPPG	Bureau Procurement Planning Guide
BPR	Business Process Reengineering
BPS	Backbone Packet Switch
bps	bits per second
	bytes per second
BPSK	Binary Phase Shift Keying
BPU	Buffer Processor Unit
BPV	BiPolar Violation
BRAC	Base Realignment and Closure
BRB	Budget Review Board
BRDCST	Broadcast
BRDG	Bridge
BRI	Basic Rate Interface
BRS	Broadcast Radiating Station
BSA	Backbone Service Area
BSC	Binary Synchronous Communications
	Black System Controller
BSIMS	Battle Group Information Exchange Subsystem (BGIXS) Information Management Subsystem
BSL	Binary Segment Leader
	Broadcast Subscriber List
BSLN	Baseline
BSM	Basic Security Module
BSN	Broadcast Sequence Number
BSOT	Background System Operability Test
BSR	Broadcast Screen Request
BSS	Backscatter Sounding
	Broadcast Satellite Service
BT	Break Transmission
	Builder’s Trials
BTA	Best Technical Approach
BTAA	Baseline Task Area Assessment
BTAM	Basic Telecommunications Access Method
BTC	Basic Termination Code
BTF	Bench Test Facilities
BTI	Balanced Technology Initiative
BTL	Backplane Transceiver Logic
	Basic Termination Liability
BTR	Binary Tactical Report
	Bit Timing Recovery
BTS	Broadcast Transmitting Station
BTT	Bridge Transaction Translator
BTU	Basic Terminal Unit
	British Thermal Unit
BUEC	Backup Emergency Communication
BUFR	Buffer
BUPERS	Bureau of Naval Personnel

BURID	Bureau I.D.
BVR	Beyond Visual Range
BY	Budget Year
C	Centigrade
	Competitive
	Confidential
	Conventional
C&A	Certification and Accreditation
C&C	Control & Configuration
C&D	Command & Decision
	Cover & Deception
C&D/WCS	Command & Decision/Weapon Control System
C&DH	Command & Data Handling
C&DS	Command & Decision System [AEGIS]
C&F	Cables & Foundations
	Cost & Feasibility Study
C&I	Construction and Installation
C&P	Characteristics & Performance
C-CPFF	Competitive Cost Plus Fixed Fee
C-CS	Communications-Computer Systems
C-Day	Deployment Day
C-E	Communications-Electronics
C-FFP	Competitive-Firm Fixed Price
C-FP	Competitive Fixed Price
C-FPI	Competitive-Fixed Price Incentive
C-ONS	Connection-Oriented Network Services
C-SALTSO	Commercial-Streamlined Automated Logistics Transmission System
C-SPEC	Control Specification
C/A	Course and Acquisition
C/E	Components/Equipments
C/JTF	Combined/Joint Task Force
C/S	Central Site
C/SCS	Cost/Schedule Control System
C/SCSC	Cost/Schedule Control Systems Criteria
C/SSR	Cost/Schedule Status Report
C2	Command and Control
C2I	Command, Control and Intelligence
C2IS	Command and Control Information Systems
C2MP	Command and Control Master Plan
C2P	Command and Control Processor
C2RDB	Command and Control Requirements Database
C2S	Command and Control Systems
C2V	Command and Control Vehicles
C2W	Command and Control Warfare
C3	Command, Control and Communications
C3A	Command, Control, Communications and Automation
C3CM	Command, Control and Communications Countermeasures
C3I	Command, Control, Communications and Intelligence
C3I SITE	Command, Control, Communications and Intelligence Systems Integration Test and Evaluation
C3I/IS	C3I/Information Systems
C3IC	Command, Control, Communications, and Intelligence Center
C3S	Command, Control and Communications Systems
C3SMP	Command, Control, and Communications Systems Master Plans
C4	Command, Control, Communications and Computers
C4I	Command, Control, Communications, Computers and Intelligence
C4IFTW	Command, Control, Communications, Computers and Intelligence For The Warrior

C4IJI	Command, Control, Communications, Computers and Intelligence Joint Interoperability
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
C4S	Command, Control, Communications and Computer Systems
CA	Certification Authority
	Connection Approval
	Contract Award
	Contracts Analysis
	Course of Action
CAA	Controlled Access Area
CAAS	Contractor Advisory and Assistance Services
CAC	Central Alarm Cabinet
	Command and Control
	Computer-Aided Classification
	Crisis Action Center
CACEAS	Computer-Assisted Circuit Engineering and Allocating System
CACEX	Command and Control Exercise
CACO	Corporate Administrative Contracting Officer
CACTIS	Community Automated Counter-Terrorism Intelligence System
CAD	Collective Address Designator
	Computer-Aided Design
	Control and Display
CAD/C	Computer-Aided Detection/Classification
CAD/CAM	Computer-Aided Design/Computer-Aided Manufacturing
CADAM	Computer-Graphics Augmented Design and Manufacturing
CADPS	Call Data Processing System
CAD/DA	Computer Aided Design/Design Automation
CADM	Configuration Administration and Data Management
CADMAT	Computer-Aided Design, Manufacture and Test
CADPIP	Communications Automatic Data Processing Interface Program
CADRS	Concern and Deficiency Reporting System (Joint Staff)
CADS	Common Advanced Disk System
	Computer-Assisted Display System
CAE	Common Application Environment
	Component Acquisition Execution
CAFÉ	Commercial Automation Follow-On Effort
	Communication Automation Follow-On Effort
CAFMS	Computer-Aided Force Management System
CAG,N	Competition Advocate General of the Navy
CAGE	Commercial and Government Entity
CAI	Communications Action Identifier
	Computer-Aided Instruction
CAIG	Coast Analysis Improvement Group
CAIV	Cost as an Independent Variable
CAL	Computer-Aided Learning
CALS	Computer Area Local Station
	Computer-Aided Acquisition and Logistic Support
	Continuous Acquisition and Life Cycle Support
	Continuous Acquisition Logistic Support
CALSIP	Computer-Aided Acquisition and Logistic Support (CALS) Implementation Plan
CAM	Communications Access Method
	Computer-Aided Manufacturing
	Control Account Manager
CAMA	Central Automated Message Accounting
CAMAS	Computer Assisted Manpower Analysis System
CAMEAS	Centralized Automatic Message Entry and Address System
CAMHS	Compact Automated Message Handling System

CAMP	Cost of Alternative Military Programs
CAMS	Communications Area Master Station
CAN	Cancel or Discard Message Control Character
CANCO	Cannot Comply
CANTRAN	Cancel Transmission
CAO	Collateral Action Office
	Contract Administration Office
	Cost Analysis Organizations
CAP	Channel Access Protocol
	Communications Access Processor
	Communications-Electronics Accommodation Program
CAP EXP	Capability Expansion
CAPE	Capability and Proficiency Evaluation
CAPERTISM	Computer Assisted Program Evaluation Review Technique Simulation
CAPL	Controlled Assembly Parts List
CAPPS	Contract Appraisal System
CAPR	Capability Request
CAPRIS	Computerized Advanced Personnel Requirements Information System
CAPRS	Corrective Action Problem Report and Summary
CAPS	Cost and Planning Status
	Cost and Planning System
CAR	Configuration Audit Review
	Contract Action Request
	Corrective Action Report
CARD	Corrective Action, Repair and Diagnosis
	Cost Analyst Requirements Description
CARDS	Central Archive for Reusable Defense Software
CARE	Computer Assistance Resource Exchange
	Cost Accumulating, Reporting and Evaluation
CARGO	Consolidated Afloat Requisition Guide Overseas
CARP	Contingency Alternate Routing Plan
	Contract Award Review Panel
CARRS	Contract Administrative Records and Retrieval System
CART	Central Automated Replenishment Technique
	Condition of Assembly at Release and Transfer
	Control and Alert Reporting Terminal
CARTS	Common Antenna for Receiving and Transmitting System
CAS	Contract Administration Services
CASA	Cost Analysis Strategy Assessment
CASCAN	Casualty Canceled
CASCOR	Casualty Correction Report
CASE	Computer-Aided Software Engineering
CASES	Capabilities Assessment Expert System
CASR	Corrective Action Summary Report
CASREP	Casualty Report
CASS	Common ATCCS Support Software
	Communications Administrative Statistical Summary
	Consolidated Automatic Support Station
CAT	Category
	Communication Assistance Team
	Crisis Action Team
	Communications Support (CSS) Action Team
CAT II	Category Three Acceptance Testing
CATF	Commander, Amphibious Task Force
CATIS	Computer-Aided Tactical Imagery Support
	Computer-Assisted Tactical Information System
CATS	Centralized Automatic Test System

CAU	Crypto Ancillary Unit
	Channel Access Unit
CAV	Constant Angular Velocity
CAVI	Computer-Assisted Video Instruction
CBB	Contract Budget Baseline
CBC	Construction Battalion Center
CBD	Commerce Business Daily
CBE	Computer Based Education
CBESS	Computer Based Education Software System
CBF	Commander, Battle Force
CBI	Computer Based Instruction
CBIV	Computer Based Interactive Video
CBL	Computer Based Learning
	Conceptual Base Line
	Configuration Breakdown Lists
CBN	Current Data Block Sequence Number
CBO	Congressional Budget Office
CBR	Chemical, Biological, Radiological
CBS	Computer Based Support
CBT	Computer Based Training
	Communications Support Processor Backside Terminal
CBT-IV	Computer-Based Training-Interactive Video
CBTS	Computer-Based Training System
CC	Communications Center
	Communications Controller
	Configuration Control
	Connect Confirm
	Control Console
	Courtesy Copy
CCA	Circuit Card Assembly
	Communications Control Area
	Controlled Configuration Article
CCB	Central Control Board
	Change Control Board
	Configuration Control Board
CCBD	Configuration Control Board Directive
CCC	Commander-in-Chief (CINC) Command Complex
	Commander-in-Chief (CINC) Command Center
	Communications Center Computer
	Cost Category Code
	Crisis Coordination Center
CCCB	Component Change Control Board
CCCI	Commercial Communications Circuit Identifier
CCD	Charge Coupled Device
CC&D	Centralized Control & Display
CCDB	Common Cryptologic Database
CCDR	Contractor Cost Data Recording
CCE	Continuous Comprehensive Evaluation
CCF	Central Component Facility
	Communications Control Facility
	Component Characteristics File
CCFP	Communications Control Facility Processor
CCG	Configuration Control Group
CCGF	Crisis Coordination Group Facility
CCI	Controlled Cryptologic Item
CCIB	Command and Control Interoperability Board
	Configuration Control Interoperability Board
CCIP	Command Center Improvement Program
CCIR	Commander’s Critical Information Requirements

	Consultative Committee on International Radio
	Contract Cost Information Report
CCIS	Command and Control Information System
	Common Channel Interoffice Signaling
CCITT	Comite Consultatif International de Telegraphique et
	Consulting Committee on International Telephone and Telegraph [French]
CCLM	Computer Communications Line Monitor
CCM	Communications Controller, Multichannel
	Counter Countermeasures
CCMT	Combined Countermeasures Tow
CCN	Commercial Circuit Number
CCO	Circuit Control Office
	Component Certification Officer
	Contract Change Order
CCOW	Channel Control Orderwire
CCP	Central Control Point
	Communications Control Processor
	Consolidated Cryptologic Program
	Contract Change Proposal
CCPC	Civil Communications Planning Committee
CCPDS	Command Center Processing and Display System
CCR	Central Control Register
	Commitment, Concurrency, and Recovery
	Components Characteristics Record
	Configuration Change Report
CCRP	Configuration Control Review Board
CCRS	Cost Category Reporting System
CCS	Combat Control System
	Command and Control System
	Common Channel Signaling
	Communications Control Station
	Communications Control Subsystem
	Configuration Control System
CCSB	Configuration Control Specification Board
	Configuration Control Sub-Board
	Configuration Control System Board
CCSC	Combat Cryptologic Support Console
	Command and Control Systems Center
CCSD	Command Communications Service Designator
	Cryptologic Combat Support Console
CCSL	Character Channel Segment Leader
CCSP	Communications Computer Security Panel
	Communications Control Station Processor
CCSS	Cryptologic Combat Support System
CCTASS	Cryptologic Carry-On Tactical Applications Software System
	Cryptologic Carry-On Tactical Application Support System
CCTS	Command and Control Technical Center
CCTV	Closed Circuit Television
CCTVS	Closed-Circuit Television System
CCU	Communication Control Unit
	Configuration Control Unit
	Crypto Control Unit
CCW	Counter Clockwise
CCWO	Commercial Communication Work Center
CD	Calendar Day
	Carrier Detection
	Channel Designator
	Combiner/Demodulator

	Compact Disc
	Conference Director
	Contract Definition
CD DA	Compact Disc, Digital Audio
CD DVI	Compact Disc, Digital Video Interactive
CD I	Compact Disc, Interactive
CD V	Compact Disc, Video
CD-ROM	Compact Disc-Read-Only Memory
CD-ROM XA	Compact Disc-Read Only Memory, Extended Architecture
CD/V	Compact Demonstration/Validation
	Concept Demonstration/Validation
CDA	Central Design Agency
	Common Data Area
	Computer Design Activity
CDAA	Circularly-Disposed Antenna Array
CDAd	Component Data Administrator
CDAN	Component Deployment Approval Notice
CDAR	Component Deployment Approval Request
CDB	Corporate Data Base
CDBDD	Computer Database Decision Document
CDBS	Central Database Server
	Control Database System
CDC	Central Data Controller Intelligence Analysis Center
	Central Directory Component
	Combat Direction Center
	Contract Data Coordinator
	Control Data Corporation
	Control Data Terminal
	Curriculum Development Center
CDCP	Central Data Control Point
CDD	Contract Delivery Date
CDDI	Copper Distributed Data Interface
CDDR	Contract Data Description Report
	Coordinated Design Data Required
CDE	Common Desktop Environment
CDES	Combat Direction Systems Development and Evaluation Site
CDF	Combat Decision Finding
	Combined Distributing Frame
CDF	Confined Detonating Fuse
CDFA	Component Functional Data Administrator
CDFC	Combat Direction-Finding Communications
CDFTT	Combat Direction-Finding Tactical Intelligence (TACINTEL) Terminal
CDI	Conventional Defense Improvements
CDIN	Continental United States (CONUS) Defense Integrated Network
CDINIT	Cross Domain Initiate
CDIP	Combined Defense Improvements Projects
	Consolidated Defense Intelligence Program
CDM	Configuration Data Manager
CDMA	Code Division Multiple Access
CDMC	Continental United States (CONUS) Defense Information System Network (DISNET) Monitoring Center
CDMD-OA	Configuration Data Managers Database – Open Architecture
CDNC	Communications Data Net Controller
CDO	Change Design Order
	Command Duty Officer
CDP	Contractor Definition Phase
	Contract Definitions Plan
	Cost Data Plan

CDPA	Central Data Processing Activity
CDPD	Cellular Digital Packet Data
CDPS	Communications Data Processing System
	Communications Distribution Processing Subsystem
	Consolidated Decision Package Set
CDR	Commander
	Critical Design Review
CDRL	Contract Data Requirements List
CDS	Combat Direction System
CDSS	Commander's Decision Support System
CDT	Control Data Terminal
	Curriculum Development Team
CDTS	Computer Directed Training System
CDU	Control and Display Unit
CDV	Compressed Digital Video
C-E	Communications-Electronics
CE	Concept Evaluation
	Concurrent Engineering
	Cost Effective
	Critical Examination
	Current Estimate
CE&D	Concept Exploration & Definition
CE/D	Concept Exploration/Definition
CEA	Cost Effective Analysis
CEAP	Communications-Electronics Accommodation Program
CEC	Contractor Establishment Code
	Cooperative Engagement Capability
CED	Capacitance Electronic Data
CEG	Communications Equipment Group
CEIF	Component Equipment Index File
CEIN	Contract End Item
CENPAT	Centralized Patch and Test
CENSEI	Center for Systems Engineering and Integration
CENTRA	Centralized Training Equipment Management System
CEO	Common Element Objective
CEP	Circular Error Probability
	Chief of Naval Operations Executive Panel
	Continuing Evaluation Program
CERP	Communications Security (COMSEC) Equipment Repair Program
CERT	Computer Emergency Response Team
CES	Channel Evaluation System
	Common Elements of Service
	Communications Equipment String
CESG	Communications Electronics Security Group
CESM	Cryptologic Electronic Surveillance Measures
CEWI	Combat Electronic Warfare and Intelligence
CF	Concept Formulation
	Confidence Factor
CFA	Center for Architecture
	Cognizant Field Activity
	Conformal Array
	Contract Funding Available
CFD	Control Flow Diagram
CFE	Center for Engineering
	Communications Front End
	Contractor Furnished Equipment
CFES	Contractor Field Engineering Services
CFG	Configuration
CFI2	Center for Integration and Interoperability

CFIB	Corporate Functional Integration Board
CFM	Contractor Furnished Material
CFMS	Central Financial Management System
CFNE	Common Family of Network Elements
CFR	Course Frequency Receiver
CFS	Center for Standards (JIEO)
	Contract Field Services
CFSR	Contract Funds Status Report
CFU	Control Functional Unit
CFY	Current Fiscal Year
CG	Coast Guard
CG(-)	Commanding General (---)
	Consolidated Guidance
	Cruiser
CGA	Carrier Group Alarm
	Color Graphics Adapter
CGM	Computer Graphics Metafile
CGNET	Command Grid Network
CGS	Common Ground Station
CGSE	Common Ground Support Equipment
CH	Chief
Chal. Ath. CAP	Challenge Athena Capabilities Access Protocol
CHAN	Channel
CHBDL	Common High Bandwidth Data Link
CHEC	Channel Evaluation and Calling
CHKDSK	Check Disk
CHMN	Chairman
CHNL	Channel
CHOP	Change Operational Control
CHS	Common Hardware and Software
CI	Configuration Item
	Control Indicator
	Counter Intelligence
CIB	Communications Information Bulletin
CIBS-M	Common Integrated Broadcast Service-Module
CIC	Combat Information Center
	Computer Interface and Control
	Computer Interface Cabinet
	Content Indication Code
	Counter Intelligence Corps
CIC/CDS	Combat Information Center/Combat Direction System
CICF	Customer Information and Control File
CICO	Combat Information Center Officer
	Content Indicator Code Officer
CICWO	Combat Information Center Watch Officer
CID	Channel Identifier
	Channel Indicator
	Circuit Identifier
	Commercial Item Description
	Component Identification [number]
	Cryptologic Interface Device
CIDF	Classified Intermediate Distributing Frame
CIE	Card Image Edition
CIG	Control Interconnecting Group
CII	Compatibility, Interoperability, and Integration
	Configuration Item Index
CIK	Cryptographic Ignition Key
CILOP	Conversion in Lieu of Procurement
CIM	Communications Improvement Memorandum

	Communications Information Memorandum
	Computer Integrated Manufacturing
	Corporate Information Management
CIMNET	Center for Information Management Network
CIMP	Corporate Information Management Plan
CIN	Channel Identification Number
	Combat Information Net
	Course Identification Number
CINC	Commander In Chief
CINS	Common Interface Standards
CIO	Central Imagery Office
	Chief Information Office
CIOC	Current Intelligence Operations Center
CIP	Combined Interoperability Program
	Communication Improvement Program
	Critical Intelligence Parameter
CIR	Committed Information Rate
CIRC	Circular
	Continuous Infrared
CIS	Cable Interface Set
	Combat Identification System
	Combat Intelligence Squadron
	Combat Information System
	Cryptologic Interface Station
CISC	Complex Instruction Set Computer
CISS	Center for Information Systems Security (JIEO)
CITIS	Contractor Information Technology Information System
CIU	Communication Interface Unit
	Cryptologic Interface Unit
CIWG	Communications Interoperability Working Group
CJCS	Chairman, Joint Chiefs of Staff
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CJTF	Command Joint Task Forces
CKA	Constant Key Alarm
CLAM	Completed Leasing Action Message
CLCU	Communications Line Control Unit
	Common User Digital Information Exchange Subsystem (CUDIXS) Link Control Unit
CLEF	Commercial Licensed Evaluation Facility
CLF	Commander Landing Force
CLI	Communication Line Interface
CLIN	Contract Line Item Number
CLIPS	Common User Digital Information Exchange Subsystem (CUDIXS) Link Interface Protocol Standard
CLNP	Connectionless Network Protocol
CLNS	Connectionless Network Service
CLOS	Command to Line-of-Sight
CLS	Clear Screen
	Contractor Logistics Support
CLTP	Connectionless Transport Protocol
CLUT	Color Look-Up Table
CM	Configuration Management
	Countermeasures(s)
CM&D	Collection Management & Dissemination
CMA	Configuration Management Agent
CMAG	Configuration Management Advisory Group
CMAS	Countermeasures Assessment Simulator
	Crisis Management Automated Data Processing (ADP) System
CMC	Configuration Management Committee

CMCC	Corps Movement Control Center
CMCS	Communications Management and Control Subsystem
	Communications Monitoring and Control Subsystem
CMD	Command
CMF	Common Message Format
CMG	Configuration Management Group
	Control and Management Group
CMI	Computer-Managed Instruction
	Code Mark Inversion
CMIO	Communications Security Material Issuing Office
CMIP	Common Management Information Protocol
CMIS	Common Management Information Service
CMM	Capability Maturity Model
	Configuration Management Manual
CMMC	Continental United States (CONUS) Military Network (MILNET) Monitoring Center
CMN	Compartmented Mode Network
CMO	Circuit Management Office
	Configuration Management Office
CMOS	Complementary Metal Oxide Semiconductor
CMOT	Common Management Information Protocol (CMIP) Over TCP/IP; Network Protocol
CMP	Configuration Management Plan
CMP-x	Configuration Management Procedure - (x=Number)
CMPLT	Complete
CMPS	Compartmented Mode Processing System
CMPU	Computer Message Processing Unit
CMPX	Complex
CMRT	Crypto, Modem, and Receiver/Transmitter
CMS	Communication Management Subsystem
	Classified Material Storage
	Communications Security Materiel System
	Communications Security (COMSEC) Materiel System
	Conferencing Messaging System
	Configuration Management System
	Control and Management Segment System
CMSS	Collection Management Support System
CMT	Control, Monitor and Test
CMTU	Cartridge Magnetic Tape Unit
CMW	Compartmented Workstation
CMWG	Configuration Management Working Group
CMYK	Cyan, Magenta, Yellow, Black
CN	Common Name
CNA	Communications Network
	Center for Naval Analysis
	Corporate Network Accreditor
CNC	Central Navigation Computer
	Communications Network Controller
	Computer Numerical Control
CNC/C	Communications Network Computer/Controller
CNCE	Communications Nodal Control Element
CMMI	Capability Maturity Model Integrated
CNI	Communications, Navigation and Identification
CNN	Cable Network News
CNO	Chief of Naval Operations
CNR	Channel Number Report
	Chief of Naval Research
	Combat Net Radio
CNS	Commercial Network Survivability

CNSI	Communications Systems Network Interoperability
CnxPlan	Connection Plan
CO	Check Out
	Commanding Officer
COA	Course of Action
COAS	Command Office Automation System
COB	Close of Business
COBOL	Common Business-Oriented Language
COC	Centralized Operational Control
	Certificate of Competency
	Certificate of Conformance
	Combat Operations Center
COCC	Contractor Operations Control Center
COCOM	Combatant Command
COD	Carrier On-board Delivery
	Computer Operations Division
CODEC	Coder-Decoder
COE	Checkout and Evaluation
	Common Operating Environment
	Concept of Employment
COEA	Cost and Operational Effectiveness Analysis
COED	Composition and Editing Display Device
COFA	Change of Frame Alignment
COG	Cognizance
COH	Complex Overhaul
COI	Certificate of Identicality
	Community of Interest
	Critical Operational Issue
COIC	Critical Operational Issues and Criteria
COINS	Community On-Line Intelligence System
COL	Common Operators Language
	Communications-Oriented Language
COLAN	Central Office Local Area Network (LAN)
COLFIL	Collective Name File
COM	Character-Oriented Messages
	Collection Operations Management
	Commander
	Component Object Model
COMCEN	Communications Center
COMINT	Communications Intelligence
COML	Committed On-Hand Lift Capability
COMM	Communications
COMMERSAT	Commercial Satellite Communications
COMMOPLAN	Communications Operating Plan
COMMOPS	Communications Operations
COMMPLAN	Communications Plan
COMMS	Communications Management System
COMMSHIFT	Communications Guard Shift
COMMU	Communications Unit
COMPCEN	Computer Center
COMPREP	Composite Reporting [now CORS]
COMPUSEC	Computer Security
COMSAT	Communications Satellite
COMSEC	Communications Security
COMSPOT	Communications Spot Report
COMSSIS	Combat System/Ship Interface Specification
COMSTAT	Communications Status Report
COMTAC	Communications Tactical
COMTEN	Communications Front End Processor

CON	Conical
CONNPLAN	Connection Plan
CONOP	Concept of Operation
CONP	Connection-Oriented Network Services
CONPLAN	Concept of Operation Plan
	Concept Plan
	Contingency Plan
CONV	Conversion
COORD	Coordination Drawing
COPS	Current Operations Planning System
COPS I/II	Computer-Oriented Partial SUM I/II [Beamformer]
COR	Contracting Officer’s Representative
CORBA	Common Object Request Broker Architecture
CORCEN	Correlation Center
CORREL	Correlate
CORT	Coherent Receiver Transmitter
COTR	Contracting Officer’s Technical Representative
COS	Communications Operating System
	Communications Oriented Software
	Computer Open System
	Corporation for Open System
COSATI	Committee on Scientific and Technical Information
COSE	Common Open Software Environment
COT	Contractor's Operations Trails
COTCO	Consolidation of Telecommunications Centers on Oahu, HI
COTR	Contracting Officer's Technical Representative
COTS	Commercial Off-the Shelf
COTSS	Classified Operational Telecommunications Switching
COU	Cable Orderwire Unit
CP	Central Processor
	Change Proposal
	Command Post
	Communications Processor
	Communications Protocol
	Computer Programmer
	Control Plan
	CRYPTO Peripheral
	Cryptographic Peripheral
CP&T	Contractor-Furnished Equipment Patch & Test
CP/M	Computer Program/Microcomputers
CPA	Communications Processor Architecture
CPAM	Chief of Naval Operations (CNO) Program Analysis Memorandum
CPARS	Contractor Performance Assessment Reporting System
CPB	Charged Particle Beam
CPC	Computer Program Component
	Contract Planning Conference
	Cost Per Copy
CPCI	Computer Program Configuration Item
CPDB	Characteristics and Performance Database
CPDP	Computer Program Development Plan
CPE	Computer Performance Evaluation
	Customer Premise Equipment
CPFF	Cost Plus Fixed Fee
CPFG	Chief of Naval Operations (CNO) Planning and Fiscal Guidance
CPG	Correction Plan Generator
	Control Program Generator
CPG/SM	Connection Plan Generator/Security Manager
CPI	Characters Per Inch
	Communications Processing Interface

	Continuous Process Improvement
CPIF	Cost Plus Incentive Fee
CPIWM	Customer Premise Inside Wire Maintenance
CPL	Capillary Pumped Loop
	Change Part List
	Computer Program Library
CPLR	Coupler
CPM	Characters Per Minute
	Computer Performance Management
	Critical Path Methodology
CPNF	Cost Plus No Fee
CPOM	Computer Program Operator's Manual
CPOS	Communications Processor Operating System
CPP	Communication Protocol Processor
	Communications Patch Panel
CPPG	Chief of Naval Operations Policy and Planning Guidance
CPPS	Computer Program Performance Specification
CPR	Cardio Pulmonary Resuscitation
	Cost Performance Report
CPS	Cellular Priority Services
	Communications Protocol Stack
	Cycles Per Second
CPT	Chief Programmer Team
	Communications Project Tasking
CPTF	Central Projects Test Facility
CPU	Central Processing Unit
	Communications Processor Unit
CQM	Check Queue Multiple
CR	Card Reader
	Carriage Return
	Combination Radio [SINCGARS]
CR&DO	Commander's Research & Development Objectives
CR-A	Combination Radio-Airborne Version
CR-S	Combination Radio-Shipboard Version
CRADA	Cooperative Research and Development Agreement
CRASO	Computer Resources Acquisition Support Office
CRC	Country Release Code
	Cyclic Redundancy Check
CRD	Capstone Requirements Document
CRDA	Cooperative Research and Development Agreement
CREAM	Combat Readiness Electromagnetic Analysis Measurement Program
CRF	Cryptographic Repair Facility
CRI	Collective Routing Indicator
CRISD	Computer Resources Integrated Support Document
CRISP	Computer Resources Integrated Support Plan
CRITIC	Critical Intelligence
CRITICOM	Critical Intelligence Communications
CRITICOMM	Critical Communications
CRIU	Channel Access Protocol (CAP) Router Interface Unit
CRL	Certificate Revocation List
CRLCMP	Computer Resources Life Cycle Management Plan
CRM	Communications Resource Manager
	Control Release Marking
CRMC	Continental United States (CONUS) Remote Monitoring Center
CRP	Control and Reporting Post
CR/PRP	Card Reader/Punch Replacement Program
CRR	Channel Rerun Request
CRRC	CSIF Rate Review Council

CRT	Cathode Ray Tube
CRWG	Circuit Reroute Time
	Computer Resources Working Group
	Copernicus Requirements Working Group
CRYPTO	Cryptologic
CS	Communication Services
CS3	Critical Sensitive 3
CSA	Communication Support Activity
	Communications Service Authorization
	Communications Support Area
	Communications Systems Analyst
CSAP	Computer Software Accreditation Plan
CSAW	Cryptologic Support To Amphibious Warfare
CSC	Command Support Center
	Common Signaling Channel
	Communications Steering Committee
	Computer Security Center
	Computer Software Component
	Computer Software Configuration
	Computer Systems Command
	Customer Supply Center
CSCE	Communications System Control Equipment
CSCG	Communications Security Control Group
CSCI	Commercial Satellite Communications Initiative
	Computer Software Configuration Item
C/SCS	Cost/Schedule Control Systems
CSCS	Common Signaling Channel System
	Contractor Satellite Control Station
CSCT	Communications Security Control Terminal
CSD	Constant Speed Drive
	Critical Systems Demonstration
CSDR	Combat System Design Requirements
CSE	Client-Server Environment
	Communications Security Equipment
	Communications Support Element
CSE&A	Combat System Engineering & Analysis
CSED	Combat System Engineering Development
CSEDS	Combat Systems Engineering Development Site
CSEEB	Communications Security Equipment Engineering Bulletin
CSES	Consecutively Severely Errored Second
CSESO	Computer Switching Equipment Security Office
CSF	Centralized Services Facility
CSG	Cryptologic Support Group
CSI	Commercial Satellite Interconnectivity
	Competitive Strategies Initiative
CSIDS	U.S. Central Command (CENTCOM)/Southern Communications (SOCOM) Integrated Data System
CSIF	Communications Services Industrial Fund
CSII	Center for Systems Interoperability and Integration
CSL	Character Segment Leader
CSLC	Coherent Side Lobe Canceller
CSMA	Carrier-Sense, Multiple Access
CSMA/CD	Carrier-Sense, Multiple Access/Collision Detection
CSMIS	Combat System Management Information System
CSMTF	Combat Systems Maintenance Test Facility
CSN	Channel Sequence Number
	Circuit Symbol Number
CSNI	Communications Systems Networks Interoperability
CSO	Communication Support Officer

	Communications Service Order
	Component Security Officer
	Computer Security Object
	Corps Signal Officer
CSOB	Command Systems Operations Branch
CSOC	Consolidated Space Operations Center, Colorado Springs, CO
CSOD	Combat System Operational Design
CSOM	Computer System Operator's Manual
CSOT	Constant Source Operator Terminal
CSP	Central Service Point
	Communications Support Processor
	Contract Support Program
	Control Screener Position
CSR	Command Status Register
	Controlled Supply Rate
CSRB	Communications Systems Requirements Board
CSRF	Common Source Routing File
CSRFS	Common Source Routing File System
CSRO	Center for Software Reuse Operations
CSRS	Constant Source Receiver Suite
CSS	Central Security Service [see NCEUR]
	Command Support System
	Communications Security System
	Communications Selector Switch
	Communications Subsystem
	Communications Support Squadron
	Communications Support System
	Communications System Segment
CSSA	Cryptologic Shore Support Activity
CSSCS	Combat Service Support Control System
CSSE	Combat Service Support Element
CSSO	Computer Systems Security Officer
CSSQT	Combat System Ship Qualification Test
C/SSR	Cost/Schedule Status Report
CSSTSS	Combat Service Support Training Simulation System
CST	Central Standard Time
	Conventional Support Team
	Communications Support Team
	Contingency Support Team
CST&QP	Combat System Test & Qualification Program
CST&QPCSESD	Communications Security Equipment System Document
CSTA	Communications Systems Test Activity
CSTAT	Communications Status
CSU	Channel Service Unit
	Circuit Switching Unit
	Communications Switching Unit
	Computer Software Unit
CT	Communications Terminal
	Contractor Test
	Cryptologic Technician
CT&E	Certification Test & Evaluation
	Compliance for Test & Evaluation
CTA	Center for Technical Architecture
CTAF	CSS Technical Architecture Framework
CTD	Charge Transfer Device
CTE	Center for Test and Evaluation
	Contractor Technical Evaluation
CTF	Commander, Task Force
CTG	Commander, Task Group

CTIC	Communications Security (COMSEC)/Transmission Security (TRANSEC) Integrated Circuit Module
	Contractor Technical Information Catalog
CTM	Cryptologic Technician Maintenance
CTN	Computer-Aided Acquisition and Logistic Support Test Network
CTO	Cryptologic Technician Communications
	Cryptologic Technician Operator
CTP	Consolidated Telecommunications Program
CTRL	Control
CTS	Consolidated Task Statement
	Clear to Send
CTT	Commander's Tactical Terminal
	Console Tape Transport
CTT(3)	Commander's Tactical Terminal 3 Channel
CTT-H	Commander's Tactical Terminal-Hybrid
CTTA	Certified Electronic Security Requirement (TEMPEST) Technical Authority
CTTY	Control Teletype
CTU	Central Timing Unit
	Command and Telemetry Unit
CU	Communications Unit
	Control Unit
	Controller Unit
	Cryptographic Unit
CUC	Circuit Utilization Code
CUDI	Controller Unit to Disk Interface
CUDIXS	Common User Digital Information Exchange Subsystem
CUP	Channel Up
	Communications User Program
CURRSTRM	Current Stream
CUS	Common-User Software
CUSL	Character Unclassified Segment Leader
CUT	Coordinated Universal Time
CUTIM	Common Source Routing File Update Transaction Interactive Maintenance
CV-C3	Aircraft Carrier-Command, Control and Communications
CVAN	Commander-in-Chief, Pacific (CINCPAC) Voice Alert Network
CV-ASWM	Carrier-Anti-Submarine Warfare Module
CVBG	Aircraft Carrier Battle Group
CVIC	Carrier Intelligence Center
CVLF	Compact Very Low Frequency
CVNS	Aircraft Carrier Navigation System
CVR	Crystal Video Receiver
CVS	Concurrent Version System
CVSDM	Continuously Variable Slope Delta Modulation
CW	Continuous Wave [transmission]
CWC	Composite Warfare Commander
CWO	Communications Watch Officer
CWSP	Commercial Wideband Satellite Communication (SATCOM) Program
CXRFIL	Collective Cross-Reference File
CY	Calendar Year
	Current Year
D	Depot
D&D	Display & Decision [area]
D&F	Determination & Findings
D&T	Detection & Tracking
D&V	Demonstration & Validation
	Development & Validation

D&W	Detection & Warning
D/A	Digital-to-Analog
D/F	Direction/Finder
D/T	Detector/Tracker
D3	Design, Development and Documentation
DA	Data Administrator
	Demand Assignment
	Developing Agency
DA-TDMA	Demand Assigned-Time Division Multiple Access
DAA	Designated Approving Authority
DAAS	Defense Automated Addressing System
DAASC	Defense Automated Addressing System Center
DAB	Defense Acquisition Board
	Digital Audio Broadcasting
DABBS	Defense Information Systems Agency (DISA) Acquisition Bulletin Board System
DAC	Data Administration Council
	Device Access Controller
	Digital-to-Analog Converter
	Discretionary Access Control
DACM	Data Adapter Control Mode
DACO	Defense Logistics Agency Automated Data Processing/Telecommunications Contracting Office
DAD	Draft Addendum
DADU	Data Accumulation and Distribution Unit
DAE	Defense Acquisition Executive
DAES	Defense Acquisition Executive Summary
DAF	Device Attach Facility
DAG	Defense Acquisition Guidebook
	Defense Special Security Communications System (DSSCS) Address Group
DAIPC	Defense Logistics Agency (DLA) Automated Information Processing Center
DAISY	Defense Reutilization and Marketing Automated Information System
DAMA	Demand Assigned Multiple Access
DAMES	Defense Automated Addressing System Center (DAASC) Automated Message Entry System
DAMIS	Defense Analysis Management Information System
DAP	Directory Access Protocol
DAR	Defense Acquisition Regulation
	Defense Acquisition Regulatory [council]
	Designated Agency Representative
DARC	Data Acquisition and Reduction Center
DARP	Director's Acquisition Review Panel
DARPA	Defense Advance Research Products Agency
DARPANET	Defense Advanced Research Projects Agency Network
DARS	Defense Acquisition Regulatory System
DART	Dynamic Analysis and Replanning Tool
	Dynamically Adaptive Receiver Transmitter
DAS	Data Acquisition System
	Demand Assignment Signaling
	Discrepancy Analysis Sheet
DASA	Demand-Assigned Single Access
DASD	Deputy Assistant Secretary of Defense
	Direct Access Storage Device
DASD (IM)	Deputy Assistant of Defense (Information Management)
DASN	Deputy Assistant Secretary of the Navy
DASO	Demonstration and Shakedown Operation

DASTS	Deployed Acoustic Sensor Training System
DAT	Digital Audio Tape
DATS	Digital Audio Transmission System
	Digital Automated Telecommunications System
DAVIS	Defense Automated Visual Information System
DAWIA	Defense Acquisition Workforce Improvement Act
DAX	Digital Access Exchange
DB	Database
db	decibel
DBA	Database Administration
DBD	Defense information Systems Agency (DISA) Budget Decision
DBDD	Database Design Document
DBFYP	Department of the Navy Five-Year Program
DBH	Data Base Host
DBIS	Database Information System
dbm	Decibel Milliwatts
DBMS	Database Management System
DBOE-CISA	Defense Business Operations Fund-Communications Information Services Activity
DBOF	Defense Business Operating Fund
DBOF-DSA	Defense Business Operations Fund-Defense Services Activity
DBP	Data Buffer Processor
DBS	Database Specification
	Direct Broadcast Satellite
DBSS	Direct Broadcast Satellite System
DBUA	Data Base Update Authority
dBW	decibel referenced to one watt
DC	Development Coordinator
	Direct Current
	Distributed Control
DCA	Distributed Communications Architecture
DCC	Data Control Cabinet
	Display Control Console
DCCEP	Digitally Controlled Communication Equipment Program
DCCTFL	Distribution Copy Count File
DCD	Data Carrier Detect
	Design Control Drawing
DCE	Data Circuit Terminating Equipment
	Data Communications Equipment
	Distributed Computing Environment
DCFS	Data Conversion and Files Section
DCI	Data Communications Interface
DCIC	Demand Assigned Multiple Access (DAMA) Controller Interface Card
DCKA	Demand Assigned Multiple Access (DAMA) Constant Key Alarm
DCL	Direct Communications Link
DCM	Distributed Control Module
DCN	Design Change Notice
DCNM (--)	Deputy Chief of Naval Material for (--)
DCNM (A)	Deputy Chief of Naval Material for Acquisition
DCNM (L)	Deputy Chief of Naval Material for Logistics
DCNO	Deputy Chief of Naval Operations
DCNO (--)	Deputy Chief of Naval Operations for (--)
DCOM	Data Communications
DCON	Down Converter
DCOS	Digital Communications Operating System

DCOSS	Defense Communications Operations Support System
DCP	Decision Concept Paper
	Decision Coordinating Paper
	Developmental Concept Paper
	Display and Control Panel
	Distributed Communications Processor
DCP/OS	Distributed Communications Processor/Operating System
DCPS	Data Communications Protocol Standards
DCPSK	Different Coherent Phase Shift Keying
DCR	Digital Cable Radio
DCRS	Digital Cassette Recording System
DCS	Desktop Computer System
	Digital Command Signal
	Digital Cross-connect System
	Display and Control System
DCSS	Digital Communications Subsystem
DCSTC	Defense Communication Station Technical Control
DCT	Data Communications Terminal
	Development Certification Testing
	Digital Communications Terminal
DCTN	Defense Commercial Telecommunications Network
	Defense Commercial Telephone Network
DCU	Detection and Control Unit
	Digital Control Unit
	Display Control Unit
DCW	Digital Chart of the World
DD/DS	Data Dictionary/Directory System
DD/I	Design, Development/Implementation
DDA	Domain Defined Attribute
DDAS	Dedicated Demand Assignment Signaling
DDBMS	Distributed Database Management System
DDC	Defense Documentation Center
	Digital Data Computer
DDDR&E (T&E)	Deputy Director, Defense Research & Engineering (Test & Evaluation)
DDF	Due In-Due Out File
DDFS	Direct Digital Frequency Synthesizer
DDGFIL	Distribution Guide File
DDI	Delivery Distribution Indicator
	Digital Data Interface
DDL	Design Data Laboratories
	Designation of Disclosure Authority Letter
	Digital Data Link
	Direct Down Link
DDN	Defense Data Network
	Defense Department Network
DDN IMP	Defense Data Network Interface Message Processor
DDN MIS	Defense Data Network Management Information System
DDN PMO	Defense Data Network Project Management Office
DDN/IP	Defense Data Network/Internet Protocol
DDP	Demand Development Period
	Distributed Data Processing
DDR	Detailed Design Review
	Document Discrepancy Report
DDR&E	Director of Defense Research & Engineering
DDRS	Defense Data Repository System
DDS	Data Display System
	Defense Distribution Service
	Data Distribution System

	Digital Data Storage
	Digital Data System
	Direct Digital Synthesizer
	Dynamic Diagnostic System
DDSC	Defense Data Support Center
DE	Development Estimate
	Directory Enquires Directory User Agent
DE&T	Development, Evaluation & Testing
DEBS	Digital European Backbone System
DECCO	Defense Commercial Communications Office
DECM	Defense Electronic Countermeasures
DECNET	Digital Equipment Corporation Network
DECS	Distributed Emergency Communications System
	Defense Satellite Communications System (DSCS) Electronic Counter-Countermeasures (ECCM) Control System
DED	Data Element Dictionary
	Dedicated
	Distribution Edit
DEF	Defense
	Development and Evaluation Facility
DEFCON	Defense Condition
	Defense Readiness Condition
DEFCOS	Defense Courier Service
DEG	Degree
DEIS	Defense Enterprise Integration Services
DEL	Delete
DEM/VAL	Demonstration/Validation
DEMUX	Demultiplexer
DEN	Data Element Number
DEP	Deputy
DEPSEC DEF	Deputy Secretary of Defense
DEPSK	Differentially Encoded Phase Shift Keying
DepSO	Departmental Standardization Office(r)
DES	Data Encryption Standard
DESIG	Designate
DESP	Data Element Standardization Program
DEV	Development
DF	Directional Finding
DFAD	Digital Feature Analysis Data
DFC	Directional Frequency Correlation
DFD	Data Flow Diagram
DFI	Display Systems Protocol Format Identifier
DFI/DUI	Data Field Identifier/Data Use Identifier
DFM	Distribution File Management
DFMR	Dual Frequency Minimum Essential Emergency Communications Network (MEECN) Receiver
DFOW	Definable Features Of Work
DFR	Direction Finding Receiver
DFSU	Dual Frequency Signaling Unit
DGBC	Digital Geoballistic Computer
DGCC	Defense information Systems Agency Global Control Center
DGM	Digital Group Multiplexer
DH	Distant Host
DHCP	Dynamic Host Configuration Protocol
DHIS	Distributed Heterogeneous Information Systems
DHMS	Data, Hour, Minutes, Seconds
DHS	Data Handling System
DI	Data Item
DIAC	Data Interpretation Analysis Center

DIACAP	DOD Information Assurance Certification and Accreditation Process
DICASS	Directional Command Activated Sonobuoy System
DICO	Data Information and Coordination Office
DIFAR	Directional Frequency and Ranging
DIFCASS	Directional Command-Activated Sonobuoy System
DII	Defense Information Infrastructure
DIICC	Defense Information Infrastructure Control Concept
DICCOE	Defense Information Infrastructure (DII) Common Operating Environment
DIMSS	Defense Switched Network (DSN) Integrated Management Support System
DIN	Digital Information Network
DIP	Disk Interface Processor
	Dual In-Line Processor
DIR	Directive
	Director
DIRES	Defense Imagery Requirements and Exploitation System
DIS	Data Inquiry System
	Distributed Interactive Simulation
DISA	Data Interchange Standard Association
	Defense Information Systems Agency
DISPL	Display
DITAR	Digital Telemetry Analog Recording
	Digital to Analog Recorder
DITS	Digital Information Transfer System
DITSCAP	DOD Information System Technology Security Certification and Accreditation Process
DITSS	Digital Imagery Tactical Support System
DIU	Digital Interface Unit
DIV	Division
DL	Design Language
	Digital Loop
	Distribution List
DLC	Direct Link Communications
DLC-SUB	Down-Link Call-Up - Signal Underwater Sound
DLCS	Data Link Communications System
	Data Link Control System
DLED	Dedicated Loop Encryption Device
DLIU	Digital Line Interface Unit
DLOS	Disturbed Line-of-Sight
DLP	Data-Level Protocol
	Director of Laboratory Programs
DLR	Data-Level Reset
DLRP	Data Link Reference Point
DLT	Data Line Terminal
Dlvy(s)	Delivery(-ies)
DM	Data Management
DMA	Direct Memory Access
DMC	Data Management Center
	Defense Megacenter
DMD	Digital Message Device
DMDC	Disk Memory Drive Controller
DMDU	Disk Memory Drive Unit
DME	Distance Measuring Equipment
	Distributed Management Environment
DMED	Digital Multiplexer Encoder-Decoder
DMF	Device Management Facility
DMG	Management Review Group

DMM	Digital Multi-Meter
DMO	Data Management Office
DMR	Defense Management Review
	Digital Modular Radio
DMS	Data Management System
	Data Monitor Scope
	Defense Materiel System
	Defense Message System
	Digital Multiplex System
DMS UA	Defense Message System User Agent
DMSP	Defense Meteorological Satellite Program
DMSWG	Defense Message System Working Group
DMTS	Defense Message Transfer System
DMTU	Dockside Mobile Test Unit
DMU	Dual Modem Upgrade
DMU II	Dual Modem Upgrade Phase II
DN	Delivery Notification
	Department of the Navy
DNCC	Distribution Network Control Center
DNL	Director of Naval Laboratories
DNOC	Data Network Operations Center
DNPP	Director Navy Program Planning
DNPPG	Department of the Navy, Policy and Planning Guidance
DNS	Domain Name Server
DNS	Domain Name System
DNSARC	Department of the Navy, Systems Acquisition Review Council
DNT	Director of Navy Technology
DNVT	Digital Nonsecure Voice Terminal
DOC	Distributed Operational Control
DOCS	Defense Satellite Communications System (DSCS) Operational Control Subsystem
DOCT	Doctrine
DOD	Department of Defense
DOD Directive 5200.28	Security Requirements for Automated Information Systems
DOD Instruction 5200.40	DOD Information System Technology Security Certification and Accreditation Process (DITSCAP)
DOD-STD	Department of Defense Standard
DoDD 5000.1	The Defense Acquisition System Publication
DoDI 5000.2	Operation of the Defense Acquisition System
DODINST	Department of Defense Instruction
DODISS	Department of Defense Index of Specifications and Standards
DODM	Department of Defense Manual
DODR	Department of Defense Regulation
DOE	Department of Energy
DOE-DMA	Department of Energy - Division of Military Applications
DOI	Defense Special Security Communications System (DSSCS) Operating Instruction
DOIM	Directorate of Information Management
DOIT	Department of Defense (DOD) Open Systems Environment, Implementation, and Transition
DoN	Department of the Navy
DONPIC	Department of the Navy Program Information Center
DONPPG	Department of the Navy Planning and Programming Guidance
DOP	Demand Assigned Multiple Access (DAMA) Orderwire Processor
	Directory Operational Binding Management Protocol
DOS	Disk Operating System
DOSS	Defense Satellite Communications System (DSCS) Operational Subsystem
DOT&E	Director, Operational Test & Evaluation

DOV	Data Over Voice
DP	Data Processing
	Decision Paper
	Development Plan
	Development Proposal
	Dial Pulse
	Display Processor
DP&E	Direction, Planning & Evaluation
DPASS	Defense Data Network (DNN) Program Management Office (PMO) Automatic Data Processing (ADP) Support System
DPC	Data Processing Center
DPDISK	Data Pattern Directory Disk File
DPDT	Dial Pulse and Dual Tone
DPG	Defense Planning Guidance
	Defense Policy Guidance
	Director's Planning Guidance
DPI	Data Processing Installation
DPM	Digital Plotter Map
DPMA	Docking Phase Maintenance Availability
DPO	Development Project Officer
DPP	Delegated Production Policy
DPPC	Defense Planning and Programming Category
DPPG	Defense Policy and Planning Guidance
DPQ	Defense Planning Questionnaire
DPR	Document Problem Report
DPRB	Defense Planning and Resources Board
DPRC	Defense Program Review Committee
DPRO	Defense Plant Representative Office
DPS	Decision Package Set
DPSK	Differential Phase Shift Keying
	Dual Phase Shift Keying
DPT	Dual Patch Transmitter
DPU	Data Processing Unit
DPUL	Data Processing Unit Loading
DPVS	Distributed Plain Language Address Verification System
DQDB	Distributed Queue Dual Bus
DQPSK	Differential Quadriphase Shift Keying
DR	Data Requirements
DRA	Data Reduction and Analysis
	Dynamic Redeployment Algorithm
DRAM	Dynamic Random Access Memory
DRB	Design Review Board
	Discrepancy Review Board
DRC	Data Relay Console
DRDT&E	Direction, Research, Development, Test & Evaluation
DRG	Defense Research Group
DRI	Destination Routing Indicator
DRM	Design Reference Mission
DRMO	Defense Reutilization and Marketing Office
DRO	Digital Readout
DROLS	Defense Research, Development, Test & Evaluation (RDT&E) On Line System
	Direct Reporting Program Manager
DRPM	Data Requirements Review Board
DRRB	Data Recording Subsystem
DRS	Data Relay Satellite
	Dedicated Requested Slots
DRSI	Defense Software Reuse Initiative
DRSN	Defense Red Switch Network

DRSP	Defense Reconnaissance Support Program
DRT	Decision Response Time
	Diagnostic Rhyme Test
DRTS	Detecting, Ranging, and Tracking System
DS	Development Specification
	Digital Signature
	Direct Sequence
	Direct Support
	Directory Service
DS-0	Digital System Level-Zero
DSA	Data System Analysis
	Dedicated Signaling Access
	Digital Signature
	Digital Spectrum Analyzer
DSAC	Demand Assigned Multiple Access Semi-Automatic Controller
DSARC	Defense Systems Acquisition Review Council
DSAS	Demand Assigned Multiple Access Slot Assignment System
DSB	Defense Science Board
	Double Side Band
DSC	Defense Space Council
DSCS	Defense Satellite Communications System
DSCSOC	Defense Satellite Communications System Operations Center
DSD	Digital Sharing Device
DSI	Dissimilar Source Integration
DSIX	Dedicated Submarine Information Exchange System
DSM	Data Source Matrix
	Data Systems Modernization
DSMAC	Digital Science Matching Correlation
DSN	Defense Switched Network
DSNET	Defense Secure Network
DSNET3	Defense Secure Network 3
DSNVOG	Defense Switched Network Voice Operations Group
DSP	Defense Standardization Program
	Digital Signal Processor
	Display Systems Protocol
	Domain Specific Part
DSR	Data Set Ready
	Data Speed Reader
DSRA	Docking Selected Restricted Availability
DSRI	Destination Station Routing Indicator
DSRS	Defense Software Repository System
DSS	Data Standards and Structures
	Decision Support System
	Defense Switched Services
	Defense Switching System
	Digital Signature Standard
	Direct Station Selection
DSSC	Digital Sideband Suppressed Carrier
DSSM	Data Standards and Structures Manual
DSTE	Digital Simulation Test Equipment
	Digital Subscriber Terminal Equipment
DSTM	Data Slot Time Mark
DSU	Data Service Unit
	Data Systems Unit
DSVT	Digital Secure Voice Terminal
	Digital Subscriber Voice Terminal
DT	Development Test
	Down Time
DT&E	Development Test & Evaluation

DT/OT	Development Test/Operational Test
DTA	Data Transfer Acknowledge
DTACCS	Director, Telecommunications and Command and Control Systems
DTC	Design-to-Cost
	Desktop Computer
DTC-2	Desktop Tactical Support Computer - 2
DTD	Data Transfer Device
	Data Transport Device
	Digital Transport Device
DTDMA	Distributed Time Division Multiple Access
DTE	Data Terminal Equipment
DTED	Digital Terrain and Elevation Data
DTFO	Distributed Time and Frequency Oscillator
DTG	Data Terminal Go
	Date-Time-Group
	Digital Transmission Group
DTMF	Dual-Tone Multiple Frequency Signaling
DTMP	Data Communications Protocol Standards Technical Management Panel
	Data Communications Protocol Standards (DCPS) Technical Management Panel
DTN	Data Transmission Network
DTOT	Development Test and Operational Test
DTP	Detailed Test Plan
	Distributed Transaction Processing
DTR	Data Terminal Ready
DTS	Data Transfer Request
	Data Terminal Set
DTSA	Defense Technology Security Administration
DTSS	Digital Topographic Support System
DTT	Data Task Team
DTTN	Distributed Tactical Test Network
DTU	Data Transmission Unit
	Digital Tracking Unit
DTUPC	Design-to-Unit Production Cast
DTVG	Digital TV Display Generator
DTVPU	Digital TV Projection Unit
DUART	Dual Asynchronous Receiver/Transmitter
DUCA	Distributed User Coverage Agile
DUNS	Data Universal Numbering System
DUPAK	Disk Utility Package
DUPSEARCH	Duplicate Search
DURP	Display Unit Reader/Punch
DUSC	Dual Universal Serial Communications Controller
DUSD/C3I	Deputy Undersecretary of Defense/Communications, Command, Control, and Intelligence
DVAL	Data Line Vulnerability
DVC	Direct View Console
DVM	Digital Voltmeter
DVP	Design Verification Program
DWTS	Digital Wideband Transmission System [USMC Program]
E&A	Enemy & Allied
E&I	Engineering & Installation
E&MD	Engineering & Manufacturing Development
E-Mail	Electronic Mail
E-TESTS	Operational Effectiveness Tests
E/S/S	Equipment/System/Sub-System
E3	Electromagnetic Environmental Effects
	End-to-End Encryption

EA	Economic Analysis
	Electronics Assembly
	Event Analysis
	Evolutionary Acquisition
	Executive Agent
EAC	Estimate At Completion
EAM	Emergency Action Message
EAP	Emergency Action Plan
	Emergency Action Procedures
EAS	Extended Addressing System
EASTPAC	Eastern Pacific
EB	Equipment Bay
EBCDIC	Extended Binary Coded Decimal Interchange Code
EBLOS	Extended Beyond Line-of-Sight
EBTR	Electronic Bearing Time Recorder
EC	Emitter Count
	Engineering Change
ECA	Estimate At Completion
	External Communications Adapter
	External Communications Security (COMSEC) Adapter
ECAC	Electromagnetic Compatibility Analysis Center, Annapolis, MD
	Estimate Cost at Completion
ECAM	Executive Communications Access Method
ECC	Electronic Courier Circuit
	Enduring Command Center
ECCB	Executive Configuration Control Board
ECCM	Electronic Counter-Countermeasures
ECD	Estimated Completion Date
ECH	Earth Coverage Horn
ECI	Engineering Change Instruction
ECL	Emitter Coupled Logic
ECLIPS	Expanded Calculator Link Processing System
ECM	Electronic Countermeasures
ECMP	Extremely High Frequency (EHF) Communications Management Plan
ECN	Engineering Change Notice
	Engineering Change Number
ECO	Engineering Change Order
ECOM	Exterior Communications
ECOP	Early Communications Operations Plan
ECP	Engineering Change Proposal
	Equipment Change Proposal
ECR	Embedded Computer Resources
	Engineering Change Report
	Engineering Change Request
ECS	Environmental Control System
ECTC	East Coast Telecommunications Center
ECU	Environmental Control Unit
	Error Correction Unit
ECWG	Emergency Communications Working Group
EDAC	Error Detection and Correction
EDB	Entry Data Blocks
EDCD	Environmental Design Criteria Document
EDD	Estimated Delivery Date
EDF	Engineering Development Facility
EDFA	Erbium Doped Fiber Amplifier
EDG	Exploratory Development Goals
EDI	Electronic Data Interchange

	Electronics Document Interchange
EDIFACT	Electronic Data Interchange (EDI) For Administration, Commerce, and Transportation
EDM	Engineering Design Model
	Engineering Development Model
	Enterprise Data Model
EDMICS	Engineering Data Management Information and Control System
EDP	Electronic Data Processing
EDPE	Electronic Data Processing Equipment
EDPODS	Engineering Drawing Print-on-Demand System
EDPP	Exploratory Development Program Plan
EDR	Enhanced Data Rate
	Entity Data Record
EDS	Electronic Data Systems
EDT	Engineering Development Test
	Equipment Device Table
EEE (E3)	Electromagnetic Environmental Effects
EEPROM	Electronically Erasable Programmable Read-Only Memory
EFA	Engineering Field Activity
EFB	Error Detection and Correction and Format Buffer
EFM	Emitter File Memory
EFOV	Earth Field of View
EFR	Equipment Facility Requirement
EFT	Electronic File Transfer
	Electronic Funds Transfer
	Engineering Feasibility Test
EFTO	Encrypted for Transmission Only
EFTS	Electronic Funds Transfer System
EFX	Emitter File Index
EGP	External Gateway Protocol
EHF	Extremely High Frequencies
	Extremely High Frequency [30 GHz-300 GHz]
EHF LDR	Extremely High Frequency (EHF) Low Data Rate
EHF LDR CAP	Extremely High Frequency (EHF) Low Data Rate Channel Access Protocol (CAP)
	Extremely High Frequency (EHF) Medium Data Rate
	Extremely High Frequency (EHF) Medium Data Rate Channel Access Protocol (CAP)
EHF MDR	Extremely High Frequency (EHF) Medium Data Rate
EHF MDR CAP	Extremely High Frequency (EHF) Medium Data Rate Channel Access Protocol (CAP)
EHF MGR	Extremely High Frequency (EHF) Manager
EHF SATCOM	Extremely High Frequency (EHF) Satellite Communications
EHFIXS	Extremely High Frequency Information Exchange Subsystem
EI	Enterprise Integration
EIA	Electronic Industries Alliance
EI&A	Enhanced Identification & Authentication
EIB	Engineering Information Bulletin
EIC	Equipment Identification Code
EICMC	Enterprise Integration Corporate Management Council
EIP	Embedded Information Security (INFOSEC) Product
	Engineering Implementation Plan
EIRP	Effective Isotropic Radiated Power
EIS	Electronic Information Security
	Executive Information System
	Expanded Instruction Set
EISA	Extended Industry Standard Architecture
EIT	Electronic Installation Team
	Encoded Information Type

EJS	Enhanced Joint Tactical Information Distribution Systems
EKMS	Electronic Key Management System
EL	Electroluminescent
ELANT	East Atlantic
ELF	Extremely Low Frequency [0 kHz-3 kHz]
ELINT	Electronic Intelligence
ELOS	Expanded Line-of-Sight
ELT	Extended Limits Test
ELV	Expendable Launch Vehicle
EM	Extremely High Frequency Manager
	Electromagnetic
	Electronic Mail
	End of Medium
	End User Manual
EMA	Electronic Messaging Association
EMACS	Equipment Management and Control System
EMATS	Emergency Message Automated Transmission System
EMC	Electromagnetic Compatibility
	Engineered Military Circuit
EMCCP	Electromagnetic Compatibility Control Plan
EMCON	Emission Control
EMCP	Electromagnetic Compatibility Program
EMCS	Electromagnetic Compatibility Studies
EMD	Engineering and Manufacturing Development
EMETF	Equipment Maintenance Data Environmental Test Facility
EMH	Electronic Mail Host
EMI	Electromagnetic Interference
EMI/EMC	Electromagnetic Interference/Electromagnetic Compatibility
EML	Electromagnetic Log
EMLOG	Electromagnetic Log
EMMPS	Enhanced Minimum Essential Emergency Communications Network Message Processing System
EMO	Electronic Maintenance Officer
EMP	Electromagnetic Pulse
EMPASS	Electromagnetic Performance of Aircraft and Ship Systems
EMPRESS	Electromagnetic Performance Evaluation System
EMPSKED	Employment Scheduling System
EMR	Electromagnetic Radiation
EMRC	Engineered Maintenance Requirements Catalog
EMS	Electronic Mail System
EMSEC	Emanations Security
EMSP	Enhanced Modular Signal Processor
EMSS	Emergency Mission Support System
	Equipment Maintenance Support System
EMT	Equipment Management Tool
EMTR	Emitter
EMUT	Enhanced Manpack Ultra High Frequency Terminal
EMV	Electromagnetic Vulnerability
EN	Emitter Number
ENA	Extended Network Addressing
ENCAP-C	Enhanced Capability System
ENCL	Enclosure
ENG	Engineering
ENGR	Engineer
EO	Electro-Optical
	End Office
EOC	Engineering Order
	Executive Order
	Early Operational Capability

	Emergency Operations Center
	Engineered Overhaul Cycle
	Extended Operating Cycle
EOF	End of File
EOH	End of Overhaul
EOL	End of Life
	End of Line
EOM	End of Message
	End of Month
EOQ	Economic Order Quantity
EOR	End of Routing
	Evaluation Observation Report
EOS	Elements of Service
	Executive and Operation System
	Extended Operation System
EOT	End of Transmission
	Engineering and Operations Training
EOV	End of Voice
EPAC	Eastern Pacific
EPAS	Exercise Production and Analysis System
EPC	Electronic Plane Conversion
EPDS	Electrical Power and Distribution Subsystem
	Electronic Processing and Dissemination System
EPROM	Erasable Programmable Read Only Memory
EPS	Early Production System
	Electrical Power Subsystem
	Encapsulated PostScript
	Engineering Performance Standards
EQUIP	Equipment
ER	Enhanced Radiation
	Error Rate
	Established Reliability
	Extended Range
ERB	Engineering Review Board
ERN	Engineering Revision Notice
ERP	Effective Radiated Power
	Extended Refit Period
ERT	Engineering Readiness Test
	Equipment Repair Time
ES	End System
	Equipment Section
	Error Second
ES-IS	End System - Intermediate System
ESA	Extremely High Frequency (EHF) Subnet Access Control
ESD	Electrostatic Discharge
ESF	Extended Super Frame
ESIS	Equipment String Information System
ESL	Electronic System Laboratory
	Expected Service Life
ESLD	External Software Load Device
ESM	Electronic Support Measures
	Electronic Surveillance Measures
ESOP	Enhanced Switch Operations Program
ESRA	Extended Selected Restricted Availability
EST	Eastern Standard Time
	Estimated Controlled Slip
ESTEPS	Enhanced Ships Technical Publication System
ESU	Electronic Switching Unit
ESWBS	Expanded Ship Work Breakdown Structure

ET	Electronic Technician
	Embedded Training
ET&E	Engineering Test & Evaluation
ETA	Estimated Time of Arrival
ETAC	Environmental Technical Applications Center
ETB	End of Transmission Block
	End Transmission Blank
ETC	Enhanced Throughput Cellular
	Executable Test Case
ETD	Estimated Time of Departure
ETE	Electronic Test Equipment
Eti	Elapsed Time for Trail i
ETMS	Electronic Technical Manual System
ETP	Evaluation Test Procedure
ETPS	Electronic Technical Publishing System
ETR	Estimated Time of Repair
	Evaluation Technical Report
ETX	End of Text
	End Transmission Text
EU	End User
EUTE	Early User Test and Experimentation
EVM	Earned Value Management
EVMS	Earned Value Management System
EVP	Enhanced Very Low Frequency (VLF) Digital Information Network (VERDIN) Processor
EVS	Enhanced Very Low Frequency (VLF) Digital Information Network (VERDIN) System
EVSG	Elasteromeric Vertical Support Group
EX	Experimental
EXCOM	External Communications
EXER	Exercise
F	Fahrenheit
F/L	Format Line
F2D2	Functional Flow Diagram Descriptions
FA	False Alarm
	Field Activity
	Field Artillery
	First Article
FAB	Fixed Action Button
FAC	Facility
FACCON	Facility Control
FACD	Functional Analysis Concept Development
FACMAT	Facilities Matrix
FACS	Fleet Ocean Surveillance Information Facility Analysis Communications System
FACSFAC	Facility Analysis Communications System
FACSR	Fleet Air Control Surveillance System
	Final Acceptance Constraints Status Report
FAD	Force Activity Designator
FAI	First Article Inspection
FAP	File Allocation Program
FAPES	Force Augmentation Planning and Execution System
FAPM	Functional Activity Program Manager
FAQ	Frequently Asked Questions
FAR	Federal Acquisition Regulation
	Fife and Retrieval
FAS	Functional Address Symbol
	Functional Area Sponsor
FASP	Facility for Automated Software Production

FAST	Fast Accurate Simple Tempest
	Fly-Away Super High Frequency (SHF) Terminal
	Fly-Away Satellite Communication (SATCOM) Terminal (SHF)
FAT	Final Acceptance Trial
	First Article Test
FATC	Fleet Area Telecommunications Center
Fax	Facsimile
FBL	Functional Baseline
FBN	Final Data Block Sequence Number
FBS	Fleet Broadcast System
FC	Field Change
	Format Code
FCA	Functional Configuration Audit
FCA/PCA	Functional Configuration Audit/Physical Configuration Audit
FCAPS	Fault, Configuration, Accounting, Performance, Security Management Areas
FCB	Field Change Bulletin
	Functional Control Board
FCC	Fleet Command Center
FCC/MCSC	Fleet Command/Marine Corps Supply Center
FCCS	Fleet Command Center System
FCI	Functional Configuration Identification
FCIM	Flexible Computer Integrated Manufacturing
FCIP	Field Change Implementation Program
FCP	Field Change Improvement Plan
	Field Change Installation Program
	Field Change Proposal
FCPLANT	Fleet Computer Programming Center, Atlantic
FCS	Frame Check Sequence
FCSC	Fleet Command Support Center
FCT	Final Contract Trials
FCTF	Fast Carrier Task Force
FCTG	Fast Carrier Task Group
FCTRL	Final Contractor's Trial
FD	Functional Description
FDA	Final Delivered Article
FDBM	Functional Database Manager
FDCR	Fleet Documentation Change Request
FDD	Fault Detection Diagnostic
	Floppy Disk Drive
	Functional Design Document
FDDI	Fiber Distributed Data Interface
	Fiber-Optic Distributed Data interface
FDDI/SMT	Fiber-Optic Distribution Data Interface/Station Management
FDDS	Flag Data Display System
FDM	Frequency Division Multiplex
	Functional Demonstrator Model
FDMA	Frequency Division Multiple Access
FDOA	Frequency Difference of Arrival
FDR	Future Digital Radio
FDS	First Development System
	Fixed Distributed System
FDT	Formal Description Technique
FDX	Full Duplex
FDX TTY	Full Duplex Teletypewriter
FDUX	Full Duplex
FE	Force Element
	Front End Computer
FEA	Front-End Analysis

	Functional Economic Analysis
FEAC	Far-End Alarm and Control Channel
FEBE	Far-End Block Error
FEC	Forward Error Correction
FECL	Fleet Electronics Calibration Laboratory
FED	Forward Entry Device
FED-STD	Federal Standard
FEP	Fleet Satellite (FLTSAT) Extremely High Frequency Package
	Front-End Processor
FET	Field Effect Transistor
	Functional Equivalency Test
FF	Field Format
	Form Feed
FFA	Functional Failure Analysis
FFD	Flattened Flow Diagram
FFGX	Experimental Guided Missile Frigate
FFIRN	Field Format Index Reference Number
FFN	Fleet Flash Net
FFT	Fast Fourier Transform
	For Further Transfer
FG	Functional Group
FGC	Fiscal Guidance Category
FGM	Fiscal Guidance Memorandum
FH	Frequency-Hopping
FHD	Fixed Head Disks
FHLT	Force High-Level Terminal
FI&C	Fault Isolation & Correction
FIA	Functional Integration Area
	Functional Interoperability Architecture
FIAS	Fleet Information Acquisition System
FIC	Facility Interface Code
	Fleet Intelligence Center
FICEURLANT	Fleet Intelligence Center - Europe and Atlantic
FICPAC	Fleet Intelligence Center - Pacific
FID	Fault Insertion Device
FIF	Facsimile information Field
FIDR	Final Installation Design Review
FIFO	First In, First Out
FIM	Fault Isolation Module
	Functional Information Manager
	Functional Integration Manager
FIP	Federal Information Processing
	Fleet Introduction Program
FIPS	Federal Information Processing Standard
	Federal Information Processing System
FIR	Field Integration Representative
FIRP	Federal Internet Requirements Panel
FIS	Functional Information System
FISINT	Foreign Instrumentation Signals Intelligence
FIST	Fleet Imagery Support Terminal
FIT	Field Installation Team
FL	Focal Length
FLAD/DCC	Flexible Analysis Display/Data Control Cabinet
FLAGE	Flexible Lightweight Agile Guided Experiment
FLAIR	Force Level Analysis Interactive Language
	Functional Language Articulated Interactive Resource
FLC	Force Level Control
FLCS	Force Level Control System
FLEXVOICE	Flexible Bit Rate Voice Subsystem

FLIR	Forward Looking Infrared
FLP	Frame-Level Protocol
FLSC	Flexible Linear-Shaped Charge
FLTASIP	Fleet All-Source Imagery Processor
FLTASWOPS	Fleet Coordinated (Intertype) Anti-Submarine Warfare Operations FLTBCST
FLTCEN	Fleet Center
FLTCINC	Fleet Commander-in-Chief
FLTCOMDIRSSACT	Fleet Combat Direction System Support Activity
FLTCOMTRACEN	Fleet Command Training Center
FLTNBSV	Fleet Narrowband Secure Voice
FLTR	Filter
FLTSAT	Fleet Satellite
FLTSAT A	Follow-on to Current Fleet Satellite [formerly LEASAT]
FLTSATBCST	Fleet Satellite Broadcast
FLTSATCOM	Fleet Satellite Communications
FLX	Fiber Loop Access
FM	Frequency Modulation
FMCP	Force Management Communications Plan
FMEA	Failure Mode and Effects Analysis
FMHS	Formal Message Handling Service
FMIS	Financial Management Information System
FMOCC	Fleet Mobile Operational Command Center
FMOP	Frequency Modulated On Pulse
FMOS	Formatted Message Origination System
FMP	Fleet Modernization Program
FMS	File Maintenance System
	Formal Message Server
FMT	Format
FO	Fiber-Optics
FOA	Fitting Out Availability
FOAL	Fiber Optic Antenna Link
FOC	Final Operating Capability
	Fleet Operations Center
	Full Operational Capability
FOCA	Fiber-Optic Cable Assembly
FOD	Function Operational Design
FOIA	Freedom of Information Act
FOL	Fiber-Optic Landline
FOMAU	Figure of Merit
FOMAU	Fiber Optic Medium Attachment Unit
FOMIS	Fitting-Out Management Information System
FOO	Follow-On Outfitting
FOR	Functional Operating Requirements
FORACS	Fleet Operational Readiness Accuracy Check and Site Operations
FORMETS	NATO Message Text Formatting System
FORTRAN	Formula Translation
FOS	Final Operating System
	Functional Operational Specification
FOSIC	Fleet Ocean Surveillance Information Center
FOSIF	Fleet Ocean Surveillance Information Facility
FOSS	Fiber Optic Sensor System
	Follow-On System Stock
FOT	Follow-On Operational Test
FOT&E	Follow-on Test & Evaluation
FOTAS	Fleet Operational Telecommunications Automated Control System
FOTC	Force Over The Horizon – Targeting (OTH-T) Track Coordinator
FOTP	Fleet Operational Telecommunications Program
FOTS	Fiber-Optic Transmission System
FOUO	For Official Use Only

FOV	Field of View
FPA	Fixed Plant Adapter
	Focal Plane Array
FPB	Fast Patrol Boat
FPC	Front Panel Controller
FPGA	Field-Programmable Gate Array
FPI	Functional Process Improvement
FPO	Fleet Post Office
FPR	Federal Procurement Regulation
FPT	Fleet Project Team
	Full Period Termination
FPU	Floating Point Unit
	Forwarding Participating Unit
FQR	Formal Qualification Review
FQT	Formal Qualification Test
	Functional Qualification Test
FRACAS	Failure Reporting Analysis and Corrective Action System
FRCB	Fleet Readiness Certification Board
FRCT	Fixed Record Communications Terminal
FRD	Functional Requirements Description
	Functional Requirements Document
FRI	Fleet Routing Indicator
FRID	Functional Requirements and Interface Document
FRRS	Frequency Resource Record System
FRWG	Fleet Requirement Working Group
FRZ LVL	Freeze Level
FS	First Stage
FSB	Fleet Satellite Broadcast
FSBS	Fleet Satellite Broadcast System
FSC	File Server Control
	File System Control
FSCS	Fleet Satellite Communications System
	Full-Scale Development
	Functional Statement Document
FSDPSK	Filtered Symmetric Dual Phase Shift Keying (DPSK)
FSDWG	Functional Segment Development Working Group
FSED	Full-Scale Engineering Development
FSI	Functionally Significant Items
FSK	Frequency Shift Keying
FSM	Fleet Satellite Communications (FLTSATCOM) Spectrum Monitor
FSP	Full Scale Production
FSR	Frequency Select Receiver
FSS	Functional System Specification
FSTC	Foreign Science and Technology Division
FSTS	Federal Secure Telephone Service
FSVS	Future Secure Voice System
FT	Feet
FTA	Fast Time Analyzer
FTAM	File Transfer, Access and Management
	File Transfer Access Method
FTAS	Fast Time Analysis System
FTC	Fast Time Constant
	Fleet Training Center
	Force Track Coordinator
FTCN	Fleet Telecommunications Conference Network
FTD	Foreign Technology Formal Test Description
FTE	Field Test Extender
FTI	Fixed Target Indicator

FTOC	Fleet Tactical Operations Center
	Fleet Telecommunications Operations Center
FTP	File Transfer Protocol
FTR	File Transfer Receive
FTS	Federal Telecommunications System
	Fie Transfer Send
	Flexible Turret System
	Frequency Time Standard
FTS-2000	Federal Telecommunications Services - 2000
FTSC	Federal Technical Support Center
	Federal Telecommunications Standards Committee
FTSR	Feeder Telecommunications Service Request
FTTC	Fiber to the Curb
FTTS	Factor-to-Target Sequence
FU/DP	File Upload/Download Protocol
FUD	Field Use Designator
FVLF	Fixed Very Low Frequency
FVNI	Flexible Bit Rate Voice Subsystem (FLEXVOICE) Voice Network Interface
FVPP	Flexible Bit Rate Voice Subsystem (FLEXVOICE) Voice Packet Processor
FVSI	Flexible Bit Rate Voice Subsystem (FLEXVOICE) Voice Subscriber Interface
FVVI	Flexible Bit Rate Voice Subsystem (FLEXVOICE) Voice Vocoder Interface
FWC	Fleet Weather Center
	Force Weapon Coordinator
FWD	Forward
FWF	Fleet Weather Facility
FWO	Fleet Watch Officer
FWSEB	Fleet Warfare System Engineering Board
FY	Fiscal Year
FYCP	Future Years Corporate Plan
FYDP	Five Year Defense Plan
	Future Years Defense Plan
FYI	For Your Information
FYIAP	Five Year Interoperability Assurance Plan
FYMOP	Five Year Master Objectives Program
G&A	General & Administrative
G&C	Guidance & Control
G&G	Gravity & Geodetic
G/T	Antenna Gain/Temperature Ratio
GACT	Graphic Analysis and Correlation Terminal
GADS	Geographic and Alphanumeric Display System
GAE	Generic Application Environment
GAPSAT	Gapfiller Satellite
GAT	Government Acceptance Tests
GATS	General Access Time Slot
Gb	Giga-Byte
GBS	Global Broadcast Service
	Ground Based Sensor
GBS CAP	Global Broadcast Service Channel Access Protocol
GBS RF Switch	Global Broadcast Service Radio Frequency Switch
GCCS	Global Command and Control System
GCCSM	Global Command and Control System Maritime
GCO	Government Concept of Operations
GCOS	General Comprehensive Operating System
GCP	Ground Control Processor
GCR	Group Encoded Recording

GCS	Ground Central Station
	Ground Communications Segment
GCSS	Global Combat Support System
GDD/D	Global Data Dictionary/Directory
GDEM	Generalized Digital Environmental Model
GDS	Gridlock Data System
GDSO	Geographically Distributed Seamless Organization
GDT	Graphics Display Terminal
GEA	Guidance Electronics Assembly
GENSER	General Service
GENSER ADP	General Service Automatic Data Processing
GENSER R	General Services Routing Indicators
GENSER/ISS	General Service/Intelligence Support System
GEO	Geosynchronous Earth Orbit
GEODSS	Ground-Based Electro-Optical Deep Space Surveillance
GEOS	Geodesic Earth Orbiting Satellite
	Geosynchronous
GEOSAT	Geostationary Satellite
GEP	Ground Entry Points
GETS	Government Emergency Telecommunications System
GFCP	Generic Front-End Co-Processor
GFD	Government Furnished Data
GFE	Government Furnished Equipment
GFI	Government Furnished Item
GFM	Government Furnished Material
GFP	Government Furnished Property
GFR	General Functional Requirement
GFS	Government Furnished Services
GG	GateGuard
GGP	Gateway to Gateway Protocol
GHz	Gigahertz [109 cycles per second]
GIDEP	Government-Industry Data Exchange Program
GIGO	Garbage In, Garbage Out
GII	Global Information Infrastructure
GIP	Gateway Interface Processor
GIS	Geographic Information System
GITN	Government Open Systems Interconnection Profile (GOSIP) Interoperability Test Network
GITS	Government Information Technology Service
GIU	Ground Interface Unit
GIWS	Graphic Icons/Windows Selection
GKS	Graphic Kernel System
GLE	Government Loaned Equipment
GLLD	Ground Laser Locater Designator
GLOBIXS	Global Information Exchange System
GLOMR	Global Low Orbiting Message Relay
GMDSS	Global Maritime Distress and Safety System
GME	Gimbal-Mounted Electronics
GMF	General Message File
	Ground Mobile Forces
GMFSC	Ground Mobile Forces Satellite Communications
GMN	General Message Number
GMR	Generic Mission Replay
GMS	Ground Mobile Segment
GMT	Greenwich Mean Time
GND	Ground
GNDACF	Ground Alternate Command Facility
GNI	Global Network Initiative
GNMP	Government Network Management Profile

GOCO	Government-Owned, Contractor-Operated
GOE	Government-Owned Equipment
GOGO	Government-Owned, Government-Operated
GOR	General Operational Requirement
GORD	Government Open Systems Interconnection Profile (GOSIP) Register Database
GOSIP	Grade of Service
	Government Open Systems Interconnection Profile
	Government Open Systems Interface Protocol
	Government OSI Protocol Suite
GOSIUG	Government Open Systems Interconnection User's Group
GOTS	Government Off-The-Shelf
GP	General Purpose
	Government Property
	Group
GP-SHF	General Purpose Super High Frequency
GP-UHF	General Purpose Ultra High Frequency
GPD	General Purpose Device
GPEE	General Purpose Encryption Equipment
GPETE	General Purpose Electronic Test Equipment
GPF	General Purpose Force
	Ground Processing Facility
GPIB	General Purpose Interface Bus
GPNF	General Purpose Naval Forces
GPRA	Government Performance Results Act
GPS	Global Positioning System
	Global Positioning System [NAVSTAR]
	Ground Positioning System
	Ground Processing Stations
GPCS	General Purpose Satellite Communications System
GPTE	General Purpose Test Equipment
GQI	Get Queue Item
GRA	Government Research Announcement
GRAD LVL	Gradient Level
GRD	Government Furnished Data
	Ground Resolved Distance
"GREEN $"	Marine Corps Appropriations [CMC-sponsored]
GRNC	Groups Not Counted
GRTS	General Remote Terminal System
GRTS II	General Remote Terminal System Supervisor
GS	General Support
GSD	Generic Security Device
GSE	Government Support Equipment
GSFC	Goddard Space Flight Center, Washington, DC
GSM	Ground Station Module (JSTARS)
GSMC	Geospatial Standards Management Committee
GSORTS	Global Command and Control System (GCCS) Status of Resources and Training System
	Generic Security Service
GSS	Gravity Sensors System
GTD	Government Task Director
GTN	Global Transportation Network
GTO	Geosynchronous Transfer Orbit
GTP	Generic Technology Platform
GTS	Global Telecommunications Service
	Global Telecommunications System
	Go to Sync
GTT	Government Test Team
GUAM	Ship Repair Facility, Guam

GUI	Graphical User Interface
GUPEL	Guidance Package Error Levels
GUST	Global User Service Task
GVD	Group View Display
GW	Gateway
GWEN	Ground Wave Emergency Network [Air Force]
H/W	Hardware
H2P	Host-to-Host Protection
HAMA	Haul-off Adaptive Multiple Access
HARDMAN	Hardware Manpower
HAT	Hardware Acceptance Test
HAVEQUICK	Anti-Jam Radio System
HAZCON	Hazardous Condition
HAZMAT	Hazardous Materials
HDB3	High-Density Bipolar with Three-Zero Substitution
HC	Hard Copy
	Host Concentrator
HCA	Hardware Configuration
HCB	Header Control Block
HCI	Human-Computer Interface
HCTR	High Capacity Thinking Radio
HCU	High-capacity Computer Unit
HDBK	Handbook
HDD	Hard Disk Drive
HDF DIFAR	High Density Field Directional Frequency and Ranging
HDH	High-Level Data Link Control Distant Host
HDI	High Density Interconnect
HDLC	High-Level Data Link Control Protocol
HDR	Header
	High Data Rate
HDSL	High-Bit-Rate Digital Subscriber Line
HDTV	High Definition Television
HDUX	Half Duplex
HDX	Half Duplex
HEET	Header Extract Electrical Transmission
HEM	Hold at End of Message
HEMP	High Altitude Electromagnetic Pulse
HEMT	High Electron Mobility Transistor
HEO	Highly-Inclined Earth Orbit
HERF	Hazards of Electromagnetic Radiation to Fuel
HERO	Hazards of Electromagnetic Radiation to Ordnance
HERP	Hazards of Electromagnetic Radiation to Personnel
HEWG	Hardware Engineering Working Group
HEX	Hexadecimal
HF	High Frequency [3 MHz-30 MHz]
HF/DP	High Frequency/Display Processor
HF/LRI	High Frequency/Limited Range Intercept
HFAJ	High Frequency Anti-Jam
HFAL	High Frequency Automatic Link Establishment
HF CAP	High Frequency Channel Access Protocol
HFCC	High Frequency Communications Control [USMC Program]
HFCT	High Frequency Communications Terminal
HFD	Halt Duplex
HFDF	High Frequency Direction Finding
HFDM	High Frequency Digital Modem
HFDS	High Frequency Data System
HFE	Human Factors Engineering
HFEP	Host Front-End Processor
HFIC	High Frequency Intra-Task Force Communications

HFIP	High Frequency Improvement Program
HFIXS	High Frequency Information Exchange Subsystem
HFP	Host to Front End Processor
HFPPM	High Frequency Performance Prediction Model
HFRG	High Frequency Radio Group
HFXS	High Frequency Transmission Subsystem
HHLR	Hand-Held Laser Rangefinder
HHR	High Hop Rate
HIA	Held in Abeyance
HIDAR	High Data Rate
HIFOM	High Figure of Merit
HIMUX	High Frequency Multiplexer
HIO	High/Highly-Inclined Orbit
HIP	Host to (Internet Private Line Interface) Protocol
HIPPI	High Performance Parallel Interface
HLA	Horizontal Line Array
HLP	Host Level Program
HLT	High Level Terminal
HMA	Hull Mounted Array
HMI	Human-Machine Interface
HMP	Host Management Protocol
HNA	Host Nation Approval
	Host National Approval
HNCA	Host Nation Connection Approval
HNS	Host-Nation Support
	Hughes Network Systems
HOC	Hybrid Operational Control
HOE	Homing Overlay Experiment
HOL	High Order Language
HP	Hewlett-Packard
HPA	High Power Amplifier
	Horizontal Planar Array
HPBW	Half Power Beam Width
HPI	High Power Illuminator
HPR	Hardware Problem Report
HPS	Hops per Second
HPSC	High Performance Super Computer
HPSLTC	Hunters Point Surface Launch Test Center
HRA	Heading Reference Assembly
	Hull Receiving Array
HRB	Hardware Review Board
HRCS	High Resolution Camera System
HRS	Horizon Reference Set
HFSB	High Speed Fleet Broadcast
HSI	Human Systems Integration
HSIP	Human Systems Integration Plan
HSLP	High Speed Line Printer
HSP	High-Speed Printer
HSPTR	High-Speed Printer
HSTDM	High Speed Time Division Multiplexer
HSTP	High Speed Tape Punch
HSTR	High Speed Tape Reader
HTI	Horizontal Technology Integration
HTML	Hyper Text Markup Language
HTR	Hardware Trouble Report
HTTP	Hyper Text Transfer Protocol
HTU	Handheld Terminal Unit
HUD	Head-Up Display
HULTEC	Hull to Emitter Correlation

HUMINT	Human Intelligence
HVAC	Heating, Ventilation, and Air Conditioning
HVD	Hub Vortex Dissipater
HVPS	High Volt Power Supply
HVU	High Value Unit
HW	Hardware
HWCI	Hardware Configuration Item
HYDRA	Hierarchical yet Dynamic Radio Architecture
Hz	Hertz
I	Intermediate
I.P.	Isolated Program
I&A	Identification & Authentication
I&C	Installation & Checkout
I&L	Installation & Logistics
I&W	Indications & Warning
I-CASE	Integrated-Computer Aided Software Engineering
I-Level	Intermediate Level
I-S/A	Inter-Service/Agency
I-S/AAMPE	Inter-Service/Agency Automated Message Processing Equipment
I-SALTSTM	International-Streamlined Automated Logistics Transmission System
I/A	Interactive
I/C	Intercommunications
I/F	Interface
I/IP	Implementation/Installation Plan
I/O	Input/Output
I/R	Inrouter
IA	Imaginary Analysis
	Independent Assessment
	Information Assurance
	Installation Activity
IAB	Internet Activities Board
	Internet Architecture Board
IAC	Information Analysis Center
	Integration, Assembly and Checkout
	Intelligence Analysis Center
	Inter-Array Communication
IACK	Interrupt Acknowledge
IACS	Integrated Acoustic Communications System
IAD	Integrated Acoustic Display
IADB	Interoperability Assurance Data Base
IADL	Interoperable Airborne Data Link
IADS	Integrated Air Defense System
IADT	Integrated Automatic Detection and Tracking
IAISG	Information Architecture and Integration Subgroup
IAMPS	Interim Anti-Submarine Warfare Operations Center (ASWOC) Message Processing System
IANTN	Inter-American Navy Teletypewriter Network
IAP	Improved Accuracy Program
	Independent Assessment Plan
IAP/I/II	Inter-Array Processor I/II
IAR	Interoperability Assessment Report
IAS	Intelligence Analysis System
IATO	Interim Authority to Operate
IAW	In Accordance With
IBC	In-Band Control
IBF	Intra-Boundary Format
IBM	International Business Machines
IBS	Integrated Broadcast Service

IC	Identification Code
	Installation Component
	Integrated Circuit
	Integration Control
	Intelligence Center
	Intercept Control
	Intercommunications
IC	Interface Certification
	Interior Communications
IC/NIPS	Intelligence Center/Navy Intelligence Processing System
ICA	Integrated Communications Architecture
ICAD	Integrated Control and Display
ICAPA	Integrated Circuit Active Phased Array
ICAPS	Integrated Carrier Anti-Submarine Warfare Prediction System
	Interactive Computer-Aided Provisioning System
ICATS	Intermediate Capacity Automated Telecommunications System
ICBD	Interim Concept Baseline Design
ICC	Information Coordination Control
	Integrated Control Center
ICC/TABP	Improved Computer Capacity/Towed Array Broadband Processing
ICCB	Interoperability Configuration Control Board
ICCCM	Inter-Client Communications Conventions Manual
ICCD	Interface Coordination Control Drawing
ICD	Initiative Communications Display
	Installation Control Drawing
	Interface Control Document
	Interface Control Drawing
ICDB	Integrated Communications Database
ICDC	Improved Control and Display Console
ICDSN	Input Channel Designator/Sequence Number
ICE	Independent Cost Estimate
	Interface Connector Extender
ICEP	Interface Control Electronics Package
ICF	Interconnect Facility
ICID	Input Channel Identifier
ICL	Integrated Configuration List
ICM	Influence Countermeasure
	Interface Configuration Management
ICMP	Internet Control Message Protocol
ICO	Inclined Circular Orbit
ICP	Interface Change Proposal
	Interoperability Change Proposal
ICR	Item Control Recommendation
ICS	Integrated Command System
	Integrated Communications System
	Inter-Communication Set
	Integrated Control Systems, Inc
ICSE	Integrated C4I Systems Engineering
ICSN	Incoming Channel Sequence Number
ICSP	Integrated Communications Support Plan
ICSS	Integrated Communications Switching Systems
ICSTF	Integrated Combat Systems Test Facility
ICT	Interface Certification Test
	Integrated Communications Terminal
ICU	Interface Control Unit
ICW	Interactive Courseware
ICWG	Information and Cutover Working Group
	Interface Control Working Group
ID	Identification

	Interface Device
IDAC	Inter-Digital Analog Converter
	Interference Detection and Characterization
IDAS	Integrated Data Acquisition System
IDB	Integrated Database
	Interoperability Database
IDBEF	Integrated Database Extract Format
IDBMS	Integrated Database Management System
IDBTF	Integrated Database Transaction Format
IDD	Information Data Display
	Interface Design Document
IDE	Integrated Drive Electronics
	Interactive Development Environment
IDEAS	Intelligence Data Elements Authorized Standards
IDEF	Integrated (Computer-Aided Manufacturing) Definition
	Integrated Definition Language
IDF	Intermediate Distributing Frame
IDH	Interface Design Handbook
IDHS	Intelligence Data Handling System
IDHSC	Intelligence Data Handling System Communications II
IDI	Initial Domain Identifier
IDIC	Intelligence Division Indication Center
IDIQ	Indefinite Delivery, Indefinite Quantity
IDL	Interoperable Data Link
IDM	Interim Demand Assigned Multiple Access Modification
IDMS	Integrated Database Management System
IDMS II	Integrated Database Management System Two
IDN	Integrated Data Network
IDNMA	Integrated Data Management System (DMS) Network Management Acquisition
IDNX	Integrated Digital Network Exchange
IDP	Initial Domain Part
	Installation Design Plan
	Inter-Digital Pause
	Integrated Data Processing
IDPS	Intelligence Data Processing System
IDR	Installation Design Review
IDQ	Identifier Queue Report
IDS	Identification Supervisor
	Information and Display System
	Integrated Data Services
	Integrated Data Store
	Interface Design Specification
	Interface Design Standards
	Intrusion Detection System
IDS-MIS	Integrated Data Services-Management Information System
IDSCP	Initial Defense Satellite Communications Program
IDSCS	Initial Defense Satellite Communications System
IDSM	Intermediate Direct Support Maintenance
IDSS	Interoperability Decision Support System
IE	Information Engineering
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IEMATS	Improved Emergency Message Automatic Transmission System
IEMH	Installation Electronic Message Host
IEP	Independent Evaluation Plan
IER	Independent Evaluation Report
	Information Exchange Requirements
IET	Installation Evaluation Test

IETF	Internet Engineering Task Force
IETM	Interactive Electronic Technical Manual
IEWS	Intelligence Electronic Warfare System
IF	Industrial Fund
	Intermediate Frequency
IFCC	Interim Fleet Command Center
IFDS	Integrated Flagship Data System
IFIP	International Federation of Information Processing
IFM	Instantaneous Frequency Measurement
IFS	Interface Control Specification
IFSBS	Integrated Fleet Submarine Broadcast System
IFSM	Interim Fleet Satellite Communications (FLTSATCOM) Spectrum Monitor
IFTAS	Interim Fast Time Analyzer System
IFU	Interface Unit
IG	Implementation Group
	Inspector General
	Intelligent Gateway
	Interconnecting Group
IGDL	Interoperable Ground Data Link
IGES	Initial Graphics Exchange Specification
IGMP	Internet Group Management Protocol
IGOSS	Industry/Government Open System Specification
IGP	Integrated Gateway Processor
	Intelligent Gateway Processor
	Interior Gateway Protocol
IGRP	Interior Gateway Routing Protocol
IGW	Integral Gateway
IH	Inert Head
IHCC	Internal Handling Control Console
IHFR	Improved High Frequency Radio
IHG	Integration Housing Group
II	Imagery Interpretation
IID	Integrated Information Display
IINCOM	Intra-Theater Intelligence Communication
IINCOMNET	Intra-Theater Intelligence Communication Network
IINCOMRAD	Intra-Theater Intelligence Communication Radio
IIP	Implementation Installation Plan
	Interoperability Improvement Panel
	Interoperability Improvement Program
	Imagery Intelligence Report
IIR	Imaging Infrared
IIS	Intelligence Information System
	Interagency Information System
IITIS	Intra-Theater Imagery Transmission System
IITS	Installation/Information Transfer System
IJMS	Interim Joint Tactical Information Distribution System (JTIDS) Message Specification
ILAP	Integrated Logistics Analysis Program
ILCS	International Logistics Communications System
ILGSD	Industrial Logistics Systems Directorate
ILS	Integrated Logistics Support
ILSIS	Integrated Logistic Support Information System
ILSM	Integrated Logistic Support Manager
ILSMP	Integrated Logistic Support Management Plan
ILSMT	Integrated Logistics Support Management Team
ILSP	Integrated Logistic Support Plan
ILSS	Integrated Logistics Support Summary
ILSWG	Integrated Logistics Support Working Group

IM	Installation Manager
	Intermodulation
	Inventory Manager
IMA	Installation Management Activity
IMC	Integrated Management Center
	Inter-Module Communication
	Item Management Code
IMCS	Integrated Maritime Communications System
IMI	Intermodulation Interference
IMINT	Imagery Intelligence
IMO	Installation Management Office
	International Maritime Organization
IMP	Integrated Management Plan
	Integrated Master Plan
	Integrated Monitor Panel
	Interface Message Processor
	Interoperability Management Plan
	Interpersonal Message Protocol
IMS	Integrated Master Schedule
IMSP	Installation Management Surveillance Plan
IMTA	Intermediate Message Transfer Agent
INA	Information Networking Architecture
INAC	Inactivation
INC	Interface Network Controller
INCA	Intelligence Communications Architecture
INCO	Installation and Checkout
INCR	Increase
INE	In-Line Network Encryptors
INFO	Information Addressee of a Message
INFORM	Information Network for On-Line Retrieved Modules
INFOSEC	Information Security
INGRES	Interactive Graphics Retrieval System
INGSLD	Ingleside, TX, homeport
INHIB	Inhibit
INHR	In-House Program Review
INID	Immediate Diversion Network-Inward-Dialing
INM	Integrated Network Management
INMARSAT	International Maritime Satellite [commercial]
INMS	Integrated Network Management System
INS	Inertial Navigation System
	Institute of Naval Studies
INST	Information Standards and Technology Standardization Area
INSTAL	Installation
INSURV	Board of Inspection and Survey
INT	Interim
INTEL	Intelligence
INTEL & SEC	Intelligence & Security
INTELCAST	Intelligence Broadcast
INTELDATA	Intelligence Data
INTELNET	Special Intelligence Contingency Satellite Network
INTELSET	International Telecommunications Satellite
INTSUM	Intelligence Summary
INV	Invalid
INX	Information Exchange
IO	Indian Ocean
IOC	Initial Operating Capability
	Initial Operational Capability
IOC&E	Initial Operational Checkout & Evaluation
IOCC	Input/Output Control Console

IOCDS	Initial Operational Capability Directory Service
IOIC	Integrated Operational Intelligence Center
IOP	Input/Output Processor
	Interface Operating Procedure
IOS	Integrated Observation System
IOT	Initial Operational Test
IOT&E	Initial Operational Test & Evaluation
IP	Imagery Processing
	Information Precedence
	Information Processing
	Installation Plan
	Intermediate Processor
	Internet Protocol
IP___	Internet Protocol packet data services
IPA	Information Processing Activity
	Integrated Program Assessment
IPAC	Intelligence Center, Pacific
IPAD	Integrated Planning and Assessment Directorate
IPADD	Internet Protocol Addressing
IPAT	In-Plant Acceptance Test
IPB	Intelligence Preparation of the Battlefield
	Interoperability Policy Board
IPC	Information Policy Council
	Information Processing Center
	Inter-Process Communication
IPD	Integrated Product Development
IPDS	Imagery Processing and Dissemination System
IPF	Integrated Processing Facility
	Intelligence Processing Facility
IPGY	Internet Protocol Gateway
IPL	Initial Program Load
IPLI	Internet Private Line Interface
IPM	Implementation or Integrating Project Manager
	Interpersonal Messaging
IPMS	Information Processing Management System
	Interpersonal Messaging System
IPMUA	Interpersonal Message User Agent
IPN	Interpersonal Notification
IPP	Integrated Program Plan
IPPD	Integrated Process and Product Development
IPR	In Process Review
	Internet Protocol Router
IPS	Information Planning System
	Information Processing System
	Integrated Program Summary
	Integrated Propulsion System
IPSC	Information Processing Standards for Computers
IPSMG	Information Processing Standards Management Group
IPSO	Internet Protocol Security Option
IPT	Initial Production Test
	Integrated Product Team
	Integrated Program Team
IPTD	Information Processing Test Directorate
IPTO	Information Processing Techniques Office
IQS	Input Queue Summary
IQX	Internetwork Packet Exchange
IR	Information Resources
	Infrared
	Intelligence Report

	Interoperability Requirements
IR&D	Independent Research & Development
IR/OED	Independent Research/Independent Exploratory Development
IR2	Integrated Radio Room [Trident]
IRA	Intelligence Related Activities
	Interface Requirements Analysis
IRAC	Interdepartment Radio Advisory Committee
IRCC	International Radio Consultative Committee
IRCM	Infrared Countermeasures
IRCO	Information Requirements Control Officer
IRD	Installation Requirements Drawings
	Integrated Receiver/Descrambler
	Interface Requirements Document
	Interoperability Requirements Document
IRDS	Information Resource Distribution System
IRE	Institute of Radio Engineers
IRIG	Inertial Reference Integrating Gyro
IRM	Information Resource Management
	Intelligence Requirements Management
IRN	Interface Revision Notice
IROC	Intrusion-Resistant Optical Cable
IRP	Interference Rejection Processing
IRR	Installation Readiness Review
	Integrated Radio Room [Trident]
IRS	Interface Requirements Specifications
IRT	In Reference To
	In Response To
IS	Information System
	Intermediate System
	Interstage Section
IS-IS	Intermediate System-Intermediate System
IS3	Integrated Satellite Selection Switch
ISA	Imagery Sensor Autoprocessor
	Information System Architecture
	International Security Affairs
ISABPS	Integrated Submarine Automated Broadcast Processing System
ISACS	Inter-Systems Applications Communications Services
ISB	Independent Sideband
	Intelligence System Board
ISC	Information Service Center
	Integrated Systems Control
	Intersite System Control
ISC/SCAN	Integrated Communications System/Shipboard Communications Area Network
ISD	Information System Display
	Instructional Systems Development
ISDB	Integrated Satellite Communications Database
	Interoperability Standards Database
ISDN	Integrated Services Digital Network
ISDS	Intelligence Support Display System
ISEA	In Service Engineering Activity
	In Service Engineering Agent
ISEC	Information Systems Engineering Center
ISF	Intelligence Support Facility
ISG	Intelligence Support Group
ISIP	Integrated Signal/Information Processing
ISIS	Integrated Signals Intelligence System Intersite Link
ISMC	Imagery Standards Management Committee
	Information Systems Management Center

ISME	International Subject Matter Experts
ISMO	Information Systems Management Organization
ISN	Input Sequence Number
	Internal Sequence Number
ISO	Information Systems Office
	Internal Organization for Standardization
	International Standards Organization
ISOC	Internet Society
ISP	Inside Plant
	International Standardized Profiles
	Interoperability Support Program
ISR	Installation Status Review
	Intelligence Surveillance and Reconnaissance
ISRR	Internal System Requirement Review
ISS	Information Systems Security
	Intelligence Support System
ISS ADP	Intelligence Support System Automated Data Processing
ISSA	Inter-Service Support Agreement
ISSO	Information System Security Officer
	Information Services Support Officer
ISSP	Information System Security Policy
IST	lnterswitch Trunk
ISTD	Information Systems Test Division
ISU	Information Systems Unit
ISWG	Information Systems Working Group
ISYSCON	Integrated System Control
IT	Information Technical
	Information Technology
	Installation Telecommunications Center (TCC)
	Integration Test
IT&A	Installation, Test & Acceptance
IT-21	Information Technology for the 21st Century
ITA	International Telegraphic Alphabet
ITA-2	International Telegraph Alphabet -Two
ITABBS	Information Technology Acquisition Bulletin Board Service
ITAC	Intelligence and Threat Analysis Center
ITAM	Information Technology Asset Management
ITAP	Integrated Technical Application Program
ITB	Intermediate Text Block
ITEM	Interactive Electronic Technical Manual
ITF	Integration Test Facility
	Intelligence Task Force
	Intra-Task Force
ITFCC	Interim Tactical Flag Command Center
ITIP	Integrated Transition Implementation Plan
ITOP	Integrated Test Operational Panel
ITP	Integrated Test Package
	Integrated Terminal Program
	Interoperability Test Panel
	Interoperability Test Program
	Integrated Test Program
ITR	Interoperability Test Report
ITRG	Interoperability Technical Review Group
ITS	Information Technology Standards
	Information Transfer System
	Institute for Telecommunications Sciences
	Integrated Telecommunications Systems
	Interoperability Test Suite
ITSEC	Information Technology Security Evaluation Criteria

ITSEM	Information Technology Security Evaluation Manual
ITSI/BBS	Information Technology Standards Integrated/Bulletin Board Service
ITSIM	Information Transport Systems Installation Manual
ITSPO	Information Technology Standards Program Office
ITTD	Information Transfer Test Directorate
ITU	Information Transport Utility
	International Telecommunications Union
ITU-T	International Telecommunications Union - Telecommunications
ITU-TSS	International Telecommunications Union - Telecommunications Standardization Section
ITV	Intransit Visibility
IUT	Implementation Under Test
IUT-SUT	Implementation Under Test - System Under Test
IV&V	Independent Verification & Validation
IVANS	International Value-Added Network Services
IVCS	Integrated VME Communications Systems
	Interior Voice Communications Systems
IVD	Interactive Videodisc
IVIS	Inter-Vehicle Information System
IVOX	Interactive Voice Exchange
IVTT	Integrated Very Low Frequency (VLF) Digital Information Network (VERD)
IWG	Internet Working Group
IX	Information Exchange
	Information Transfer
IXS	Information Exchange Subsystem
J&A	Justification & Analysis
	Justification & Approval
J&F	Justification & Findings
J-NET	Joint Development Laboratory-Simulation Network
J2	Intelligence (Joint Staff Directories)
J3	Joint Staff Director of Operations
JAAD	Justification, Approval and Acquisition Documentation
JAADS	Joint Interoperability of Tactical Command and Control Systems (JINTACCS) Automation Committee
JAC	Joint Interoperability of Tactical Command and Control Systems Automatic Committee
JAFPUB	Joint Armed Forces Publication
JAMES	Joint Automated Message Editing System
JAMPS	Joint Interoperability of Tactical Command and Control Systems Automated Message Preparation System
JAMS	Joint Interoperability of Tactical Command and Control Systems Automated Message System
JAN	Joint Army-Navy
	Justification for Authority to Negotiate
JANAF	Joint Army-Navy-Air Force
JANAP	Joint Army-Navy-Air Force Publications
JANSPEC	Joint Army-Navy Specification
JANUS	Joint Army-Navy Uniform Simulation
JARCC	Joint Air Reconnaissance Control Center
JARIC	Joint Air Reconnaissance Interpretation Center
JARP	Joint Analysis Review Panel
JATCCCS	Joint Advanced Tactical Command, Control and Communications System
JBBWG	Joint Baseband Working Group
JBS	Joint Broadcast Satellite System
JC3TC	Joint Command, Control and Communications (C3) Test Center
JCACC	Joint Contact Administration Coordinating Council

JCALS	Joint Computer-Aided Acquisition and Logistic Support
	Joint Computer-Aided Logistics System
JCCC	Joint Communications Control Center
JCCIP	Joint Command and Control Improvement Program
JCDSC	Joint Communications Decision Support Center
JCENS	Joint Communications Electronics Nomenclature System
JCG C-E	Joint Logistics Commanders Group for Communications-Electronics
JCIP	Joint Combined Interface Procedures
JCL	Job Control Language
	Joint Logistics Commanders
JCPMS	Joint Communications Planning and Management System
JCS	Joint Chiefs of Staff
JCSAN	Joint Chiefs of Staff Alerting Network
JCSC	Joint Communications Satellite Center
JCSE	Joint Communications Support Element
JDISS	Joint Deployable Intelligence Support System
	Joint Defense Intelligence Support System
JDIWG	Joint Demand Assigned Multiple Access (DAMA) Implementation Working Group
JDL	Joint Development Laboratory
JDS	Joint Deployment System
JDSSC	Joint Data Systems Support Center
JDT&E	Joint Development Test & Evaluation
JES	Joint Tactical Information Distribution System (JTIDS) Environment Simulator
JETDS	Joint Electronics Type Designation System
JEWC	Joint Electronics Warfare Center
JFAST	Joint Flow and Analysis System for Transportation
JFC	Joint Forces Commander
JFMCC	Joint Forces Maritime Component Commander
JFT	Julian Filing Time
JIB	Joint Information Bureau
JIC	Joint Intelligence Center
JIEO	Joint Interoperability and Engineering Organization
JIEP	Joint Intelligence Estimate for Planning
JIES	Joint Interoperability Evaluation System
JILSP	Joint Integrated Logistic Support Plan
JINTACCS	Joint Interoperability of Tactical Command and Control Systems
JIOP	Joint Interface Operational Procedure
JIP	Joint Interoperability for Tactical Command and Control Systems (JINTACCS) Implementation Plan
JIPC	Joint Imagery Processing Complex
JIT	Jittered
JITC	Joint Integrated Tactical Communications
	Joint Interoperability Technology Center
	Joint Interoperability Test Center
JITF	Joint Interface Test Force
JITPC	Joint Interface Test Processing Center
JITS	Joint Interface Test System
JLMT	Joint Logistics Management Team
JLREID	Joint Long-Range Estimate Intelligence Document
JLRSA	Joint Long-Range Strategic Approval
JLRSS	Joint Long-Range Strategic Supply
JLSC	Joint Logistics Systems Center
JMAS	Joint Mission Application Software
JMCIS	Joint Maritime Command Information System
JMCIS 98	Joint Maritime Command, Control, Communications, Computers and Intelligence (C4I) System

JMCOMS	Joint Maritime Communications System
	Joint Military Communications Strategy
JMENS	Joint Mission Element Needs Statement
JMINI	Joint Military Satellite Communications (MILSATCOM) Network Integration
JMOA	Joint Memorandum Of Agreement
JMOCC	Joint Mobile Operational Command Center
JMSN	Joint Military Switched Network
JMSNS	Justification for Major System New Start
JMSWG	Joint Tactical Information Distribution System (JTIDS) Message Standard Working Group
JMTSS	Joint Multi-Channel Trunking and Switching System
	Joint Maritime Tactical Switching System
JMTWG	Joint Military Satellite Communications (MILSATCOM) Technical Working Group
	Joint Military Satellite Communications (MILSATCOM) Technical Working Group (TWG)
JOA	Joint Operating Agreement
JOC	Joint Operations Center
JPES	Joint Operational Planning and Execution System
JOR	Joint Operational Requirement
JORD	Joint Operational Requirements Document
JOT&E	Joint Operational Test & Evaluation
JOTS	Joint Operational Tactical System
JP/CTAN	Joint Pacific/Command Teletype Alert Net
JPAM	Joint Program Assessment Memorandum
JPM	Joint Program Manager
JPN	Joint Integrated Tactical Communications (JITC) Project Number
JPO	Joint Program Office
	Joint Project Office
JPR	Joint Interoperability of Tactical Command and Control Systems Program Review
JPSD TF	Joint Precision Strike Demonstration Task Force
JPTDS	Junior Participating Tactical Data System
JPTT	Joint Portable Tactical Digital Information Link (TADIL) Tester
JPWG	Joint Projects Working Group
JQR	Job Qualification Requirement
JR	Jam Resistant
JRC	Joint Reconnaissance Center
JRDOD	Joint Research and Development Objectives Document
JRIS	Joint Reconnaissance Information System
JRMB	Joint Requirements and Management Board
JRNL	Journal
JROC	Joint Requirements Oversight Committee
	Joint Requirements Overview Council
JRS	Joint Reporting Structure
JRSC	Jam Resistant Secure Communications
	Jam Resistant Survivable Communications
JRWG	Joint Maritime Command Information System Requirements (JMICS) Working Group
JS	Joint Services
	Joint Staff
JSAMS	Joint Staff Automated Message System
JSAN	Joint Staff Automation of the Nineties
JSARO	Joint Service Agency Representative Office
JSC	Johnson Space Center, Houston, TX
	Joint Steering Committee
JSCP	Joint Strategic Capabilities Plan
JSEC	Joint Systems Engineering Center

JSG-TCCCS	Joint Standardization Group-Tactical Command Control Communications Systems
	Joint Standardization Group for Tactical Command, Control and Communications Systems
JSIA	Joint Service Interface Architecture
JSIPS	Joint Services Imagery Processing System
JSMB	Joint Space Management Board
JSNS	Justification for System New Start
JSO	Joint Service Office
JSOFC3IP	Joint Special Operations Force C3 Interoperability Program
JSOR	Joint Services Operational Requirement
JSORD	Joint Statement of Operational Requirements
JSPD	Joint Strategic Planning Document
JSPDSA	Joint Strategic Planning Document Support Analysis
JSPS	Joint Staff Planning System
	Joint Strategic Planning System
JSS	Joint Surveillance System
JSTPS	Joint Strategic Target Planning Staff
JT&E	Joint Test & Evaluation
JTA	Joint Tactical Agency
	Joint Technical Architecture
JTACMS	Joint Tactical Missile System
JTC	Joint Technical Committee
	Joint Test Center
JTC1	Joint Technical Committee One
JTC3-CDBS	Joint Tactical Command, Control and Communications Central Database System
JTC3-TC	Joint Tactical C3 Test Center
JTC3A	Joint Tactical Command, Control and Communications Agency
JTD	Joint Table of Distribution
JTE	Joint Test Element
JTF	Joint Task Force
	Joint Test Facility
JTFC	Joint Task Force Commander
JTFEX	Joint Fleet Exercise
JTFME	Joint Task Force Middle East
JTG	Joint Task Group
JTIDS	Joint Tactical Information Distribution System
JTLS	Joint Theater Level Simulator
JTPO	Joint Terminal Program Office
JTR	Joint Tactical Radio
JTRB	Joint Telecommunications Resources Board
JTSA	Joint Tactical Support Activity
JTSSG	Joint Telecommunications Standards Steering Group
JTT	Joint Tactical Terminal (JTT/CIB-M)
JTU	Joint Interoperability of Tactical Command and Control Systems (JINTACCS) Translator Unit
JU	Joint Tactical Information Distribution System Unit
JUDI	Joint Universal Data Interpreter
JUH	Joint User's Handbook
JUH-MTF	Joint User's Handbook for Message Text Formats
JULL	Joint Universal Lessons Learned
JUSMMAT	Joint United States Military Assistance, Turkey
JV	Joint Venture
JVE	Joint Verification
JVIDS	Joint Visually integrated Display System
JWICS	Joint Worldwide Intelligence Communications System
JWID	Joint Warrior Interoperability Demonstration
K	Key Generator

KAPP	Key Asset Protection Program
Kb	Kilobits
KB	Kilobytes
kbps	kilobits per second
KBS	Kilobytes per Second
KDC	Key Distribution Center [Cryptographic]
KDP	Keyboard Display Printer
KDT	Keyboard Display Terminal
KDU	Keyboard Display Unit
KEA	Key Exchange Algorithm
KEW	Kinetic Energy Weapons
KeyMat	Keying Material
KG	Key Generator [Encryption Device]
KGM	Key Generator Module
kHz	kilohertz [1000 cycles per second]
Km	Kilometer
KMGMT	Key Management
KMID	Key Materiel Identifier
KMP	Key Management Protocol
KMS	Key Management Service
KP	Key Processor
KRL	Key Revocation List
KSAM	Key Sequential Access Method
KSOS	Kernelized Secure Operating System
ksps	kilosymbols per second
KS/R	Keyboard Send/Receive
KT	Kiloton
	Knot
KTS	Key Telephone Set
kV/m	kiloVolts per meter
kVA	kilovolt-amperes
KVDT	Keyboard Video Display Terminal
KVDU	Keyboard Video Display Unit
KVG	Key Variable Generator [cryptographic term]
kW	kilowatt
KWEST	Key West, FL, homeport
KWOC	Keyword-Out-of-Context
L-Band	frequency band [390 MHz-1, 550 MHz]
LA	Local Authority
LAA	Limited Access Area
LAC	Link Access Control
LAG	Link Adaptor Group
LAN	Local Area Network
LANCE	Local Area Network Controller for Ethernet
LANDSAT	Land Satellite [NASA/NOAA Satellite Program]
LANL	Los Alamos National Laboratories, Los Alamos, NM
LANT	Atlantic
LANTFLT	Atlantic Fleet
LAP	Link Access Protocol
LAP B	Link Access Protocol Balanced
LAP D	Link Access Protocol Digital
	Link Access Procedure-D
LAPADS	Lightweight Acoustic Procession and Display System
LAPB	Link Access Protocol Balanced
LARG	Link Access Radio Group
LAS	Large Area Sensor
LASINT	Laser Intelligence
LAT	Latitude
LAV	Lifts Available

LAW	Local Available Workstation
LBCA	Limited Broadcast Control Authority
LBEF	Land Based Evaluation Facility
LBITS	Land-Based Integrated Test Site
LBO	Line Build Out
LBP	Land-Based Prototype
LBRA	Low Band Recorder Analyzer
LBTF	Land Based Test Facility
LBTS	Land-Based Test Site
LC	Launcher Console
	Line Control
LCAG	Locally Composed Address Group
LCB	Line Control Block
LCC	Launch Control Center
	Life Cycle Cost
	Local Control Center
LCCA	Life Cycle Cost Analysis
LCD	Liquid Crystal Display
LCG	Launcher Control Group
LCHDF	Low Cost High Density Field
LCHR	Launcher
LCM	Line Control Module
LCN	Local Computer Network
	Logical Channel Number
LCP	Launch Control Post
	Life Cycle Plan
LCREK	Naval Amphibious Base, Little Creek, VA
LCSS	Life Cycle Software Support
	Liquid Crystal Stereoscopic Shutter
LCST	Luke Air Force Base Communications Support Team
LCT	Limited Capability Terminal
	Low-Cost Terminal
LCU	Lightweight Computer Unit
	Line Control Unit
LDA	Line Device Assignment
LDAP	Light Directory Access Protocol
LDIB	Local Directory Information Database
LDMX	Local Digital Message Exchange
	Local Distribution Message Exchange
LDR	Leader
	Low Data Rate
LDS	Local Distribution System
	Line Encryptor
LEAD	Low-Cost Encryption and Authentication Device
LEASAT	Leased Satellite [commercial]
LED	Light Emitting Diode
	Local Area Network Encryption Device
LEIP	Link 11 Improvement Program
LEN	Large Extension Node
LENS	Large Extension Node Switch
LENSCE	Limited Energy Situation Correlation Element
LEO	Low Earth Orbit
LES	Lincoln Experimental Satellite
LF	Landing Force
	Line Feed
	Line Frequency [30kHz-300 kHz]
LFA	Low Frequency Active
LFAA	Low Frequency Active Adjunct
LFRU	Lowest Field Replacement Unit

LH	Link Header
LHR	Low Hop Rate
LIMDIS	Limited Distribution
LIN	Line Item Number
LINK 11	Naval Tactical Data System Data Link, Ship-Ship, Ship-Air
LINX	Logistics Information Exchange
LIO	Low/Lowly-Inclined Orbit
LIPS	Logistics Information Processing System
LIT	Line of Site Integrated Terminal
LIVID	Language Identification and Voice Identification
LL	Local Line
LLC	Local Line Configuration
	Logical Link Control
LLE	Link-Level Encryption
LLLTV	Low Light Level Television
LLN	Linear Lightwave Network
LMD	Lead Military Department
	Navy Key Distribution System (NKDS) Local Management Device
LMDS	Local Multipoint Distribution Service
LMF	Language Media Format
LNA	Low Noise Amplifier
LNB	Low Noise Block (Downconverter)
LNBLK	Lineblock
LNO	Liaison Officer
LO	Local Oscillator
	Low-Observable
LOA	Low Observable Antenna
LOC	Local Area Network Operations Center
	Lines of Code
LOCC	Local Operational Control Center
LOE	Level of Effort
LOF	Loss of Frame
LOS	Line-of-Sight
LOSIXS	Line of Sight Information Exchange Subsystem
LOSTFC	Line of Sight Task Force Communications
LOW	Link Order Wire
LP	Log Printer
LPA	Low Profile Antenna
LPA/PA	Low Profile Antenna/Pedestal Assembly
LPC	Linear Predictive Coding
LPD	Low Probability of Detection
LPE	Low Probability of Exploitation
LPH	Line Protocol Handler
LPI	Lines Per Inch
LPM	Lines Per Minute
LPSSA	Low Power SSA
LRAN	Local/Regional Access Node
LRC	Longitudinal Redundancy Check
LRIP	Low Rate Initial Production
LRM	Low Rate Multiplexer
LRN	Logical Reference Number
LRRS	Local Remote Retraining System
LRU	Line Replaceable Unit
	Lowest Replaceable Unit
LSA	Lead Standardization Activity
LSB	Least Significant Bit
	Lower Side Band
LSC	Lead System Command

LSD	Large Screen Display
	Loop Signaling Device
LSE	Local Subscriber Environment
LSG	Lateral Support Group
LSI	Large Scale Integration [circuit elements]
	Low Ship Impact
LSIR	Low Ship Impact Ranging
LST	Land Satellite Terminal
LSTDM	Low Speed Time Division Multiplexer
LSUS	Large Scale Unclassified System
LT	Letter of Transmittal
Lt	Light
LTA	Long Thin-Line Array
LTC	Line Termination Coordinator
	Line Type Code
LTM	Less than Major
LTP	Local Teletype Position
LTR	Letter
	Lost Termination Request
LU	Logical Unit
LUF	Lowest Usable Frequency
LWCA	Lightweight Communications Antenna
LWIR	Long Wave Infrared
Lx	Frequency Spectrum [950 MHz-1150 MHz]
M&C	Management & Control
	Monitoring & Control
M&S	Modeling & Simulation
M-DEMO	Maintenance Demonstration
M-UA	Military-User Agent
M/W	Microwave
MA	Mission Area
MAA	Mission Area Analysis
MAC	Media Access Control
	Message Authentification Code
MACSAT	Multiple Access Communications Satellite
MAD	Message Address Directory
MADA	Multiple Access Demand Assignment
	Multiple Access Discrete Address
MADC	Machine-Assisted Detection and Classification
MADS	Message Accountability Delivery System
MaGIC	Maritime Global Information Center
MAGTFC4I	Marine Air/Ground Task Force Command, Control, Communications, Computers and Intelligence
MAIS	Major Automated Information System
MAISRC	Major Automated IS Review Council
MAJB	Multiplexed Anti-Jam Broadcast
MAJCOM	Major Command
MAN	Metropolitan Area Network
MAP	Manufacturing Automation Profile
	Manufacturing Automation Protocol
MAPI	Microsoft's Mail Application Program Interface
MARAD	Maritime Administration
MARCORSYSCOM	Marine Corps Systems Command
MARD	Mission Analysis Requirement Document
MARDAN	Marine Digital Analyzer
MARE	Mare Island Naval Shipyard, CA
MARISAT	Maritime Satellite
MARS	Military Affiliate Radio Station
	Mobile Automatic Reporting System

MART	Modular Automated Multimedia Exchange (AMME) Remote Terminal
MAS	Military Agency for Standardization
	Mission Area Summary
MASC	Marine Air Ground Task Force Automated Service Center
MASE	Message Administration Service Element Meta-Assembler
MASEVR	Military Applications of Synthetic Environments and Virtual Reality
MASINT	Measurement and Signature Architecture
MASS	Magic Automated Data Processing Support System
MAST	Mobile Ashore Support Terminal
	Monopulse Anti-Sidelobe Technique
MATT	Multi-Mission Advanced Tactical Terminal
MAU	Media Attachment Unit
	Multiple Access Units
max	maximum
MAXI	Modular Architecture for the Exchange of Information
MAPT	Mayport, FL, homeport
MB	Megabyte
Mb/s	Megabits Per Second
MBA	Multiple Beam Antenna
MBI	Mailbox Interface
	Major Budget Issue
MBLT	Multiplexed Block Transfer
MBPS	Megabits Per Second
MBS	Military Base Standard
Mbyte	Megabyte
MC	Megacycle
	Message Code
	Mission Capable
	Mode Change
	Monitoring Center
MC&G	Mapping, Charting & Geodesy
MCA	Micro Channel Architecture
	Military Coordinating Activity
MCAR	Multichannel Acoustic Relay
MCATS	Medium Capacity Automated Telecommunication System
MCBF	Mean Cycles Between Failure
MCC	Mission Criticality Code
	Multichannel Communications Controller
MCCR	Mission Critical Computer Resource
MCCU	Multiple Channel Control Unit
MCDN	Marine Corps Data Network
MCDR	Multi-Channel Directional Frequency and Ranging Relay
MCDS	Message Call Detail System
MCE	Mission Control Element
	Modular Control Equipment
MCEB	Military Communications-Electronics Board
MCG&I	Mapping, Charting, Geodesic & Imagery
MCICS	Marine Corps Integrated Communications Support
MCIMP	Marine Corps Interoperability Configuration Management Plan
MCIXS	Maritime Cellular Information Exchange System
MCIXS CAP	Maritime Cellular Information Exchange System (MCIXS) Channel Access Protocol
MCIXS RF Switch	Maritime Cellular Information Exchange System (MCIXS) Radio Frequency Switch
MCJR	Multi-Channel Jezebel Relay
MCM	MultiChip Module
MCMT	Mean Corrective Maintenance Time

MCOTEA	Marine Corps Operational Test and Evaluation Activity
MCS	Master Control Station
	Mission Control System
	Message Conversion System
	Milstar Circuit Simulator
MCS-ENG	Maneuver Control System - Engineers
MCSMP	Message Conversion System Message Processor
MCST	Milstar Communications Support Tool
MCT	Message Control Table
	Movement Control Team
MCTSS	Master Clock and Timing Subsystem
MCU	Message Conversion Utility
	Mission Control Segment
	Mode Control Unit
	Modem Control Unit
	Multi-point Control Unit
MD	Management Domain
MDA	Milestone Decision Authority
MDC	Message Conversion System Directory Component
MDF	Main Distributing Frame
	Master Data File
MDL	Message Dissemination System
	Message Distribution System
MDM	Mode Division Multiplexing
	Monitor Drive Module
MDP	Master Design Plan
	Master Display Panel
MDR	Medium Data Rate
MDS	Mission Data Update
	Mission Display System
	Multipoint Distribution System
MDSE	Message Delivery Service Element
MDT	Mean Down Time
	Message Distribution Terminal
MDU	Message Dissemination Unit
MEA	Maintenance Engineering Analysis
MEB	Management Evaluation Board
MEC	Master Evaluation Center
	Minimum Essential Communications
MECC	Minimum Essential Communications Capability
MECC/A	Modularly Equipped and Configured Calibrator/Analyzer
MED	Mediterranean
	Message Element Dictionary
MEECN	Minimum Essential Emergency Communications Network
MEG	Megabytes
MEK	Message Encryption Key
MENS	Mission Element Need Statement
MEO	Medium Earth Orbit
MEP	Management Engineering Plan
MEPS	Message Editing and Preparation Service
MER	Manpower Estimate Report
MERS	Multifunction Electromagnetic Radiating System
MES	Message Entry System
MESFET	Metal Silicon Field Effect Transistor
MESSA	Mechanical Evaluation Surface Support Area
METCAL	Metrology Calibration
METOC	Meteorology and Oceanography Command
METRL	Metrology Requirements List
MF	Medium Frequency [300 kHz-3000 kHz]

MFC	Multi-Frequency Compelled Signaling
MF/D	Message Formatter/Deformatter
MFDn	Management Functional Domain n
MFG	Multi-Functional Gateway
MFI	Major Force Issue
	Multi-Function Interpreter
MFIP	Multi-Function Interoperability Processor
MFLOPS	Million Floating Point Operations Per Second
MFM	Modified Frequency Modulation
MFS	Multi-Function Switch
MG	Message Generation
MGMT.	Management
MGS	Movable Ground Station
MGS2	Message Generator System Two
MGT	Mobile Ground Terminals
MH	Message Handling
	Message Host
MHD	Moving Head Disk
MHP	Message Handling Protocol
MHS	Message Handling System
MHz	Megahertz j106 cycles per second]
MI	Multi-Installation
MICFAC	Mobile Integrated Command Facility
MICNS	Modular Integrated Communications and Navigation System
MICR	Magnetic Ink Character Recognition
Micro MAS	Microcomputer Based Message Analysis System
MIDAS	Management Information and Data Accounting System
MIDB	Modernized Integrated Database
MIDEASTFOR	Middle East Force
MIES	Multi-Imagery Exploitation System
MIIDS	Military Intelligence Integrated Data System
MIIDS/IDB	Military Intelligence Integrated Data System/Integrated Database
MIIPS	Military Intelligence Information Processing System
MIJI	Meaconing, Interference, Jamming, and Intrusion
MIL-HDBK	Military Handbook
MIL-SPEC	Military Specification
MIL-STD	Military Standard
MILCON	Military Construction
MILDEP	Military Department
MILNET	Military Network
MILRI	Military Routing Indicator
MILSATCOM	Military Satellite Communications
MILSTAR	Military Strategic, Tactical, and Relay Satellite Communication (SATCOM) System
MIM	Military Internet Multicast
MIME	Multipurpose Internet Mail Extensions
MINI TAC	Mini Terminal Access Controller
Mini-DAMA	Miniaturized Demand Assigned Multiple Access
MIP	Maintenance Index Page
MIPR	Message In Progress Report
	Military Interdepartmental Purchase Request
MIPS	Million Instructions Per Second
MISG	Message Handing System International Special Group
MISSI	Multilevel Information System Security initiative
MIT	Massachusetts Institute of Technology
MIT/LL	Massachusetts Institute of Technology, Lincoln Laboratory
MITT	Migration Implementation Transition Team
MJCS	Memorandum, Joint Chiefs of Staff
MJPO	Military Satellite Communication (MILSATCOM) Joint Program

	Office
MK	Mark
ML	Mail List
ML-N	Management List - Navy
MLA	Mail List Agent
MLAN	Militarized Local Area Network
MLD	Message Loading Device
MLDT	Mean Logistic Delay Time
MLMH	Multi-Level Mail Host
MLPP	Multi-Level Precedence and Preemption
MLS	Multi-Level Security
MLS DDN	Multi-Level Secure Defense Data Network
MM	Military Message
	Millimeter
MM&SC	Major Mission & Support Category
MM-AU	Military Messaging-Access Unit
MM-MS	Military Messaging-Message Store
MM-MTS	Military Messaging-Message Transfer Service
MMAC	Multi-Media Access Controller
MMBA	Multibeam Multimission Broadband Antenna
MMCC	Milstar Master Control Center
MMD	Mean Mission Duration
MMDF-II	Multi-Channel Memorandum Distribution Facility, Version Two
MME	Military Message Experiment
MMHS	Military Message Handling System
MMI	Man-Machine Interface
MMIC	Monolithic Microwave Integrated Circuit
MMID	Military Message Identification
MMITS	Modular Multifunction Information Transfer System
MMMBBA	Multi-Mission, Multi-Beams Broadband Antenna
MMPC	Multimedia Processor Chassis
MMPM	Minimum Essential Emergency Communications Network (MEECN) Message Processing Mode
MMPS	Minimum Essential Emergency Communications Network (MEECN) Message Processing System
MMS	Manufacturing Messaging Specification
	Meteorological Measurement System
	Military Message Service
	Military Message System
	Multi-level Mail Server
MMSN	Multi-Level Mail Server Network
MMTA	Military Messaging Transfer Agent
MMU	Mass Memory Unit
	Memory Management Unit
MMW	Millimeter Wave Radar
MNDS	Milstar Network Diagram Study
MNS	Mission Needs Statement
	Multilevel Mail Server
MNS-ORD	Mission Needs Statement-Operational Requirements Document
MNSSP	Multi-Level Network System Security Program
MOA	Memorandum of Agreement
	Mission Oriented Analysis
MOC	Milstar Operations Center
MOCMP	Milstar Operational Communications Management Plan
Mod	Modification
MODEM	Modulator/Demodulator
MOEP	Master Operational Evaluation Plan
MOI	Model Operating Instruction
MOMCOMS	Man On the Move Communications System

MONET	Mobile Operational Net
MOODS	Master Oceanographic Observation Data Set
MOP	Measure of Performance
	Memorandum of Policy
	Message Output Processor
MOPA	Master Oscillator Power Amplifier
MOR	Message of Record
	Military Operational Requirement
MOS	Measure of Stability
	Modular Operating System
MOSAIC	National Security Agency (NSA) Cryptographic Algorithm for Unclassified but Sensitive Data
MOSPF	Multicast Open Shortest Path First
MOSS	Mobile Oceanographic Support System
MOT	Method of Test
MOTIS	Message Oriented Text Interchange System
MOTU	Mobile Technical Unit
MOU	Memorandum of Understanding
MPA	Medium Power Amplifier
MPC	Message Processing Center
	Mission Planning Center
MPCR	Memorandum Program Change Request
MPD	Message Preparation Directory
	Message Preparation Device
MPD PC	Message Preparation Directory Personal Computer
MPDS	Message Processing and Distribution System
MPDT	Message Preparation and Dissemination Terminal
MPDU	Message Protocol Data Unit
	Military Protocol Data Unit
MPE	Mission Planning Element
MPF	Maritime Prepositioning Force
MPM	Milestone Planning Meeting
	Mission Planning Material
MPN	Mission Support Element Packet Network
MPP	Master Program Plan
MPPDA	Message Processing Post Distribution Analysis
MPPS	Message Processing Procedure Specifications
MPR	Monthly Progress Report
MPS	Message Processing System
MPSM	Message Processing Subsystem Multiplexer
MPSSA	Medium Power SSA
MPT	Message Pointer
	Message Processing Terminal
MPU	Message Processing Unit
MPX	Multiplex(ing)
MR	Medium Range
	Milliradian
	Modification Request
MRA	Message Release Authority
MRC	Maintenance Requirements Card
MRDIS	Message Reproduction and Distribution System
MRF	Milestone Reference File
MROC	Multi-Command Requirement of Operational Capability
MRP	Militarized Reconfigurable Processor
MRSE	Message Retrieval Service Element
MRTFB	Major Range and Test Facility Base
MRU	Minimum Replacement Unit
MRV	Multi-Rate Vocoder
MS	Message Store

	Milestone
	Milliseconds
	Microsoft
MSO	Milestone 0
MS2	Message Switching and Mail Service
MSA	Message Storage Agent
	Military Satellite Communication (SATCOM) Architecture
MSB	Most Significant Bit
MSCOP&P	Milstar Standard Communications Operations & Policies & Procedures
	Mass Storage Device
MSD	Material Support Date
	Modular Security Device
MSDT	Mobile Subscriber Equipment
MSG	Message
MSGCEN	Message Center
MSGID	Message Title
MSI	Man-System Interface
	Medium Scale Integration
	Multispectral Imagery
MSIC	Missile and Space Intelligence Center
MSIP	Message System Improvement Program
	Milstar Systems Implementation Plan
	Multi-Staged Improvement Program
MSK	Minimum Shift Keying
MSL	Master Security List
	Master Station Log
MSLP	Medium Speed Line Printer
MSM	Major System Mode
MSN	Message Sequence Number
MSO	Message Start Opportunity
	Military Satellite Office
	Military Satellite Communications (MILSATCOM) Systems Office
MSP	Medium Speed Printer
	Message Security Protocol
MSP GW	Message Security Protocol Gateway
MSR	Multi-Speed Repeaters
MSRT	Mobile Subscriber Radiotelephone Terminal
MSS	Message Switching System
	Milstar System Simulator
	Mobile Satellite Service
MSSE	Message Submission Service Element
MST	Milstar System Test
	Mountain Standard Time
MSTDF	Mobile System Technical Data Facility
MSTM	Multi-Source Technical Management
MSU	Mass Storage Unit
	Memory Storage Unit
	Message Switching Unit
	Modem Sharing Unit
MSV	Mechanical Evaluation Surface Support Area Support Vehicle
MSYNC	Multi-Synchronous
MT	Management Threshold
	Message Transfer
	Mission Training
MTA	Major Thrust Area
	Message Transfer Agent
MTAC	Mini Terminal Access Controller

MTAE	Message Transfer Agent Entity
MTBCM	Mean Time Between Corrective Maintenance
MTBCMA	Mean Time Between Corrective Maintenance Actions
MTBF	Mean Time Between Failures
MTBM	Mean Time Between Malfunctions
MTBMCF	Mean Time Between Mission Critical Failure
MTBMF	Mean Time Between Mission Failures
MTC	Manual Teletype Control
MTCC	Marine Telecommunications Center
MTDS	Marine Tactical Data System
MTF	Message Text Format
	Message Transfer Facility
	Modulation Transfer Function
MTIE	Maximum Time Interval Error
MTL	Message Transfer Layer
MTP	Milstar Transition Plan
MTS	Message Transfer System
MTSC	Modified Transmitter Signal Characteristics
MTSE	Message Transfer Service Element
MTSR	Mean Time to Service Restoral
MTT	Mobile Training Team
MTTD	Mean Time To Displace
MTTE	Mean Time To Emplace
MTTR	Mean Time to Repair
MTU	Magnetic Tape Unit
	Master Time Unit
MUB	Multiple Uplink Beam
MULE	Modular Universal Laser Equipment
MULTI	Multiple
MULTI LL	Multiple Logical Lines
MULTOTS	Multiple Units Link-11 Test and Operational Training
MUS	Mission-Unique Software
MUSIC	Multi-User Special Intelligence Communications
MUSIC II	Multi-User Special Intelligence Communications II
MUSICAM	Masking-Pattern Universal Sub-band Integrated Coding and Multiplexing
	Message User Service Task
MUST	Multi-Mission Ultra High Frequency (UHF) Satellite Communication (SATCOM) Terminal
	Multi-Use Satellite Communication (SATCOM) Terminal
MUT	Multiple Use Terminal
MUTE	Multiple Unit for Transmission Elimination
MUX	Multiplexer
MUXER	Multiplexer
MUXR	Receive Multiplexer Channels
MVATS	Mini-Volume Automated Test System
MVS	Multiple Virtual Storage
MVSS	Manual Voice Secure Switch
MWP/APCU	Microwave Processor/Antenna Position Control Unit
MYP	Multi-Year Procurement
MYSTIC LINK	Digital Information Distribution System
N	Unclassified but sensitive (message)
N-ISDN	Narrowband Integrated Services Digital Network (ISDN) Navy Network (NAVNET)
N/A	Not Applicable
N/M	Navy/Marine
NAC	Network Access Component
NACE	Network Automated Communications Executive Software
NACI	Naval Avionics Center, Indianapolis, IN

NACK	Negative Acknowledgement
NADC	Naval Air Development Center, Warminster, PA
NADEC	Navy Decision Center
NAE	Navy Acquisition Executive
NAEDSS	Navy Extremely High Frequency (EHF) Satellite Communication (SATCOM) Program (NESP) Adaptation and Ephemeris Data Support System
NAK	Negative Acknowledgement
NAMAS	National Measurement Accreditation Service
NAMMOS	Navy Manpower Mobilization System
NAMPS	Navy Manpower Programming System
NAMRADS	Naval Automated Message Reproduction and Distribution System
NAOS	N-Channel Metal Oxide Semiconductor
NAP	Network Access Protocol
NARACS	National Radio Communications System
NARB	Navy Acquisition Review Board
NARC	Non-Automatic Relay Center
NARDAC	Navy Regional Data Automation Center
NARDIC	Navy Acquisition Research and Development Information Center
NARF	Naval Air Refit Facility
NAS	Network Access Switch Network Application Support
NASCAT	Navy Accelerated Super High Frequency (SHF) Communications Acquisition Team
NASP	Navy Advanced Satellite Communication (SATCOM) Program
NATL	National
NATO	North Atlantic Treaty Organization
NAU	Network Addressal Unit
NAV	Navigation
NAVCAMS	Naval Communications Area Master Station
NAVCIRT	Naval Computer Incident Response Team
NAVCOMCO	Navy Commercial Communications Office
NAVCOMM/MIS	Navigation Communications/Mission Information System
NAVCOMMDET	Naval Communications Detachment
NAVCOMMSTA	Naval Communications Station
NAVCOMMU	Naval Communications Unit
NAVCOMPARS	Naval Communications Processing and Routing System
NAVCOMTELSTA	Naval Computer and Telecommunications Station
NAVEMSCEN	Naval Electromagnetic Spectrum Center
NAVFORSTAT	Naval Force Status
NAVIC	Navy Information Center
NAVICP	Naval Inventory Control Point
NAVIXS	NAVAL Information exchange Subsystem
NAVMACS	Naval Modular Automated Communications Subsystem
NAVMEDIACEN	Naval Media Center
NAVMEDRSCHDEVC	Naval Medical Research Development Committee
NAVNET	Navy Network (also Navy Tactical Network)
NAVOCEANO	Naval Oceanographic Office
NAVOCEANSYSCEN	Naval Ocean Systems Center
NAVORD	Naval Ordnance
NAVPGSCOL	Navy Postgraduate School
NAVPRO	Navy Plant Representative Office
NAVPUBFORMCEN	Naval Publications and Forms Center
NAVSAT	Navigation Satellite
NAVSEC	Navy Ship Engineering Center
NAVSECGRU	Naval Security Group
NAVSECGRUDET	Naval Security Group Detachment
NAVSO	Naval Aviation Supply Office
NAVSOC	Naval Space Operations Center

NAVSO PUB	Navy Staff Office Publications
NAVSPASUR	Navy Space Surveillance System
NAVSSI	Navigation Sensor System Interface
NAVSTAR	Navigation Satellite Timing and Ranging
NAVSTAR GPS	Navigation Satellite Global Positioning System
NAVSTRIKEWARCEN	Naval Strike Warfare Center
NAVSUBBASE	Naval Submarine Base
NAVSUBSCOL	Naval Submarine School
NAVSUPPACT	Naval Supply Activity
NAVSWC	Naval Surface Warfare Center
NAVTACNET	Navy Tactical Network
NAVTACSTANS	Navy Book of Standards for Tactical Data Systems
NAVTECHTRACEN	Naval Technical Training Center
NAVTELSYSIC	Naval Telecommunications System Integration Center
NAVWAG	Naval Warfare Analysis Group
NAWAS	National Warning System Telephone System
NAWC	Naval Air Warfare Center
NB	Narrowband
NBAM	Narrowband Amplitude Modulation
NBFM	Narrowband Frequency Modulation
NBS	National Bureau of Standards
	Navy Broadcasting Service
NBSV	Narrowband Secure Voice
NC	Net Control
	Network Controller
	No Change
	Node Center
	Not Carried
NC2	Navigation Control Console
NC2P	Navy Command and Control Plan
NC3	Navy Command, Control and Communications
NC3A	Naval Command, Control, and Communications Architecture
NC3N	Naval Command, Control, and Communications Network
NC3S	Naval Command, Control, and Communications System
NCA	National Command Authority
	National Communications Agency
	Net Control Authority
NCAMS	Network Control Alarm and Maintenance System
NCAPS	Naval Control and Protection of Shipping
NCB	National Codification Bureau (Code)
	Network Configuration Books
NCC	National Communications Center
	National Coordinating Center
	Navigation Control Console
	Navy Command Center
	Network Computing Corporation
	Network Control Center
NCCS	Navy Command and Control System
	Network Communications and Control Station
NCD	Deputy Comptroller of Navy
	Naval Contracting Directive
NCDF	Net Control Direction Finding
NCF	Net Control Facility
NCGC	Navy Control Group Center
NCIS	NATO Common Interface Standards
	Navy Cost Information Systems
NCM	Net Control Master
NCMP	Naval Communications Master Plan
NCO	Net Control Officer

	Non-Combat Operations
	Non-Commissioned Officer
NCO LANT	Net Control Officer, Atlantic
NCO PAC	Net Control Officer, Pacific
NCP	Naval Communications Plan
	Network Control Processor
NCPII	Naval Communications Processing and Routing System (NAVCOMPARS) Follow-On System
NCR	National Capital Region
	Navy Command and Control System Change Request
NCS	National Communications System
	Naval Command System Support Activity
	Naval Communications Station
	Naval Control of Shipping
	Navy Control System
	Network Control System
	Net Control Station
	Network Computing System
	Network Control Station
	Node Control Switch
NCS-E	Net Control Station-Enhanced Position Location Reporting System (EPLRS)
NCS-J	Net Control Station-Joint Tactical Information Distribution System (JTIDS)
NCSC	National Communications Security Committee
	National Computer Security Center
	Naval Command Support Center
NCSUK	Net Control Station, United Kingdom
NCTAMS	Naval Computer and Telecommunications Area Master Station
NCTR	Noncooperative Target Recognition
NCTS	Naval Computer and Telecommunications Station
NCTSI	Navy Center for Tactical Systems Interoperability
NCU	Naval Communications Unit
	Net Control Unit
NDCCA	Navy Data Communications Control Architecture
NDCP	Navy Decision Coordinating Paper
NDCS	Network Data Control System
NDDC	Navy Department Duty Captain
NDDI	Navigation Data Digital Interface
NDES	Naval Allocation Resources Model (NARM) Data Entry Sheet
NDHQ	Naval District Headquarters
NDI	Non-Developmental Items
NDIS	Network Drivers Interface Specification
NDL	Network Database Language
NDM	Navy Command and Control System Data Management
NDN	Non-Delivery Notification
NDP	National Disclosure Policy
NDRC	National Defense Research Council
NDRO	Non-Destructive Readout
NDT	Non-Destructive Test
NEARTIP	Neartime Improvement
NEAT	Naval Electronic Intelligence Analysis Terminal
NEC	National Electrical Code
	Navy Enlisted Classification
NECC	Navy Extremely High Frequency (EHF) Satellite Communication (SATCOM) Program Communication Controller
NECM	Navigation Error Covariance Matrix
NECOS	Network Control Station
NECS	Navy Embedded Computer System

NED	Network Encryption Device
NEDALS	Navy Engineering Data Asset Locator System
NEDN	Navy Environmental Data Network
NEDS	Naval Environmental Data System
	Naval Environmental Display System
NEF	Naval Expeditionary Forces
NEMS	Navy Electronic Mail Service
NEO	Non-Combatant Evacuation Operations
NEPA	National Environmental Policy Act
NEPHEM	Navy Extremely High Frequency (EHF) Satellite Communication (SATCOM) Program Ephemeris
NEPTRI	Newport, RI, homeport
NERF	Navy Emitter Reference File Network Encryption System
NES	Network Encryption System
NESLRTP	Naval Electronic Systems Long Range Technical Plan
NESP	Navy Extremely High Frequency (EHF) Satellite Communication (SATCOM) Program
NESS	Navy Extremely High Frequency (EHF) Satellite Communication (SATCOM) System
NET	Network
	Network Entity Title
	New Equipment Training
NET MGR	Network Manager
NETBIOS	Network Basic Input/Output System
NETCAP	Network Capabilities
NETS	Nationwide Emergency Telecommunications System
	Navy Engineering Technical Service
NEU	Neutral
NEXT	Near-End Crosstalk
NFC	Numbered Fleet Commander
NFE	Network Front End
NFEP	Navy Command and Control System Front End Processor
NFPS	Navy Field Procurement System
NFS	Network File System
NGCR	Next Generation Computer Resources
NGDC	National Geophysical Data Center
NGS	Non-Government Standard
NGSB	Non-Government Standards Body
NGST	Next Generation Satellite Communication (SATCOM) Terminal
NHA	Next Higher Assembly
NIB	Number of Input Blocks
NIC	Network Information Center
	Network Interface Controller
NICMP-P	Navy Interoperability Configuration Management Plan for Procedural Interface Standards
NICN	Navy Item Control Number
NICRAD	Navy/Industry Cooperative Research & Development (R&D) Program
NICS	Nomenclature Identification and Configuration System
NID	Naval Intelligence Database
	Network Inward Dialing
NIDF	Navy Industrial Development Fund
NIDMO	Network-Inward-Dialing
NIDMS	National Military Command System (NMCS) Information for Decision Makers Systems
NIDN	Navy Intelligence Data Network
NIDPS	Network-Inward Dialing, Precedence Division
NIDR	Network Information Discover and Retrieval
NIDS	National Military Command System Information and Display

	System
NIES	Navy Extremely High Frequency (EHF) Satellite Communication (SATCOM) Program (NESP) Information Exchange System
NIF	Navy Industrial Fund
NIFS	Naval Oceanographic Data Distribution Expansion System (NODDES) Interface Subsystem
NII	National Information Infrastructure
NIIN	National Item Identification Number
NIIRS	National Imagery Interpretability Scale
NIPD	NATO Interoperability Planning Document
NIPRNET	Non-secure Internet Protocol Router Network
NIPS	National Military Command System Information Processing System
	Navy Tactical Command System – Afloat Intelligence Processing Services (NTCS-A) Intelligence Processing Services
	Naval Intelligence Processing System
NIPSSA	Naval Intelligence Processing System Support Activity
NIROP	Naval Industrial Reserve Ordnance Plant
NIS	Not In Stock
	Naval Investigative Service
NIST	National Institute of Standards and Technology
NITES	Navy Tactical Command System – Afloat Integrated Tactical Environmental Subsystem
NITF	National Imagery Transmission Format
NITFS	National Imagery Transmission Format Standard
NITP-P	Navy Interoperability Test Plan for Procedural Interface Standards
NITP-T	Navy Interoperability Test Plan for Technical Interfaces
NKDS	Navy Key Distribution System
NKMS	Navy Key Management System
NLA	Navy Lower Assembly
NLQ	Near Letter Quality
NLRG	Navy Long Range Guidance
NLSP	Network Layer Security Protocol
NLT	Navy Liaison Team
NM	Nanometers
	Nautical Mile
	Network Member
NMARC	Navy and Marine Corps Acquisition Review Committee
NMC	Network Monitor Controller
	Non Mission Capable
NMCC	National Military Command Center
NMCI	Navy Marine Corps Intranet
NMCS	National Military Command System
NMDT	Nodal Message Disposition Table
NMF	Network Management Facility
	Normalized Message Format
NMI	Nautical Mile
NMITC	Navy-Marine Corps Intelligence Training Center, Little Creek, VA
NMM	Network Management Message
NMRG	Navy Mid-Range Guidance
NMS	Network Management Services
	Network Management Section
NMU	Navy Meteorological Unit
NNSS	Navy Navigation Satellite System
NNTP	Network News Transfer Protocol
NOAA	National Oceanic and Atmospheric Administration
NOB	Naval Order of Battle
	Not on Board
NOBS	Navy Extremely High Frequency (EHF) Satellite Communication

	(SATCOM) Program (NESP) Optical Blockage Survey
NOC	Notice of Change
NOCC	Navy Operational Checkout Console
NOD	Network Outward Dialing
	Night Observation Device
	Non-Organic Data
NODAC	Navy Occupational Development and Analysis Center
NODDES	Naval Oceanographic Data Distribution Expansion System
NODLR	Night Observation Device, Long Range
NOFORN	Not Releasable to Foreign Nationals
NOIC	Navy Operational Intelligence Center
NOJ	Null-on-Jam
NOMSS	Naval Oceanographic and Meteorological Support System
NOO	Naval Oceanographic Office
NOP	Navigation Operating Procedure
NOPF	Naval Oceanographic Processing Facility
NOR	Notice of Revision
NORATS	Navy Operational Radar and Telephone Switchboards
NORVA	Norfolk, VA
NOS	National Ocean Service
	Naval Ordnance Station
NOSS	Navy Ocean Surveillance Satellite
NOVRAM	Non-Volatile Random Access Memory
NPC	Non-Permanent Change
NPDM	Navy Program Decision Meeting
	Navy Program Decision Memorandum
NPE	Navy Preliminary Evaluation
	Networking, Planning, And Engineering
NPM	Non-Penetrating Mast
NPPO	Navy Program Planning Office
NPR	National Performance Review
	Noise Power Ratio
NRAC	Naval Research Advisory Committee
NRDN	Naval Environmental Distribution Network
NRFI	Not Ready for Issue
NRL	Naval Research Laboratory
NRR	Naval Research Requirement
NRRF	Naval Radio Receiver Facility
NRS	Navy Reporting System
NRT	Near Real Time
NRT-DRS	Near Real Time-Data Recovery Systems
NRTF	Navy Radio Transmitter Facility
NRZ	Non-Return to Zero
NRZI	Non-Return to Zero Inverted
NS&MP	Navy Support & Mobilization Plan
NSA	National Security Agency
NSB	Narrow Spot Beam
NSC	National Security Council
	Naval Supply Center
NSCS	Navy Satellite Control Station
NSG	National Security Group
NSGA	Naval Security Group Activity
NSGD	Naval Security Group Detachment
NSI	National Security Information
NSN	National Stock Number
NSRD	National Software Reuse Directory
NSS	Naval Simulation System
	Navy Strategic Study
NSSK	North-South Station Keeping

NSSM	Navy Spread Spectrum Modem
NST	Navy Standard Teleprinter
	Network Signaling Terminal
NSTA	Navy Standard Teletype Ashore
NSTAC	National Security Telecommunications Advisory Committee
NSTISSAM	National Security Telecommunications and Information Systems Security Advisory Memorandum
NSTS	National Secure Telephone System
NSV	Netted Secure Voice
NSY	Naval Ship Yard
NT	New Technology
NTC	Naval Training Center
NTCC	Naval Telecommunications Center
NTCS	Navy Tactical Command System
	Navy Tactical Communications System
NTCS-A	Navy Tactical Command System - Afloat
	Navy Tactical Communications System - Afloat
NTCS-S	Navy Tactical Command System - Shore
	Navy Tactical Communications System - Shore
NTCSS	Navy Tactical Command Support System
NTCSS-A	Navy Tactical Command Support System-Afloat
NTDR	Near-Term Digital Radio
NTDS	Naval Tactical Data Display System
	Navy Tactical Display System
NTDS CPTRS	Naval Tactical Data System Computer System
NTDSIXS	Naval Tactical Data System Information Exchange System
NTE	Navy Technical Evaluation
	Not-to-Exceed
NTIA	National Telecommunications and Information Administration
NTIS	National Technical Information Service
NTP	Naval Telecommunications Procedures
	Navy Technological Projections
NTR	Navy Technical Representative
	Network Time Reference
NTS	Naval Telecommunications Systems
NTS/DCS	Naval Telecommunications System/Defense Communications System
NTSA	Naval Telecommunications System Architecture
NTSCS	Naval Tactical Switched Communications System
NTSDP	Naval Telecommunications Systems Development Plan
NTSP	Navy Training System Plans
NTSTN	Naval Telecommunications System Test Node
NTTC	Naval Tactical Telecommunications Center
NUSC	Non-Update System
NUSTF	Navy Ultra High Frequency (UHF) Satellite Communication (SATCOM) Testing Facility
	Naval Underwater Systems Center
NVDET	Network Virtual Data Entry Terminal
NVT	Network Virtual Terminal
NWG	Network Working Group
O	Organizational
O&M	Operations & Maintenance
O&M,MC	Operations & Maintenance, Marine Corps
O&M,N	Operations & Maintenance, Navy
O&MN	Operations and Maintenance
O&R	Overhaul & Repair
O&S	Operations & Services
	Operations & Support
O-Level	Organizational Level

O/S	Ocean Surveillance
O/W	Orderwire
OA	Office Automation
	Operational Analysis
	Operational Assessment
OAD	Operational Availability Date
OADR	Originating Agency Determination Required
OAG	Optical Advisory Group
OASN	Office of the Assistant Secretary of the Navy
OAT	Operational Acceptance Test
OB	Order of Battle
OBE	Overcome by Events
OBS	Ocean Surveillance Information System Baseline System
OBU	Ocean Surveillance Information System Baseline Upgrade
OC	Operational Capability
OCC	Operations Control Center
OCCIS	Operations Control and Command Information System
OCD	Operational Concept Document
OCEANCENS	Oceanographic Centers
OCF	Other Command Funded
OCI	Optically Coupled Isolator
OCP	Operational Communications Plan
OCP(H)	Ocean Surveillance Information System Communications Processor (Hawaii)
OCR	Operational Capabilities Requirement
	Optical Character Recognition
ODAA	Operational Designated Approval Authority
ODC	Office of Defense Cooperation
	Other Direct Costs
ODP	Open Distributed Processing
OED	Operational Effectiveness Demonstration
OEG	Operations Evaluation Group
OEIC	Opto-Electronic Integrated Circuit
OEM	Original Equipment Manufacturer
OIC	Officer in Charge
	Operator Interface Control
	Optical Integrated Circuit
OICC	Operational Intelligence Crisis Center
OID	Object Identifier
OII	Operations-Intelligence Interface
OIOD	Operator Input/Output Device
OIPT	Overarching Integrated Product Team
OIRG	Operational Interoperability Requirements Group
OIU	Operator Interface Unit
OJT	On-the-Job Training
OLE	Object Linking and Embedding
OLTS	Optical Loss Test Set
OM	Operations Module
OMEGA	Optimized Method for Estimating Guidance Accuracy Very Low Frequency (VLF) Navigation System
OMI	Operator-Machine Interface
OMNCS	Officer of the Manager, National Communications System
OMS	Optimum Mode Selection
ONC	Open Network Computing
	Open Network Computing Environment
ONI	Office of Naval Intelligence
ONR	Office of Naval Research
OO	Object-Oriented
	Operations Officer

OOA	Object-Oriented Analysis
OOD	Object-Oriented Design
	Officer of the Deck
OODBMS	Object-Oriented Database Management System
OOF	Out-Of-Frame
OOL	Object-Oriented Language
	Out-of-Lock
OOS	Out-of-Synchronization
OOSD	Object-Oriented Structured Design
OPA&E	Office of Program Appraisal & Evaluation
OPAREA	Operating Area
OPASSESS	Operational Assessment
OPCOMM	Operations Communications
OPCON	Operational Control
OPCONC	Operations Control Center
OPDEC	Operational Deception
OPDEP	Operations Deputy
OPER	Operator
OPEVAL	Operational Evaluation
OPFAC	Operational Facility
OPGEN	Operational General
OPINTEL	Operational Intelligence
OPLAN	Operational Plan
OPN	Other Procurement, Navy
OPNAV	Office of Chief of Naval Operations
OPNAVINST	Office of the Chief of Naval Operations Instruction
OPN (I)	Other Procurement Navy (Installation)
OPN (P)	Other Procurement Navy (Procurement)
OPNOTE	Operator Note
OPNOTES	Operational Notes
OPORD	Operational Order
OPR	Office of Primary Responsibility
OPREP 1	Operation(s) Planning Report
OPREP 2	Operation(s) Start Report
OPREP 3	Operation(s) Event/Incident Report
OPREP 4	Operation(s) Stop Report
OPREP 5	Operation(s) Summary Report
OPS	Operations
OPSCOMM	Operational Communications
OPSEC	Operational Security
OPSINST	Operational Support Instruction
OPSIT	Operational Situation
OPSPEC	Operations Specification
OPSTAT	Operational Status
OPSUM	Operational Summary
Opt.	Option
OPTAR	Operating Target
OPTASK	Operational Tasking
OPTASK COMM	Operational Tasking Communications Message
OPTEMPO	Operating Tempo
OPTEST	Operational Testing
OPTEVFOR	Operational Test and Evaluation Force
OPU	Outstation Processing Unit
OQPSK	Offset Quartered Phase Shift Keying
OR	Operational Requirement
ORA	Optical Reference Assembly
ORD	Operational Requirements Document
ORDALT	Ordnance Alteration
ORG	Organization

ORI	Operational Readiness Inspection
ORP	Onboard Repair Part
ORTS	Operational Readiness Test System
OS	Ocean Surveillance
	Operating System
	Operational Site
OS/IPC	Operating System/Inter-Process Communication
OSA	Open Systems Architecture
OSC	Operations Support Center
OSCAR	Optical Submarine Communications by Aerospace Relay
OSD	Office of the Secretary of Defense
OSDIU	Outlaw Shark Digital Interface Unit
OSDP	Operational Systems Development and Production
OSE	Open System Environment
OSE/IA	Open System Environment Profile for Imminent Acquisitions
OSF	Open Software Foundation
OSG	Operations Support Group
OSGR	On Site Government Representative
OSHA	Occupational Safety and Health Administration
OSI	Open Systems Interconnection
	Operating Space Item
	Operational Support Inventory
OSI/RF	Open Systems Interconnection/Reference Model
OSIP	Operational Safety Improvement Program
OSIS	Ocean Surveillance Information System
OSN	Office of the Secretary of the Navy
OSO	Operational Support Office
OSP	Outside Plant
OSPF	Open Shortest Path First
OSRI	Originating Station Routing Indicator
OSS	Operational Support System
OSSN	Originating Station Serial Number
OT	Operational Testing
OT&E	Operational Test & Evaluation
OT/FOT	Operational Test/Follow-On Operational Test
OTA	Office of Technology Assessment [U.S. Congress]
	Operational Test Authority
	Over-the-Air
OTAM	Off-the-Air Monitor
OTAR	Over-the-Air Rekeying
OTAT	Over-the-Air Transfer
OTC	Officer in Tactical Command
OTCIXS	Officer in Tactical Command Information Exchange Subsystem
OTD	Operational Test Director
OTDR	Optical Time Domain Reflectometer
OTEA	Operational Test and Evaluation Agency
OTG	Operational Test and Evaluation Force (OPTEVFOR) Tactical Guide
OTH	Over-the-Horizon
OTH-B	Over-the-Horizon Backscatter
OTH-F	Over-the-Horizon Forward Scatter
OTH-R	Over-the-Horizon Radar
OTH-T	Over-the-Horizon Targeting
OTH/DCT	Over-the-Horizon/Detection, Classification and Targeting
OTHTIXS	Over-the-Horizon Targeting Information Exchange Subsystem
OTO	Operator-to-Operator
OTRR	Operational Test Readiness Review
OTS	Over-the-Side
OTSR	Optimum Track Ship Routing

OUTBOARD	Name of a Cryptologic Sensor System
P	Period
P&A	Prices & Availability
	Priorities & Allocations
P&D	Production & Deployment
P&P	Planning & Programming
P-Spec	Process Specification
P/A	Peak-to-Average Ratio
P/N	Part Number
P/N-NSN	Part Number-National Stock Number
P2	Power Projection
P3I	Pre-Planned Product Improvement
PA	Pedestal Assembly
	Performance Analyzer
	Power Amplifier
	Purchasing Agent
PA&E	Program Analysis & Evaluation
PAA	Primary Aircraft Authorization
PABX	Private Automatic Branch Exchange
PAC	Pacific
PACA	Product Assurance Checkout Area
PACAIDS	Pacific Command Crisis Action Information Distribution System
PACCS	Post Attack Command and Control System
PACFLT	Pacific Fleet
PAD	Packet Assembler/Disassembler
PADS	Passive Advanced Sonobuoy
	Positioning and Azimuth Determining System
PAIE	Performing Activity Initial Estimate
PAL	Permissive Action Link
PALET	Performance Analysis Link Evaluation Terminal
PAM	Pulse Amplitude Modulation
PanAmSat	Pan American Satellite
PAR	Protect Approval Request
PARAM	Parameter
PARM	Participating Manager
PARTIOT ICC	Phased Array Tracking to Intercept of Target Information and Coordination Center
PARTS	Program Support Data Automated Reporting and Tracking System
PAS	Primary Alert System
PASCA	Pascagoula, MS, homeport
PASU	Preliminary Approval for Service Use
PAT	Passive Angle Track
PAT&E	Production Acceptance Test & Evaluation
PATS	Passive Acoustic Threat Sensor
PAU	Port Applique Unit
PAWS	Prototype Analyst Workstation System
PB	Particle Beam
PBA	Performance Based Acquisition
PBB	Passive Broadband
PBC	Performance Based Contracting
PBD	Program Budget Decision
PBL	Product Baseline
PBMA	Precedence-Based Multiple Access
PBS	Program Baseline Summary
PBSL	Packed Binary Segment Leader
PBX	Private Branch Exchange
PC	Personal Computer
	Power Carrier
	Printed Circuit

	Program Coordinator
PCA	Physical Configuration Audit
PCAC	Primary Control and Analysis Center
PCAD	Program Change Approval Document
PCB	Polychloratinatedbiphenyls
	Printed Circuit Board
PCC	Passive Polarity Coincidence Correlator
PCD	Product Configuration Documentation
	Program Change Decision
PCF	Program Checkout Facility
PCI	Produce Configuration item
	Protocol Control Information
PCITF	Positive Combat Identification Task Force
PCL	Printer Control Language
PCLT	Procurement Lead Time
PCM	Pulse Code Modulation
PCMCIA	Personal Computer Memory Card International Association
PCMT	Personal Computer Message Terminal
PCN	Product Control Number
PCO	Provisioning Control Number
	Primary Control Officer
	Principal Contracting Officer
	Procuring Contracting Officer
PCOLA	Pensacola, FL, homeport
PCOTES	Prototype Carrier Operational Test and Evaluation Site
PCP	Packet Core Protocol
	Program Change Proposal
PCR	Problem Change Report
	Program Change Request
	Project Change Request
PCS	Personal Communications System
	Primary Control Ship
PCT	Product Confidence Tests
PCTE	Portable Common Tools Environment
PCTS	Portable Operating System interface Conformance Test Suite
PCU	Power Control Unit
PD	Presidential Decision
	Program Directorate
	Project Director
	Pulse Duration
PDT	Program Definition Teams
PDA	Personal Digital Assistant
	Post-Detection Amplifier
	Principal Development Activity
	Principal Development Agency
	Program Decision Authority
PDD	Program Description Document
	Program Design Document
PDES	Product Data Exchange Specification
PDL	Process Design Language
	Program Decision Language
	Program Design Language
PDM	Program Decision Meeting
	Program Decision Memorandum
PDR	Preliminary Design Review
	Program Design Review
	Program Deviation Report
PDRC	Program Development Review Committee
PDS	Packet Data Subsystem

	Passive Detection System
	Personnel Daily Summary
	Physical Delivery System
	Platform Distribution Segment
	Primary Development Service
	Processing Display System
	Program Decision Summary
	Program Design Specification
	Protected Distribution System
PDSS	Post-Deployment Software Support
PDSSA	Post-Development Software Support Activity
PDT	Program Definition Team
PDU	Protocol Data Unit
PE	Planning Estimate
	Procurement Executive
	Program Element
	Project Engineer
PEARL	Pearl Harbor, HI, homeport and Naval Shipyard
PEC	Passive Equipment Center
	Program Evaluation Center
PECI	Preliminary Equipment/Component Index
PEDDS	Program Element Descriptive Data Sheet
PEDS	Planning, Programming, Budget, and Execution Electronic Delivery System
	Program Element Descriptive Summary
	Program Evaluation and Decision Summary
PEM	Preliminary Engineering Model
	Program Element Monitor
	Program Endorsement Memorandum
PEO	Program Executive Office
PEP	Producibility Engineering and Planning
PERA	Planning and Engineering for Repair and Alterations
PERD	Period
PERSSPT	Personnel Support
PERT	Program Evaluation and Review Technique
PESA	Provisioning Engineering Support Agency
PESD	Program Element Summary Data Sheet
PESM	Portable Electronic Support Measures
PEX	Programmer's Hierarchical Interactive Graphics System Extension to X
P.E.	Professional Engineer
PFCP	Program Funding Change Proposal
PFD	Power Flux Density
PFM	Plan for Maintenance
	Prefaulted Module
PFP	Program Forecast Period
PFS	Position Fixing System
PG	Package Graph
PH	Packet Header
PHEMT	Pseudomorphic High Electron Mobility Transistor
PHIGS	Programmer's Hierarchical Interactive Graphics System
PHS&T	Packing, Handling, Storage and Transportation
P&I	Procurement and Installation
PI	Priority Interrupt
	Product Integrity
PIAS	Position Location and Reporting System (PLRS) Intelligence Augmentation System
PIBS	Pre-Installation Baseline Survey
PIC	Post-Beamformer Interference Canceller

	Program Information Center
PICA	Primary Inventory Control Activity
PICO	Pre-Installation Checkout
PICT	Programmable Integrated Communications Terminal
PID	Protocol Identifier Data
PIDD	Preliminary Interface Design Document
PIDR	Preliminary Installation Design Review
PIDS	Prime Item Development Specification
PIGA	Pendulous Integrating Gyro Accelerometer
PIIN	Procurement Instrument Identification Number
PIK	Programmer's Imaging Kernel
PIM	Path of Intended Movement
	Planned Incremental Modernization
	Position and Intended Movement
PIMA	Primary Inventory Management Activity
PIN	Personal Identification Number
	Positive Intrinsic Negative
PINS	Precise Integrated Navigation System
PIO	Provisioned Item Order
PIOB	Presidents Intelligence Oversight Board
PIP	Precision Instrumentation Package
	Productivity Improvement Program
PIPA	Pulse Integrating Pendulous Accelerometer
PIRN	Proposed Interface Revision Notice
PITCO	Pre-Installation Test and Checkout
PITU	Priority Interrupt Transmission Unit
PJHS	Position Location and Reporting System (PLRS)/Joint Tactical Information Distribution System (JTIDS) Hybrid System
PL-DRO	Phase-Locked Dielectric Resonator Oscillator
PLA	Planned Language Addressing
	Programmed Logic Arrays
PLAD	Plain Language Address Designator
PLCCE	Program Life Cycle Cost Estimate
PLGP	Pulse Group
PLI	Private Line Interface
PLIR	Partition Law of Information Rates
PLNS	Plans
PLP	Physical-Level Protocol
PLRS	Position Location and Reporting System
PLT	Produced Lead Time
PLTFRM	Platform
PM	Performance Monitoring
	Phase Modulation
	Preventive Maintenance
	Program Manager
	Program Memorandum
	Program Memory
PM/FI	Performance Monitor/Fault Isolator
PMFL	Performance Monitor/Fault Location Function
PM/FM	Phase Modulation/Frequency Modulation
PMA	Phase Maintenance Availability
	Program/Project Manager, NAVAIR
PMCS	Programmable Modular Communications System
PMD	Program Management Directive
PME	Prime Mission Equipment
PMES	Performance Monitoring Equipment/System
PMI	Project Management Institute
	Proposed Military Improvement
PMMP	Preventive Maintenance Management Plan

PMN	Project Manager’s Notebook
PMO	Program Management Office
PMP	Prime Mission Product
	Program Management Plan
	Project Management Professional
PMR	Project Manager's Report
PMRT	Project Management Responsibility Turnover
PMS	Planned Maintenance System
	Program/Project Manager, NAVSEA
PMSP	Preliminary Message Security Protocol
PMT	Production Monitoring Test
PMW	Program Management Warfare
	Program Manager, SPAWAR
PMWS	Program Manager's Work Station
PN	Pseudo-Noise
	Part Number
PNB	Passive Narrowband
PNC	Positive Net Control
PNMC	Packet Network Management Center
PNOC	Proposed Notice of Change
PO	Program Office
	Project Order
POA	Plan of Action
POA&M	Plan of Action and Milestones
POC	Point of Contact
	Preliminary Operational Capability
	Proof of Concept
POD	Print on Demand
	Program Office Directive
PODAP	Portable Data Processing
PODS	Print-on-Demand System
POE	Projected Operational Environments
POG	Project Officers Group
POM	Program Objective Memorandum
	Proof of Manufacture
POR	Program of Record
POS	Probability of Success
POSIP	Portable Shipboard Instrumentation Package
POSIX	Portable Operating System Interface
POST	Prototype Ocean Surveillance Terminal
POT&I	Pre-Overhaul Test & Inspection
POTS	Plain Old Telephone System
PPB	Planning, Programming, and Budgeting
PPBS	Planning, Programming, and Budgeting System
PPD	Performance Planning Document
	Program Planning Document
PPDU	Primary Power Distribution List
PPE	Personal Protective Equipment
PPGM	Planning and Programming Guidance Memorandum
PPI	Plan Position Indicator
	Program Objective Memorandum Preparation Instructions
ppm	Parts Per Million
PPP	Point-to-Point Protocol
	Program Protection Plan
PPPS	Preliminary Program Performance Specifications
PPR	Planned Program Requirement
PPS	Positional Processing System
	Program Performance Specification
	Provisioning Performance Schedule

	Pulses Per Second
PPU	Pre-Production Unit
PR	Procurement Request
PR/MR	Procurement Modification Request
PRBS	Pseudorandom Bit Sequence
PRC	Program Review Committee
PRCSR	Processor
PRD	Program Requirements Document
PRDA	Program Research and Development Announcement
PRDR	Pre-production Reliability Design Review
PREP	Preparation and Readiness Evaluation Period
PREPO	Propositioned
PRESINSURV	President, Board of Inspection and Survey
PRF	Pulse Repetition Frequency
PRG	Program Review Group
PRI	Primary Rate Interface
	Pulse Repetition Interval
PRIFLY	Primary Flight Control
PRISM	Programmable Reconfigurable Integrated Switch and Multiplex
PRM	Program Review Memorandum
PRMD	Private Management Domain
PRN	Packet Radio Network
PRO	Plant Representative Office
Prod.	Production
PROFILE	Passive Radio Frequency Interference Location Experiment
PROG	Program
PROJ	Projected
PROM	Programmable Read-Only Memory
PROXY	Software Testing – Placeholder/Stub
PRR	Production Readiness Review
PRS	Program Review System
	Provisioning Requirements Statement
PRTS	Priority Request Time Slot
PRU	Production Representative Unit
PS	Packet Switch
PSA	Post-Shakedown Availability
	Principal Staff Assistant
PSB	Program Summary Briefing
PSD	Program Support Data
PSDD	Preliminary Software Design Document
PSE	Peculiar Support Equipment
PSK	Phase Shift Keying
PSKIXS	Phase Shift Keying Information Exchange Subsystem
PSN	Packet Switched Network
	Packet Switching Node
PSOC	Preliminary System Operational Concept
PSP	Programmable Signal Processor
PSR	Program Status Review
PSRS	Preliminary Software Requirements Specification
PSS	Performance Support System
PSTN	Public Switched Telephone Network
PSU	Port Sharing Unit
PSVS	Pilot Secure Voice System
PTA	Passive Tracking Algorithm
PTAGS	Portable Two-Axis Guidance Stand
PTB	Program Time Base
PTCI	Programmable Telecommunications Interface
PTD	Provisioning Technical Documentation
PTF	Packet and Test Facility

PTP	Point-To-Point
PTPS	Program Task Planning Sheet
PTR/P	Perforated Tape Reader/Punch
PTS	Portable Terminal System
	Precision Tracking System
PTTI	Precise Time and Time Interval
PTU	Participating Test Unit
PU	Participating Unit
PUA	Profiling User Agent
PUC	Project Unit Code
PUGET	Puget Sound Naval Shipyard, WA
PUK	Pack-Up Kit
PVC	Polyethylene Vinyl Chloride
PVCC	Photovoltaic Cavity Converter
PVCS	Program Version Control System
PW	Pulse Width
PWB	Printed Wiring Board
PWC	Public Works Center
PWR	Power
PWRMS	Prepositioned War Reserve Materiel Stocks
PWRS	Propositioned War Reserve Stocks
PY	Prior Year
Q/R	Query Response
QA	Quality Assurance
QAE	Quality Assurance Evaluator
QAP	Quality Assurance Provisions
QAPP	Quality Assurance Program Plan
QAR	Quality Assurance and Reliability
QC	Quality Check
	Quality Control
QCS	Quality Customer Service
QDPSK	Quadrature Differential Phase Shift Keying
QMCS	Quality Monitoring and Control Subsystem
QML	Qualified Materials List
QMR	Qualitative Materiel Requirements
QMSC	Quality Monitoring Control System
QOH	Quantity On Hand
QOS	Quality of Service
QPA	Quantity per Application
QPC	Quantity per Component
QPE	Quantity per Equipment
QPL	Qualified Products List
QPR	Quarterly Progress Report
QPSK	Quadrature Phase Shift Keying
QR	Quick Reaction
QRA	Quick Reaction Assessment
QRC	Quick Reaction Capability
QRFI	Quick Reaction Fleet Improvement
QRMC	Quadrennial Review of Military Compensation
QRS	Quartz Rate Sensors
QRSS	Quick Reaction Surveillance System
QSL	Qualified Source List
QSM	Quantitative Software Management
QSR	Quarterly Status Report
QSTAG	Quadrapartite Standardization Agreement
QTR	Quarter
QTY	Quantity
QUICKSAT	Quick Super High Frequency (SHF) Satellite Terminal
QVIS	Quasi-Vertical Incidence Sounding

R	Rate
R,M&OA	Reliability, Maintainability & Operational Availability
R&C	Review & Comment
R&D	Research & Development
R&M	Reliability & Maintainability
R&S	Routing & Switching
R/B	Red/Black (telephone)
R/C	Receiver/Combiner
R/CM	Radio/Communications Access Processor (CAP) Manager
R/D	Receiver/Demodulator
R/T	Receive/Transmit
R.A.	Registered Architect
RAA	Restricted Access Area
RAC	Request for Authority to Conclude
	Resource Access Control
RACC	Requirement Accumulator
RAD	Resource Allocation Display
	Resource Availability Determination
	Requirements Analysis Document
RADAR	Radio Detection And Ranging
RADCON	Radio Control Unit
	Radio Controller
RADHAZ	Hazards of Electromagnetic Radiation
	Radiation Hazard
RADIAC	Radioactivity Detection, Identification and Compilation
RADIOUS	Remote Authentication Dial In User Service
RADSTA	Radio Station
RAI	Remote Alarm Indication
	Remote Altitude Indicator
RAINFORM	color coded ("rainbow") format for messages
RAM	Random Access Memory
	Reliability, Availability, Maintainability
RAMP	Rapid Acquisition of Manufactured Parts
RAMS	Reference Acceleration Measurement System
RAMSD	Random Access Mass Storage Device
RAN	Request for Authority to Negotiate
RAP	Reliable Acoustic Path
RAPID	Rapid Access Precise Information Diagrams
RAPS	Resource Allocation Planning System
RARM	Resource Allocation Response Message
RARP	Reverse Address Resolution Protocol
RASD	Random Access Storage Device
RASG	Reassigned
RAST	Recovery, Assist, Secure and Traverse
RATD	Report Aboard Trained Date
RATS	Random Access Time Slot
RATT	Radio Teletype
RAU	Radio Access Unit
RAV	Restricted Availability
RB	Report Back
RBD	Reliability Block Diagram
RBN	Ringback Nonsecure
RBS	Red/Black Switch (Also Shipboard Communications Switching System (SCSS))
	Ringback Secure
RCC	Region Control Center
	Remote Computer Center
	Resource Category Code
RCCOW	Return Channel Control Order Wire

RCDD	Registered Communications Distribution Designer
RCI	Remote Control Indicator
	Resource Consultants, Inc.
RCM	Reliability-Centered Maintenance
RCP	Request for Contractual Proposal
RCR	Requirements Cross-Reference
RCS	Radar Cross Section
	Reaction Control System
	Remote Controller Switch
RCTU	Remote Command and Telemetry Unit
RCU	Remote Control Unit
RCV	Receive
RCVR	Receiver
RD&A	Research, Development & Acquisition
RD&E	Research, Development & Engineering
RDA	Remote Database Access
	Research, Development and Acquisition
RDB	Relational Database
RDBMS	Raw Database Management System
	Relational Database Management System
RDC	Rapid Development Capability
RDD	Required Delivery Date
	Requirements Definition Document
RDEC	Research, Development and Engineering Center
RDF	Radio Direction Finding
	Rapid Deployment Force
RFJTF	Rapid Deployment Joint Task Force
RDM	Red Digital Matrix
	Reference Data Manager
RDN	Relative Distinguished Name
RDS	Remote Display System
RDSB	Remotely Deployable Streamlined Automated Logistics Transmission System (SALTS) Basic
RDSS	Rapidly Deployable Surveillance System
	Radio Determination Satellite Service
RDT	Reliability Development Test
RDT&E	Research, Development, Test & Evaluation
RDT&E, N	Research, Development, Test & Evaluation, Navy
RDTE	Research Development Test and Engineering
RE	Receiver/Exciter
REACT	Rapid Execution and Combat Targeting
REBE	Remote-End Block Error
REC	Regional Evaluation Center
REIS	Reconstitutable Enduring Intelligence System
REJ	Reject
REL	Relative
REL NAV	Relative Navigation
RELUKCA	Releasable to United Kingdom and Canada
REMCON	Remote Controller
REPEAT	Repeatable Performance Evaluation and Analysis Tool
REQ	Required
REV	Review
REWSON	Reconnaissance, Electronic Warfare, Special Operations and Naval Intelligence Systems
RF	Radio Frequency
	Reference Model
	Replacement Factor
RFB	Request For Bid
RFC	Request for Comment

RFE	Receiver Front End
RFG	Rainform Gold
RFI	Radio Frequency Interference
	Ready for Issue
RFIU	Radio Frequency Interface Unit
RFMS	Radio Frequency Management System
RFOU	Ready for Operational Use
RFP	Request for Proposal
RFQ	Request for Quotation
RFS	Radio Frequency Surveillance
	Ready for Sea
RFT	Ready for Training
	Ready For Training Date (Training Site Installation)
RFW/RFD	Request for Waivers/Deviations
RGB	Red, Green, Blue
RGL	Receive Guard List
RHA	Radiation Hardness Assured
RHI	Range Height Indicator
RI	Request for Information
	Routing Indicator
RIB	Radio Interface Buoy
RIC	Regional Information Center
	Repairable Identification Code
	Resource Identification Code
RIIXS	Remote Interrogation Information Exchange Subsystem
RIN	Record Identification Number
RIP	Remote Interface Panel
	Routing Information Protocol
RIPSCO	Revised Internet Protocol Security Option
RISC	Reduced Instruction Set Computing
RISOP	Red Integrated Strategic Operational Plan
RIT	Remote Integrated Submarine Automated Broadcast Processing System (ISABPS) Terminal
RITC	Regional Information Technology Center
RIU*	Remote Interface Units
RIXT	Remote Information Exchange terminal
RLF	Reuse Library Framework
RLPP	Resource Loaded Project Plan
RM	Requirements Management
	Resource Management
RM&A	Reliability, Maintainability, & Availability
RMS	Root Mean Square
RNR	Receive Not Ready
RNSSIXS	Royal Navy Submarine Satellite Information Exchange System
RO	Receive Only
	Requirements Officer
	Requisitioning Objective
RO/RO	Roll On/Roll Off
ROAMS	Reusable Object Access and Management System
ROC	Random Operation Control
	Required Operational Capability
ROC/POE	Required Operational Capability/Projected Operational Environment
ROCC	Region Operations Control Center
	Remote Operation Control Center
ROH	Regular Overhaul
ROM	Read-Only Memory
	Rough Order of Magnitude
ROMC	Required Operational Messaging Characteristics

ROS	Report Organization Subsystem
ROSE	Remote Operation Service Element
ROX	Receive-over-Transmit
RP	Restoration Priority
RPC	Remote Procedure Call
RPTR	Repeater
RQMT	Requirement
RR	Receive Ready
RRaDS	Remote Request and Display System
RRC	Radio Remote Control
RRD	Resource Requirements Document
RRI	Remote Request Interface
RRU	Remote Request Unit
RSA	Reusable Software Assets
RSC	Red System Controller
RSDI	Resource Segment Digital Interface
RSIM	Regional Shore Installation Manager
RSLS	Receiver Side-Lobe Suppression
RSN	Reference Symbol Number
RSP	Red Switch Project
RSR	Required Supply Rate
RSRCH	Research
RT	Radio Transmitter
	Receiver-Transmitter
RTB	Resolver Tracking Bridge
RTCU	Remote Terminal Control Unit
RTF	Release-to-the-Fleet
RTO	Responsible Test Organization
RTS	Reliable Transfer Service
	Remote Tracking Station
	Request to Send
RTSE	Reliable Transfer Service Element
RTSP I/II	Realtime Signal Processor I /II
RTTY	Radio Teletype
RTU	Remote Telemetry Unit
RU	Reporting Unit
RUA	Remote User Agent
RV	Revalidation
	Ring Voice
RWB	Red/White/Blue
RWI	Radio Wireline Interface
Rx	Receive
S	Secret
	Standard for Interoperable Local Area Network (LAN) Security
S and SS	Space and Sensor Systems
(S)SARC	Systems Acquisition Review Council
S&L	Shipbuilding & Logistics
S&T	Science & Technology
	Supply & Transport
S&TE	Support & Test Equipment
S&TI	Scientific & Technical Intelligence
S-Band	frequency band [1,550 MHz-5,200 MHz]
S-HTTP	Secure Hyper Text Transfer Protocol
S-TESTS	Operational Suitability Tests
S/A	Services/Agencies
S/A/CINC	Services/Agencies/Commander-in-Chiefs
S/C	Spacecraft
S/F	Store/Forward
S/N	Signal/Noise Ratio

S/S	Ship/Shore
	Signaling/Supervision
S/STRK	Surface/Surface Track
S/V	Survivability/Vulnerability
S/W	Software
SA	Selective Availability
	Subsystem Analysis
	Supervising Authority
SAA	System Application Architecture
SAAS	Stand Alone Analysis Subsystem
SAASM	Selective Availability/Anti Spoof Module
SABI	Secret and Below InteroperabilitySATCOM Satellite Communications
SAC	Semi-Automatic Controller
	Service Application Code
	Subnet Access Controller
SACCS	Ship Automated Communications Control System
	Shipboard Automated Communications Control System
SACE	Shorebased Acceptance Checkout Equipment
SACEUR	Supreme Allied Commander, Europe
SACLANT	Supreme Allied Commander, Atlantic
SACONS	Standard Automated Contracting System
SACU	Stand Alone Digital Communications Units
SAD	Software Architecture Diagram
SADR	Satellite Data Relay
SADRS	Secure Acoustic Data Relay System
SADS	Submarine Active Detection System
SADS/HFA	Submarine Active Detection System/High Frequency Array
SAE	Service Acquisition Executive
SAFENET	Survivable Adaptable Fiber-Optic Embedded Network
SAG	Surface Action Group
SAI	Semi-Automatic Interface
SAINT	Shared Adaptive Internetworking Technology
SAIP	Ship Acquisition and Improvement Panel
	Spares Acquisition Integrated with Production
SAL	Security Access List
	Semi-Active Laser
	Site Activity Log
	Strategic Arms Limitations
SALT	Strategic Arms Limitation Treaty
	Strategic Arms Limitations Talks
SALTS	Streamlined Automated Logistics Transmission System
SAMAC	Ship Acoustic Modem And Controller
SAMIS	Ship Alteration Management Information System
SAMP	Security Association Management Protocol
	Single Acquisition Management Plan
SAMPS	Security Association Management Protocol System
SAMSO	Space and Missile Systems Organization
SAMT	State-of-the-Art Medium Terminal
SAO	Special Activities Office
SAOCS	Submarine-to-Air Optical Communications System
SAP	Security Accreditation Plan
	Ship Acquisition Plan
	Ship Alteration Proposal
	Simplified Acquisition Procedures
	Special Access Program
SAR	Safety Assessment Report
	Selected Acquisition Report
	Ship Alteration Record

SARB	Service Approval Review Board
SARC	Systems Acquisition Review Council
SARK	Seville Advanced Remote Keying
SARP	Ship Alteration Requirement Plan
SARS	Strategic Automatic Reporting System
SART	Structured Analysis with Real-Time Extensions
SAS	Ship Announcing Service
	Single Audio System
SASBO	Sasebo, Japan, homeport and Naval Ship Repair Facility
SASDT	Ship and Aircraft Supplemental Data Tables
SASP	Signal Advanced Signal Processor
SASS	Stand-Alone Analysis Subsystems
	Suspended Array Surveillance System
SAT	Satellite
	Simplified Acquisition Threshold
	Site Acceptance Test
	Situation Awareness Terminal
SAT Po	Saturated Power Output
SATAF	Site Activation Task Force
SATCOM	Satellite Communications
SATCOMA	Satellite Communications Agency [Army]
SATCOMFAC	Satellite Communications Facility
SATEL	Support and Test Equipment List
SATN IV	Strategic Air Command (SAC) Automated Total Information Network
SATURN	Satellite Anti-Jam Tactical User Reconfigurable Network
SB	Status Board [automated]
SBA	Small Business Administration
	Standards-Based Architectures
SBATH	Supervisor of Shipbuilding (SUPSHIP), Bath, ME
SBBSN	Supervisor of Shipbuilding (SUPSHIP), Boston, MA
SBIR	Small Business Innovation Research
SBIS	Sustaining Base Information System
SBLC	Sustaining Base Level Computer
SBM	Single Board Modem
SBPM	Single Board Processor/Multiplexer
SBRE	Single Board Receiver/Exciter
SBSA	Small Business Set Aside
SC	Screen Coordinator
	Sea Control
	Steering Committee
	Subcontractor
	Switch Control
	System Concept
SCA	Service Cryptologic Agencies
SCAC	Self-Contained Alignment Calibration
SCAMP	Single Channel Anti-Jam Manportable
	Systems Control and Maintenance Panel
SCAT	Sub Category
	Subcategory Code
SCB	Specification Control Board
SCC	Ship Control Center
	Standards Coordinating Committee
	System Coordinate Center
SCC-2	System Control Center-2
SCCB	Software Configuration Control Board
SCCP	Satellite Communications Control Processor
SCCS	Source Code Control System
SCCU	Single Channel Control Unit

SCDL	Surveillance and Control Data Line
SCE	Software Capability Evaluation
	Standard Communications Environment
SCF	Satellite Control Facility
SCHAS	Supervisor of Shipbuilding (SUPSHIP), Charleston, SC
SCI	Sensitive Compartmented Information
SCI LAN	Sensitive Compartmented Information Local Area Network
SCIB	Ship Characteristics Improvement Board
SCM	Software Configuration Management
	Synchronous Channel Multiplexer
SCMIS	Satellite Communications Management Information System
SCN	Scan
	Shipbuilding and Conversion, Navy
	Software Change Notice
	Specification Change Notice
SCO	Santa Cruz Operations
	Secondary Control Officer
	Successor Contracting Officer
SCONUM	Ship Control Number
SCOTT	Single Channel Objective Tactical Terminal
SCP	Secure Conferencing Project
	Software Change Proposal
	Submarine Communication Program
	System Change Proposal
	System Concept Paper
SCPB	Single Channel per Burst
SCPC	Single Channel per Carrier
SCPI	Standard Commands for Programmable Instruments
SCPS	Submarine Communications Program Summary
SCS	Satellite Control Site
	Sensor Control System
	Space and Communications Systems
	Submarine Combat System
SCSC	Submarine Communications Switch Controller
SCI	Small Computer System Interface
SCSS	Ship Communications Switching System
	Shore Cryptologic Support System
	Submarine Communications Support System
SCT	Single Channel Transponder
SCU	System Control Unit
SCUC	Satellite Communications Users Conference
SCUDR	Submarine Communications Universe Description Report
SCVB	Standard Combat Support System VME Board
SCVM	Standard Combat Support System VME Module
SD	San Diego, CA
SD-1	Defense Standardization Program Standardization Directory #1
SD/T	Surface Detector/Tracker
SDAF	Special Defense Acquisition Fund
SDAS	Shared Demand Assignment Signaling
SDB	Small Disadvantaged Business
	Systems Definition Branch
SDC	Software Development Center
	Space Defense Center
	Standards Development Committee
	Strategic Direction Center
SDD	Standard Operating Environment (SOE) Device Driver
	Software Design Document
SDDM	Secretary of Defense Decision Memorandum
SDE	System Development Environment

SDF	Secure Digital Facsimile
	Software Development Folder
	System Development Folder
SDI	Selective Dissemination of Information
	Strategic Defense Initiative
SDIO	Strategic Defense Initiative Organization
SDL	Software Development Library
SDM	Secure Digital Modem
	Space Division Multiplexing
	Standardization and Data Management
	System Development Modification
SDMF	Software Development and Maintenance Facility
SDMS	Shipboard Data Multiplex System
SDMX	Space Division Matrix
SDNS	Secure Data Network System
SDO	Ship Development Objective
	Standards Development Organization
SDP	Software Development Plan
	System Decision Paper
SDR	Sonar Data Recorder
	System Design Review
SDS	Satellite Data System
	Satellite Delay Simulator
	Strategic Defense System
	Surveillance Direction System
SDT	System Diagnostic Test
SDTS	Spatial Data Transfer Standard
SDU	Secure Data Unit
	Subscriber Data Unit
SE	Support Equipment
SEA	Systems Evaluation Area
SEAL	Standard Emitter Abbreviation Listing
SEAS	Surveillance Environmental Acoustic Support
SEC	Sector
SECAS	Submarine Element Coordinator
	Ship's Equipment Configuration Accounting
SECDEF	System Secretary of Defense
SECNAV	Secretary of the Navy
SECNAVINST	Secretary of the Navy Instruction
SECORD	Cordless Switchboard
SECORDS	Secure Cord Boards
SECR	Standard Embedded Computer Resource
SECVOX	Secure Voice
SEDAT	Spectrum Efficient Digital Audio Technology
SEDT	Synthetic Environment Dynamic Terrain
SEE	Software Engineering Environments
	Standard Equipment Environment
SEER	System Evaluation and Estimation of Resources
SEF	Standard Extract Format
SEG	System Evaluation Group
SEI	Software Engineering Institute
SEISP	System Electronic Information Security Policy
SEL	Select
SELF	Streamlined Automated Logistics Transmission System (SALTS)
	Expeditionary Logistics Facility
SELOR	Ship Emitter Location Report
SEM	Standard Electronic Modules
SEM E	Standard Electronic Module E
SEMATECH	Semiconductor Manufacturing Technology Institute

SEMCIP	Shipboard Engineered Military Circuit Improvement Program
SEMI	Semi-Automatic
SEMP	System Engineering Master Plan
SEN	Small Extension Node
SENS	Small Extension Node Switch
SEO	Software Executive Official
SEP	Signal Entry Panel
	Software Engineering Process
	Spherical Error of Probability
	Systems Engineering Plan
SEPO	Software Engineering Process Office
SEQ	Sequence
SERD	Support Equipment Requirements Data
SERE	Survival, Evasion, Resistance and Escape
SERVFOR	Service Force
SES	Severely Errored Second
	Ship Earth Station
	Signals Exploitation System
	Surface Effect Ship
SESEF	Shipboard Electronic Systems Evaluation Facilities
SESS	Space Environment Support System
SETA	System Engineering and Technical Assistance
SETAD	Secure Transmission of Acoustic Data
SEU	Servo Electronics Unit
SEVOCOM	Secure Voice Communications
SEVR	Synthetic Environments and Virtual Reality
SEW	Space and Electronic Warfare
SF	Standard Form
	SuperFrame Format
SF/DP	Single Fire/Dual Purpose
SFDLR	Stock Funding of Depot-Level Repairables
SFN	Security Fault Notification
SFNSY	San Francisco Naval Ship Yard
SFRAN	San Francisco, CA homeport
SFRD	Secret Formerly Restricted Data
SFT	Supplemental Flight Test
SGEMP	System-Generated Electromagnetic Pulse
SGLS	Satellite Ground Link Standard
	Space-Ground Link System
SGM	Strategic Guidance Memorandum
SGML	Standard Generalized Markup Language
SGMM	Strategic Guidance Memorandum Manager
SGMP	Simple Gateway Monitoring Protocol
SGS	Sensor Ground Station
	Ship Gridlock System
SGTM	Spare Guidance Temperature Monitor
SHA	Secure Hash Algorithm
SHAPM	Ship Acquisition Project Manager
SHELF	Super Hard ELF Communications System (survivable)
SHF	Ship's History File
	Super High Frequency [3 -30 GHz]
SHF CAP	Super High Frequency Channel Access Protocol
SHF-SAT	Super High Frequency Satellite
SHFTAMS	Super High Frequency Terminal Access Management System
SHINCOM	Shipboard Integrated Communications
SHIP OTHR	Shipboard Over-the-Horizon Radar Project
SHIPALT	Ship Alteration
SHP	Standard Hardware Program
SHPL	Shipboard High Performance Local Area Network (LAN)

SI	Special Intelligence
	Staten Island, NY homeport
SI-SSIXS	Special Intelligence Submarine Satellite Information Exchange Subsystem
SIADS	Sensor Integration and Display Sharing
SIAS	Signal Intelligence Analysis System
	Submarine Integrated Antenna System
SIC	Senior Intelligence Committee
	Standard Industrial Classification
	Subject Identifier Code
	Subscriber Interface Controller
SICPS	Standard Integrated Command Post System
SID	Ship Installation Drawings
	Subscriber Identification
	System Information Directory
SIDMS	Status, Inventory, Data Management and Supply Support System
SIDPERS	Standard Installation/Division Personnel System
SIE	Structurally Integrated Enclosures
SIF	Selective Identification Feature
SIFB	Single Integrated Fleet Broadcast
SIG	Signal
SIGINT	Signal Intelligence
SIGNET	Signaling Network
SigO	Signal Officer
SIGSEC	Signal Security
SIL	Selected Item List
	Systems Integration Lab
SILS	Secure Interoperable Local Area Network (LAN)/Metropolitan Area Network (MAN) Standard
SIM	Selected Item Management
	Sensor Interface Module
SIMA	Shore-Based Intermediate Maintenance Activity
SIMAS	Sonar In-Situ Mode Assessment System
SIMM	Single In-Line Memory Module
SIMOP	Simultaneous Operation
SINCGARS	Single Channel Ground and Airborne Radio System
SINS	Ship's Inertial Navigation System
SIOC	Serial Input/Output Controller
SIOP	Single Integrated Operation Plan
SIOP-ESI	Single Integrated Operation Plan - Extremely Sensitive Information
	Segment Interface Protocol
SIP	Shore Installation Process
	Simple Internet Protocol
	Staging Initiation Package
	System Identification Profile
	System Improvement Plan
SIPH	Shore Installation Process Handbook
SIPRNET	Secure Internet Protocol Router Network
SIRCS	Shipboard Intermediate Range Combat System
SIRD	Shore-Based Interface Requirements Document
SIRT	Signaling Information Receiver/Transmitter
SISB	Single Integrated Satellite Broadcast
SISL	Secure Information Systems Limited
SIT	Satellite Communications (SATCOM) Integrated Terminal System Integration Team
	Special Information Tones
SIT/LIT	Satellite Communications (SATCOM) Integrated Terminal/ Little-of-Sight (LOS) Integrated Terminal

SITP	Shipyard Installation Test Procedures
SITREP	Situation Report
SIU	Sensor Interface Unit
SIVCS	Scaled Integrated Voice Communications System
SKP	Submarine Keyboard Printer
SL	Segment Leader
SLA	Service Level Agreement
SLATE	Submarine Launched Anti-Submarine Warfare Two-Way Expendable [communications buoy]
SLC	Satellite Laser Communications
	Subscriber-Level Communications Security (COMSEC)
SLD	System Level Diagram
SLEP	Service Life Extension Program
SLFCS	Survivable Low Frequency Communications System
SLHC	Standards for Long-Haul Communications
SLIM	Software Life Cycle Management
SLIN	Sub-Line Item Number
SLM	Ship Logistics Manager
SLMS	Second Level Maintenance Shop
SLO	Synthesized Local Oscillator
SLOC	Sea Line of Communication
SLOT	Submarine-Launched One-Way Transmission [comm buoy]
SLPPL	Ship Level Provisioning Parts List
SLT	System Laboratory Test
SLUR	Support, Logistics and Underway Replenishment
SLVR	Submarine Low Frequency (LF) Very Low Frequency (VLF) VME Bus Receiver
SM	Security Manager
	Subscriber Management
SMART	Shipboard Modular Arrangement Reconfiguration Technology
	Submarine Message Automated Routing Terminal
SMART-T	Secure Mobile Anti-Jam Reliable Tactical Terminal
SMB	Submarine Message Buffer
SMC	Space and Missile System Center
	Special Materiel Content
	Standards Management Committee
	System Master Control
SMCS	Satellite Mission Control Segment
SMDS	Switched Multimegabit Data Service
SME	Subject Matter Expert
SMG	SSN Air Force Satellite Communication (SATCOM) System (SAFS) Modem Group
SMI	Structure of Management Information
SMIC	System Interface Controller
	Special Materiel Identification Code
SMIGS	Standard Military Graphics Symbols
SMIS	Ship's Management Information System
SMO	Software Management Organization
SMOOS	Shipboard Meteorological and Oceanographic Observing System
SMP	Shipboard Miniaturization Program
	Standard Maintenance Procedure
SMS	Signal Measurement System
SMSC	System Maintenance Support Center
SMT	Standard Measurement Techniques
	Station Management
SMTA	Subordinate Message Transfer Agent
SMTP	Simple Mail Transfer Protocol
SMU	Secure Mobile Unit
	Switched Matrix Unit

SNA	System Network Architecture
SNAP	Shipboard Non-Tactical Automated Data Processing (ADP) Program
	Standard Non-Tactical Automated Data Processing (ADP) Program
	Summary Department of the Navy Approval Program
SNAPS	Shipboard Non-Tactical Automated Data Processing (ADP) Program System
SNDL	Standard Navy Distribution List
SNDM	Secretary of the Navy Decision Memorandum
SNDTC	Standard Navy Desktop Computer
SNI	Simple Network Interface
SNIP	Single Net Information and Position
SNMP	Simple Network Management Protocol
SNP	Subnetwork Protocol
SNR	Signal-to-Noise Ratio
SNS	Secure Network Server
SNSL	Stock Number Sequence List
SO	Sonar Operator
	Stockage Objective
SOA	Speed of Advance
SOC	Satellite Operations Center
	Sector Operations Center
SOCC	Submarine Operations Command Center
SOD	System Operational
SOE	Design Safe Operating Envelope
	Standard Operating Environment
SOFA	Status Of Forces Agreement
SOFTMIT	Software Management Indicator Tool
SOH	Start of Overhaul
SOIC	Space Operational Intelligence Center
SOJ	Stand-Off Jammer
SOM	Start of Message
	System Operational Manager [Milstar and UFO/E]
	System Operator’s Manual
SOMO	System Operational Management Office [Milstar only]
SON	Statement of Need
SONET	Synchronous Optical Network
SOO	Statement of Objective
SOOT	Senior Officer Observation Team
SOP	Standard Operating Procedure
SOQPSK	Shaped Offset Quadrature Phase Shift Keying
SOR	Specific Operational Requirement
	Statement of Requirements
	System Operational Requirement
SOS	Speed of Service
	System Operational Specification
SOSS	Satellite Ocean Surveillance System
	Soviet Ocean Surveillance System
SOSUSB	Sound Surveillance System
SOT	System Operability Test
SOTASB	Stand-Off Target Acquisition System
SOTF	Screening on-the-Fly
SOTI	State of the Industry
SOV	Start of Voice
SOVT	System Operational Verification Test
SOW	Statement of Work
SP/DP	Single Purpose/Dual Purpose
SPA	Software Process Assessment

	Solicitation Package Automation
SPADATS	Space Detection and Tracking System [Air Force)
SPAG	European Standards Promotion and Application Group
SPAL	Standard Platform Abbreviation Listing
SPALT	Special Projects Alteration
SPAR	Special Projects Analysis and Reconstruction
SPARC	Scalable Processor Architecture
SPARS	System for Prediction of Acoustics Response of Sensors
SPASUR	Space Surveillance System [Navy]
SPAT	Self-Propelled Acoustic Target
SPAWAR	Space and Naval Warfare Center
	Space and Naval Warfare Systems Command
SPAWARSYSACT	SPAWAR System Activity
SPAWARINST	Space and Naval Warfare Systems Command Instruction
SPAWARSYSCOM	Space and Naval Warfare Systems Command
SPBS-R	Standard Property Book System-Redesign
SPD	Ship Program Directorate
	Ship Project Directive
	Standards Planning Database
SPE	Systems Performance Effectiveness
SPEC	Specification
SPECAD	Specification Control Advocate
SPETE	Special Purpose Electronic Test Equipment
SPF	Shipboard Processing Facility
SPFI	Single Point Failure Items
SPINSAT	Special Purpose Inexpensive Satellite
SPINTCOM	Special Intelligence Communication System
SPLTRK	Special Tracker
SPM	Security Policy Model
	Ship's Program Manager
	Software Programmer's Manual
	System Program Manager
SPO	Special Projects Office
SPOC	Single Point of Contact
SPOSE	Strategic Systems Program Office Planning Document
SPP	Sponsor Program Plan
SPR	Software Problem Report
	Sponsor Program Review
SPS	Simplified Processing Station
	Software Product Specification
	Statement of Prior Submission
	Support Processing Subsystem
	Symbols Per Second
SPT	Sound Powered Telephone
SPTD	Supplemental Provisioning Technical Documentation
SQ FT	Square Feet
SQA	Software Quality Assurance
SQL	Structured Query Language
SQPP	Software Quality Production Plan
SRAM	Static Random-Access Memory
SRB	Submarine Report Back
SRBP	Submarine Report Back Processing
SRC	Satellite Receiver-Combiner
SRCH	Search
SRCS	Shore Remote Control System
SRD	Secret Restricted Data
	Systems Requirements Document
SRP	Site Requirements Package
	Software Reuse Program

SRR	System Requirements Review
SRS	Shared Request Slot
	Software Requirements Specification
SRT	Slow Run Through
	Standard Remote Terminal
SRU	Ship Replaceable Unit
SRWBR	Short Range Wideband Radio System
SRWI	Satellite Radio/Wireline Interface
SS	Sole Source
	Spread Spectrum
	Submarine Safety
	Surface Search
	System Specification
SS/TDMA	Spread Spectrum/Time Division Multiple Access
SSA	Satellite Communications (SATCOM) Signal Analyzer
	Selective Service Act
	Shared Signaling Access
	Software Support Activity
	Source Selection Authority
	Spector Space Average
	Supply Support Activity
	SATCOM Signal Analyzer
SSAA	System Security Authorization Agreement
SSAC	Source Selection Advisory Council
SSAd	Standards and Structures Administrator
SSB	Single Sideband
SSBLT	Source Synchronous Block Transfer
SSBS	Submarine Broadcast Processor
SSC	Software Support Center
	SPAWAR Systems Center
	Strategic Systems Committee
	System/Site Control Segment
SSCC	Special Security Communication Center
SSCP	System Status Control Panel
SSCSMP	Surface Ship Combat System Master Plan
SSDI	Ship System Definition and Index
SEB	Source Selection Evaluation Board
SSEE	Ships Signal Exploitation Equipment
SSEM	System Software Engineering Methodology
SSEP	Source Selection Evaluation Plan
SSES	Ship Signal Exploitation Space
SSF	Software Support Facility
SS-FFP	Sole Source Firm Fixed Price
SSG	Signal Structure Group
SSH	Service Subordinate Headquarters
SSI	Sector Scan Indicator
	Similar Source Integration
	Small Scale Integrated
SSIC	Standard Subject Identification Code
SSIP	Ship Support Improvement Project
SSIXS	Submarine Satellite Information Exchange System
SSL	Single Site Locating
	Site Security Log
	Site System Log
SSLSM	Single Service Logistic Support Manager
SSMA	Spread Spectrum Multiple Access
SSMC	Symbology Standards Management Committee
SSME	Spread Spectrum Modulating Equipment
SSN	Station Serial Number

SSP	Source Selection Plan
	System Security Policy
SSP-S	Single Source Processor-Signal Intelligence (SIGINT)
SSPA	Solid State Power Amplifier
SSPAR	Solid-Slate Power Amplifier Replacement
SSPD	Single Shot Probability of Damage
SSPINST	Strategic Systems Program Office Instruction
SSPO	Strategic Systems Program Office
SSPP	System Safety Program Plan
SSR	Satellite Signal Receiver
	Secondary Surveillance Radar
	Site Survey Report
	Software Specification Review
	Supply Support Request
SSS	Selective Service System
	Standard Operating Environment Storage System
	Standard Software System
	Stellar Sensor System
	Strategic Satellite System
	System/Segment Specification
SSSC	Surface Subsurface Surveillance Coordination/Coordinator
SSSD	Ship's System Staging Diagram
SSSMP	Surface Ship Sonar Modernization Program
SSTC	Space Systems Test Capabilities
SSTIXS	Small Ship Teletype Information Exchange System
SSTM	Single Service Training Manager
SSTS	Satellite Simulator Test Set
SSTV	Slow Scan Television
STE	Secure Telephone Equipment
ST&E	Security Test & Evaluation
STA	Sparing to Availability
STAB	Stabilizer
STAG	Staggered
STAJ	Short-Term Anti-Jam
STAP	Studies and Analysis Program
STAR	Specifying Tailored Acquisition Requirements
	System Threat Assessment Report
STAR-T	Super High Frequency (SHF) Tri-Band Advanced Range Extension Tactical-Terminal
STARS	Software Technology for Adaptable, Reliable Systems
	Standard Accounting and Reporting System
	Surveillance Tracking and Reporting System [Joint Service]
STAS	Safe to Arm Signal
STBD	Starboard
STC	Satellite Test Center
	Sensitivity Time Control
	System Technical Control
STD	Software Test Description
	Standard
STDL	Submarine Tactical Data Link
STDS	Submarine Tactical Display System
STE	Secure Telephone Equipment
	Secure Voice Improvement Program
	Software Test Environment
STEDMIS	Ship's Technical Equipment Data Management Information System
STEP	Standard Tactical Entry Point
STEPS	Ship's Technical Equipment Publication System
STG	Steering Task Group

	System Test Guide
	System Timing Generator
STICCS	Super Tactical Information Command and Control System
STILO	Scientific and Technical Intelligence Liaison Officer
STINFO	Scientific and Technical Information
STIP	Shipboard Tactical Intelligence Processing
STM	Satellite Technology Management
	Service Test Model
STO	Science and Technology Officer
STP	Software Test Plan
	Software through Pictures
	Systems Technology Program
STR	Software Trouble Report
	Stress Test Report
	Synchronous Track and Receive
	Systems Technology Radar
STS	Space Transportation System [Shuttle]
	Staged Transport System
	Stockpile to Target Sequence
	Synchronous Transport Signal
STU	Secure Telephone Unit
	Sensor Transmitter Unit
SUB	Submarine
SUBACS	Submarine Advanced Combat System
SUBFS	Single Uplink Beam Forced Slot
SUBHDR	Submarine High Data Rate
SUBLANT	Submarine Forces, Atlantic
SUBOPAUTH	Submarine Operating Authority
SUBPAC	Submarine Forces, Pacific
SUBSATCOM	Submarine Satellite Communications
SUCCESS	Synthesized UHF Computer Controlled Equipment Subsystem
SUM	Small Submarine Underwater Mobile
SUMS	Spectrum Use Management System
SUPPLOT	Supplementary Plot
SUPRAD	Supplementary Radio
SUPSHIP	Supervisor of Shipbuilding
SUR	Surface
SURTASS	Surveillance Towed Array Sensor System
SURTASS/ETAS	Surveillance Towed Array Sensor System/Escort Towed Array System
SURV	Surveillance Systems Management
SURVSAT	Survivable Satellite
SURVSATCOM	Survivable Satellite Communications System
SUS	Single UNIX Specification
SUS-DUPE	Suspected Duplicate
SUSDLC	Sound Underwater Signaling Downlink
SUT	Surface and Underwater Target
SV	Secure Voice
SVC	Secure Voice Communications
SVE	System Vulnerability and Effectiveness
SVGC	Secure Voice and Graphics Conferencing
SVIC	Shock and Vibration Information Counter
SVID	System V Interface Definition
SVIP	Secure Voice Improvement Program
SVLA	Steered Vertical Line Array
SVM	Sound Surveillance System Validation Model
	System Validation Model
SVS	Secure Voice Switch
	Secure Voice System

SVTT	Surface Vessel Torpedo Tube
SW	Software
	Special Warfare
SWAB	Ship's Work Authorization Boundary
SWC	Ship's Weapon Coordinator
SWCC	Signal Warfare Control Center
SWES	Software Engineering Support
SWG	Switching Group
SWMAT	Switch Matrix
SWO	Staff Weather Office
	Surface Warfare Officer
SWOT	Surface Warfare Over-the-Horizon Targeting
SWP	Surface Warfare Plan
SWRS	Slow Walker Reconnaissance System
SWS	Strategic Weapons System
SXTF	Satellite X-Ray Test Facility
SYDP	Six-Year Development Plan
SYS	Systems
SYSCOM	Systems Command
T&A	Test & Acceptance
T&C	Post-Overhaul Test & Certification
T&CCP	Telecommunications & Command and Control Program
T&E	Test & Evaluation
T-AGOS	Auxiliary General Ocean Surveillance [Military Sealift Command]
	Surveillance Towed Array Sensor System Ship
T/E	Table of Equipment
	Test and Evaluation
T/O	Table of Organization
T/TDS	Tactical/Tabular Display Module
T2C2	Telemetry, Timing, Command and Control
T2C3	Theater and Tactical Command, Control and Communications
T3WG	Tactical and Tactical Technology Working Group
TA	Technical Architecture
	Technical Assessment
	Test Activity
	Towered Array
	Training Agency
	Training Agent
TA/CE	Technical Analysis/Cost Estimate
TA/CP	Technical Assessment/Control Plan
TAAA	Total Active Aircraft Authorization
TAAF	Test, Analyze and Fix
TAAI	Total Active Aircraft Inventory
TAB	Target Acquisition Battery
	Technical Abstracts Bulletin
TAC	Tactical
	Tactical Advanced Computer
	Tactical Air Coordinator
	Target Acquisition Console
	Terminal Access Controller
TAC CP	Tactical Command Post
TAC D&E	Tactical Development & Evaluation
TAC DGU	Tactical Display Generator Unit
TAC-3	Tactical Advanced Computer - 3
TAC-4	Tactical Advanced Computer - Fourth Generation
TAC/TAB	Tactical/Tabular Display Module
TACAMO	Take Charge and Move Out Airborne Very Low Frequency (VLF) Relay System
TACAN	Tactical Air Control and Navigation

TACC	Temporary Augmentation for Command and Control
TACE	Technical Analysis/Cost Estimate
	Technical Control and Analysis Element
TACINTEL	Tactical Intelligence
	Tactical Intelligence Information Exchange
TACINTEL II+	Tactical Intelligence Information Exchange Subsystem II Plus
TACJAM	Tactical Jamming
TACLOG	Tactical Logistics
TACMEMO	Tactical Memorandum
TACMO	Tacoma, WA, homeport
TACO2	Tactical Communications Protocol 2
TACON	Tactical Control
TACREP	Tactical Report
TACSAT	Tactical Satellite
TACSATCOM	Tactical Satellite Communications
TACSIIP	Tactical Systems Inter/Interoperability Program
TACT	Tactical
TAD	Technology Area Description
TADIL	Tactical Data Information Link
	Tactical Digital Information Link
TADIL-A	NATO Link 11
TADIL-B	NATO Link 1
TADIL-C	NATO Link 4
TADIL-J	NATO Link 16
TADIXS	Tactical Data Information Exchange Subsystem
	Tactical Digital Information Exchange Subsystem
TADIXS B	Tactical Data Information Exchange Subsystem Broadcast
TADS	Tactical Automated Data System
	Target Acquisition and Designation System
TADSTAND	Tactical Digital Standard
TADSTANDS	Tactical Data Standards
TAEAS	Tactical Anti-Submarine Warfare (ASW) Environmental Acoustic Support
TAF	Test, Analyze and Fix
TAMS	Test and Monitoring Systems
	Tomahawk Asset Management Systems
TAO	Tactical Action Officer
	Task Area Objective
TAP	Task Area Plan
	Transient Acoustic Processor
TAR	Technical Assessment Report
TARE	Telegraphic Automatic Relay Equipment
TASC	Tactical Anti-Submarine Warfare (ASW) and Surveillance Coordination
TASDAC	Tactical Secure Data Communications
TB	Technical Bulletin
TBD	To Be Determined
TBS	To Be Supplied
TBSP	Test Bed Stable Platform
TC2S	Tactical Command and Control Systems
TC3	Tactical Command, Control and Communications
TC3IPD	Tactical C3 Interface Development Planning Document
TCAC	Technical Control and Analysis Center
TCB	Trusted Computing Base
TCC	Tactical Command Center
	Tactical Communications Center
	Technical Coordination Committee
	Telecommunications Center
	Transmission Control Code

TCCC	Theater Communications Control Center
TCCCS	Tactical Command, Control and Communications System
TCCF	Tactical Communications Control Facilities
TCD	Target Configuration Date
TCF	Technical Control Facility
TCG	Task Communication Graph
TCI	Tactical Command Information
	Terminal Communications Interface
	Training Change Instruction
TCIM	Telecommunications Cabling Installation Manual
TCM	Tactical Contact Manager
TCMS	Technical Control and Management System
TCO	Tactical Combat Operations
TCON	Tracking Converter
TCOS	Tactical Combat Operations System
	Tactical Computer Processor
	Tactical Cryptologic Program
	Technology Coordinating Paper
	Terminal Control Processor
	Transmission Control Protocol
TCP	Terminal Control Processor
TCP/IP	Transmission Control Protocol/Internet Protocol
TCS	Tactical Command System
	Tactical Computer System
	Thermal Control Subsystem
TCSEC	Trusted Computer Security Evaluation Criteria
TCTS	Tactical Communications System Technical Standards
TCU	Transmission Security (TRANSEC)/Communications Security (COMSEC) Unit
	Transportable Computer Unit
TCXO	Temperature Compensated Crystal Oscillator
TDA	Tactical Decision Aids
	Tunnel Diode Amplifier
TDC	Technical Data Center
TDCC	Tactical Data Communications Center
TDD	Test Development Director
TDDL	Time Division Data Link
TDDM	Time Division Demultiplexer
TDDS	Tactical Data Display System
	Tactical Data Dissemination System
	Tactical Related Applications (TRAP) Data Dissemination System
	Tactical Related Applications Data Distribution System
TDF	Tactical Digital Facsimile
TDI	Trusted Database Interpretation
TDL	Tactical Data Link
TDM	Technical Data Manager
	Test Development Manager
	Time Division Multiplexer
TDMA	Time Division Multiple Access
TDMP	Technical Data Management Plan
TDMX	Time Division Matrix
TDN	Tactical Data Network (Marine Corps)
	Terminal Data Node
TDOA	Time Difference of Arrival
TDP	Tactical Data Processor
	Technical Data Package
	Technical Development Plan
TDPCON	Tactical Data Processor Controller
TDPSS	Tactical Data Processor Subscriber Segment

TDR	Technical Director's Review
	Time Domain Reflectometer
TDRD	Training Device Requirements Document
TDRSS	Tracking and Data Relay Satellite System
TDS	Tactical Data System
	Time Distribution System
	Total Distribution System
TEB	Technical Evaluation Board
TEC	Triple Error Correction
TECG	Test and Evaluation Coordinating Group
TECH	Technical
TECHASSESS	Technical Assessment
TECHEVAL	Technical Evaluation
TECPO	Tactical Embedded Computer Program Office
TED	Trunk Encryption Device
TEED	Tactical End-to-End Encryption Device
TEIN	Test and Evaluation Identification Number
TELCOR	Telecommunications Operating Requirement
TELNET	Telecommunications Network
TEMFLANT	Tender Equivalent Missile Facility, Atlantic
TEMFPAC	Tender Equivalent Missile Facility, Pacific
TEMP	Test and Evaluation Master Plan
TEMPALT	Temporary Alteration
TEMPEST	Electronic Security Requirement
	[Not an ACRONYM] Unclassified U.S. Government code word for compromising emanations]
TEMPT	Test, Equipment, Materials, Parts and Tools
TEMS	Telecommunications Emergency Management System
TENCAP	Tactical Exploitation of National Capabilities
TEP	Terminal Emulation Processor
	Test and Evaluation Plan
TEPC	Test and Evaluation Planning Committee
TEPG	Test and Evaluation Planning Group
TERM	Terminate
TEWG	Test and Evaluation Working Group
TF	Task Force
	Test Facility
TFCC	Tactical Flag Command Center
	Task Force Command Center
TFCN	Task Force Coordination Net
TFDS	Time Frequency Distribution System
TFOCA	Tactical Fiber-Optic Cable Assembly
TFR	Trouble Failure Report
TFS	Terminal Fix System
	Traffic Flow Security
TG	Task Group
	Time Gated
TGF	Tactical Data Information Exchange Subsystem (TADIXS) Gateway Facility
TGP	Tactical Data Information Exchange Subsystem (TADIXS) Gateway Processor
TGS	Track Generation System
TGSM	Terminally Guided Submunitions
TGU	Technique Generator Unit
TH	Telemetry Head
	Terminal Handler
T&I	Transition and Integration
TI	Test Instrumentation
TIA	Telecommunications Industry Association

TIB	Tactical Receive Equipment Interface Board
TIBS	Tactical Information Broadcast Service
	Tactical Intelligence Broadcast System
TIC	Tactical Information Coordinator
	Tactical Interface Computer
	Technical Interface Concept
TICC	Tactical Information Communication Center
TICCS	Tactical Information Command and Control System
TICM	Thermal Imagery Common Module Program
TID	Touch Interactive Display
	Transaction Identifier
TIDP	Technical Interface Design Plan
TIDP-FE	Technical Interface Design Plan - Final Edition
TIDP-TE	Technical Interface Design Plan - Test Edition
TIE	Time Interval Error
TIES	Tactical Information Exchange System
TIFF	Tagged image File Format
TIM	Technical Integration Manager (or IM)
TIMS	Tactical Information Management System
	Transmission Impairment Measurement System
TIP	Tactical Interface Point
TIPS	Tactical Information Processing System
	Training Information Profile Sheet
	Training Information Profile Status
TISG	Technical Interoperability Standards Group
TIU	Tactical Information Broadcast Service (TIBS) Interface Unit
TIXS	Tactical Information Exchange System
TJTS	TADIL J Test System
TL	Task Leader
	Threat Level
TLC	Telecommunication Line Controller
TLCF	Tactical Intelligence (TACINTEL) Link Control Facility
	Tactical Data Information Exchange Subsystem (TADIXS) Link Control Facility
TLD	Top Level Design
TLR	Top Level Requirement
TLR/TLS	Top Level Requirement/Top Level Specification
TLS	Time Line Summary
TM	Technical Manual
TM/ST	Technical Manager for Shipboard Testing
TMCR	Technical Manual Contract Requirement
TMDE	Test, Measurement and Diagnostic Equipment
TMDS	Tomahawk Mission Display System
TMG	Tactical Multinet Gateways
TMIN	Technical Manual Identification Number
TMS	Telecommunications Management System
	Test/Maintenance Supervisor
	Transmission Measurement System
TnT	Tactical/Non-Tactical
TNWS	Tactical Naval Warfare System
TO	Task Organization
	Technical Order
TOA	Total Obligational Authority
TOC	Tactical Operations Center
TOD	Time of Day
TOES	Telephone Order Entry System
	Time-Zero Estimation System
TOF	Technical Operations Facility
TOG	Technical Objectives and Guidelines

TOL	Tolerance
TOP	Technical and Office Protocols
TOR	Technical Override
	Tentative Operational Requirement
	Time of Receipt
TOS	Tactical Operations System
TOT	Tactical Related Applications Operator Terminal
	Time of Transmission
TP	Technical Package
	Transaction Processing
TP4	Transport Protocol Class 4
TPD	Test Planning Document
TPDA	Test Procedures Development Agency
TPDD	Test Procedures Development Director
TPDM	Test Procedures Development Manager
TPFG	Technology Programming and Fiscal Guidance
TPIPT	Technical Planning Integrated Product Team
TPL	Test Plan
TPN	Tactical Packet Network
TPO	Terminal Program Office
TPOM	Tentative Program Objectives Memorandum
TPPG	Technology Policy and Planning Guidance
TPR	Test Procedure
TPS	Test Program Set
TPSD	Test Program Set Document
TPU	Terminal Processor Unit
TR	Test Report
TRANSEC	Transmission Security
TRAP	Tactical Related Applications
	Tactical Data Information Exchange Subsystem (TADIXS)-B Broadcast
TRD	Test Requirement Document
TRE	Tactical Receive Equipment
TREAT	Tactical Receive Equipment Advanced Terminal
TRED	Tactical Receive Equipment Display
TREDS	Tactical Reconnaissance Exploitation Demonstration System
TREE	Transient Radiation Effects on Electronics
TREIXS	Tactical Receive Equipment Information Exchange Subsystem
TREP	Tactical Receive Equipment Processor
TRF	Technical Reference File
	Technical Replacement Factor
TRGUI	Technical Reports Graphical User Interface
TRI-TAC	Tri-Service Tactical Communications
TRIXS	Tactical Reconnaissance Information Exchange System
	Tactical Reconnaissance Intelligence Exchange Service
TRKSUP	Track Supervisor
TRM	Technical Reference Model
	Training Resource Model
TRN	Transmit Request Number
TRNG	Training
TRP	Technical Review Panel
	Threat Recognition Processor
TRPPM	Training Planning Process Methodology
TRQ	TEMPEST Requirements Questionnaire
TRR	Test Readiness Review
TSA	Training Support Agency
TRS	Test Requirement Specification
TRU	True
TS	Tactical Intelligence (TACINTEL) Subscriber

	Test Specification
	Top Secret
TSA	Training Support Agency
	Transportation Support Activity
TSAPG	Telecommunications System Architecture Planning Group
TSAR	Time Series Acoustic Recall
TSB	Trunk Signaling Buffer
TSC	Technology Service Corporation
TSC ADP	Tactical Support Center, Automated Data Processing
TSC/HLT	Tactical Support Center/High-Level Terminal
TSIP	Training System Installation Plan
TSIXS	Tactical Support Center Information Exchange Subsystem
TSD	Tape Storage Device
TSEC	Telecommunications Security [also equipment used for this]
	Transmission Security
TSES	Tactical Signals Exploitation System
TSG	Transmission Signaling Group
TSGCE	Tri Service Group on Communications and Electronics (NATO)
TSGCEE	Tri-Service Group on Communications and Electronic Equipment
TSI	Test and Measurement Equipment Status Inspection
TSIG	Trusted Security Interoperability Group
TSITP	Tenderside Test Program
TSM	Time Standard Module
TSO	Telecommunications Service Order
TSP	Telecommunications Service Priority
	Test Support Package
	Timely Spares Provisioning
TSPS	Tomahawk Strike Planning System
TSR	Telecommunications Service Request
TSS	Tangential Signal Sensitivity
	Telecommunication Security System
	Test Support System
TSTC	Target Selection and Tracking Console
TSTD	Total Ship Test Director
TSTP	Total Ship Test Program
TSTS	Test Support and Training System
TSTT	Total Ship Test Team
TT&C	Telemetry, Tracking & Command
	Telemetry, Tracking & Control
TTB	Tactical Data Information Exchange Subsystem (TADIXS) Transaction Block
	Tactical Data Information Exchange Subsystem (TADIXS) Transport Control and Transaction Block
TTC	Tactical Data Information Exchange Subsystem (TADIXS) Transaction Control
	Telemetry, Tracking and Control
TTE	Technical Training Equipment
TTL	Transistor-Transistor Logic
	Transmitter to Transmitter Logic
TTS	Trunk Traffic Simulator
TTY	Teletypewriter
TTY MUX	Teletypewriter Multiplexer
TU	Transmission Unit
TUT	Tactical Users Terminal
TV	Television
TVC	Thrust Vector Control
TVRO	Television Receive Only
TWA	Two Way Alternate
TWAMP	Time-Weighted Average Month's Program

TWCS	Tomahawk Weapon Control System
TWG	Technical Working Group
	Transition Working Group
TWICS	TOMAHAWK Weapons Control System
TWIDS	Threat Warning Information Display System
TWT	Traveling Wave Tube
TWTA	Traveling Wave Tube Amplifier
Tx	Transmit
TX NET	Transmission Network
TX/RX	Transmit/Receive
TYCOM	Type Command
U	Unclassified
U/I	Unit of Issue
UA	User Agent
UAA	Uncontrolled Access Area
UADPS	Uniform Automated Data Processing System
UAS	Unavailable Seconds
UAV	Unmanned Aerial Vehicle
UAV GCS	Unmanned Aerial Vehicle Ground Control Station
UAV MPCS	Unmanned Aerial Vehicle Short Range Mission Planning and Control Station
UB	Unified Build
UBL	Unit Basic Load
UBS	Unclassified But Sensitive
	Underwater Battery Supervisor
UCC	Uniform Commercial Code
UCD	Usable Completion Date
UCI	User-Computer Interface
UCON	Up Convertor
UCP	Universal Communications Processor
UDP	User Data Protocol
UDS	Unified Digital Switch
UELS	Universal Electronic Laboratory Simulator
UFO	Ultra High Frequency (UHF) Follow-On
UFO/FO	Ultra High Frequency (UHF) Follow-On Follow-On
UFO/E	Ultra High Frequency (UHF) Follow-On/Extremely High Frequency (EHF)
UHF	Ultra High Frequency [300 MHz-3000 MHz]
UHF DAMA	Ultra High Frequency Demand Assigned Multiple Access
UHF/ADF	Ultra High Frequency/Automatic Direction Finding
UHF LOS	Ultra High Frequency Line of Sight
UHF LOS CAP	Ultra High Frequency Line of Sight Channel Access Protocol
UHF SAT	Ultra High Frequency Satellite
UHF SAT CAP	Ultra High Frequency Satellite Channel Access Protocol
UI	Unit Interval
	UNIX International
	User Interface
UIA	Unit Identification Application
UIC	Unit Identification Code
UICP	Uniform Inventory Control Programs [Automated Data Processing (ADP) System]
UIR	User Interface Requirement
UIS	User Interface Segment
UISRM	User Interface System Reference Model
ULCS	Unit Level Circuit Switch
ULLS	Unit Level Logistics System
ULMS	Unit Level Message Switch
ULS	Unit Level Switch
	User Logistic Support Summary

ULSS	User's Logistics Support Summary
UMIDS	Uniform Microcomputer Disbursing System
UMS	Universal Modem System
UNCB	Uncommitted On-hand Beds
UND	Urgency of Need Designator
UNITRACK	Navy Standard Unit Tracking
UNIX	Computer Operating System
UNK	Unknown
UNSECNAV	Under Secretary of the Navy
UNT	Unified Networking Technology
UPE	User Portability Extension
UPS	Uninterruptible Power Supply
US	United States
USA	United States of America
	United States Army
USAF	United States Air Force
USAFR	U.S. Air Force Reserve
USANG	U.S. Air National Guard
USAR	U.S. Air Reserve
	U.S. Army Reserve
USAREUR	U.S. Army Europe
USASPO	U.S. Army Space Programs Office
USB	Upper Sideband
USC	United States Code
USCG	United States Coast Guard
USD(A)	Under Secretary of Defense for Acquisition
USD(P)	Under Secretary of Defense for Policy
USD(R&E)	Under Secretary of Defense for Research & Engineering
USFIB	U.S. Foreign Intelligence Board
USFJ	U.S. Forces - Japan
USFK	U.S. Forces - Korea
USG	United States Government
USGS	United States Geological Survey
USIA	United States Information Agency
USMC	U.S. Marine Corps
USMCR	U.S. Marine Corps Reserves
USMTF	U S. Message Text Format
USN	U.S. Navy
USNR	United States Navy Reserve
USNS	United States Navy Ship
USSADC	Undersea Surveillance System Acoustic Display Console
USSB	United States Satellite Broadcasting, Inc.
USTS	Ultra High Frequency (UHF) Satellite Terminal System
UT	Underway Trials
UTC	Universal Time Coordinated
	Universal Time Coordinates
UTE	Unimpaired Tactical Effectiveness
UTM	Universal Test Message
	Universal Transverse Mercator
UVEPROM	Ultraviolet Programmable Read-Only Memory
(V)	Variant
V	Version
V	Volts
V&E	Vulnerability & Effectiveness
V&V	Verification & Validation
VAC	Vital Area Center
	Volts, Alternating Current
VACAPES	Virginia Capes Operating Area
VAD	Vulnerability Assessment Device

VADAC	Voice Analysis Data Converter
VALE	Vernier Adaptive Line Enhancement
VAN	Value Added Network
VAR	Variance Analysis Report
	Varied
VARCHAR	Variable Character
VARIS	Visit Authorization Request Information System
VASS	Visual Analysis Support Subsystem
VAX	Virtual Address Extension
VCJCS	Vice Chairman, Joint Chiefs of Staff
VCNM	Vice Chief of Naval Materiel
VCNO	Vice Chief of Naval Operations
VCP	Voltage-Controlled Oscillator
VCR	Videocassette Recorder
VCS	Video Clutter Suppression
VCXO	Voltage, Control Oscillator
VD	Vertical Deflection
VDC	Volts, Direct Current
VDS	Variable Depth Sonar
VDT	Video Display Terminal
VDU	Video Display Unit
VE	Value Engineering
VEX	Video Extension to X
VF	Voice Frequency
VFCT	Voice Frequency Carrier Telegraph
VFEA	VME and Futurebus+ Extended Architectures
VGA	Video Graphics Array
VGD	Video Graphic Device
VGDC	Video Graphic Display Controller
VHF	Very High Frequency (30 MHz-300 MHz]
VHF CAP	Very High Frequency Channel Access Protocol
VHF RF	Very High Frequency Radio Frequency
VHIC	Very High Speed Integrated Circuit
VIC	VME Interconnection Controller
VICS	VME Integrated Communications System
VIGC	VME interconnection Group Controller
VIGS	VME Interconnection Group System
VINSON	Very High Frequency (VHF)/Ultra High Frequency (UHF) Wideband Tactical Secure Voice System Cryptographic Equipment
VIP	Visual Information Projector
VIS	Vertical Incidence Sounder
VISION	Very Small Aperture Terminal (VSAT) Intelligent Satellite Integrated Operations Network
VIXS	Video Information Exchange System
VLF	Very Low Frequency
VLF/LF	Very Low Frequency/Low Frequency
VLSI	Very Large Scale Integration
VME(-BUS)	Industry standard multiprocessor backplane bus
VMEB	VME Board
VMEC	VME Chassis
VMF	Variable Message Format
VMOS	V-Type Metal Oxide on Silicon
VMS	Velocity Measuring Sonar
	Video Management System
	Voice Multiplier System
VMTP	Versatile Message Transaction Protocol
VOCODER	Voice Coder [analog-to-digital converter]
VOM	Volt-Ohm Millimeter

VOX	Voice Operated Switching
VPO	Virtual Program Office
VPRS	Velocity/Positioning Recording System
VR	Virtual Reality
VSAT	Very Small Aperture Terminal
VSB	VME Subsystem Bus
VSG	Vertical Support Group
VST	Vertical Static Test
	Voice Subscriber Terminal
VSWR	Voltage Standing Wave Ratio
VT	Virtual Terminal
VTAM	Virtual Telecommunications Access Method
VTC	Video Teleconferencing
VTP	Virtual Terminal Protocol
VTS	Video Teleconferencing System
VTT	Video Teletraining
VV&A	Verification, Validation & Accreditation
VVFTD	Voice, Video, Facsimile and Data Terminal
VXI	VME Extensions for Instrumentation
W/	With
W/CSM	Wire/Circuit Switch Manager
W3	World Wide Web
WA	Work Authorization
WAA	Wide Aperture Array
WAD	Work Authorization Document
WADR	Wideband Acoustic Data Relay
WAIM	Wide-Angle Impedance Matching
WAN	Wide Area Network
WAR	Weekly Activity Report
WARC	World Administrative Radio Conference
WAVELL	United Kingdom Command and Control System
WAWCS	Washington Area Wideband Communications System
WB	Wideband
WB-LOS	Wideband Line-of-Sight
WBAM	Wideband Amplitude Modulation
WBAR	Wideband Acoustic Recall
WBDL	Wideband Data Link
WBFM	Wideband Frequency Modulation
WBS	Work Breakdown Structure
WBS	Work Breakdown Structure
WBSE	Work Breakdown Structure Element
WCAP	Waterfront Corrective Action Program
WCC	Weapon Control Console
WCDR	Wideband Compressed Data Relay
WCO	Weapons Control Order
WCS	Weapons Control System
WDM	Wave-Length Division Multiplexing
WEACEN	Weather Central
WECO	Western Electric Company
WESTCOM	Western Command
WESTHEM	Western Hemisphere
WESTPAC	Western Pacific
WG	Working Group
WHCA	White House Communications Agency
WHNS	Wartime Host-Nation Support
WHSR	White House Situation Room
WINDD	Windows Distributed Desktop
WIPT	Working Integrated Product Team
WISDIM	Warfighting and Intelligence Systems Directory for Information

	Management
WLAN	Wireless Local Area Network
WLANT	West Atlantic
WLO	Weapon Liaison Officer
WNINTEL	Warning Notice-Intelligence Sources and Methods Involved
WNMC	Weather Network Management Center
WO	Wide Open
WP	Work Plan
WPAC	Western Pacific
WPC	Washington Planning Center
	Weapons Planning Center
WPN	Weapons Procurement, Navy
WS	Workstation
WS	Wideband Short Pulse
WSP	Workstation Security Package
WSU	Weather Support Units
Wt	weight
WVR	Within Visual Range
WWOLS	Worldwide On-Line System
WWV	National Bureau of Standards radio station
WWW	World Weather Watch
	World Wide Web
WX	Weather
X-Band	frequency band [5,200 MHz-10,900 MHz]
X11	X Window System Version 11
XBT	Expendable Bathythermograph
XCOM	Exterior Communication System
XDR	External Data Representation
XFER	Transfer
XGDS	Exemption from the General Declassification Schedule
XLDB	Crosslinked Doublebase
XMIT	Transmit
XMT	Transmit
XMTR	Transmitter
XNS	Xerox Network System
XO	Executive Officer
XOR	Transmit Over Receive
XPG	X/Open Portability Guide
XPNDR	Transponder
XRIM	Experimental Surface Shiplaunched Aerial Intercept Guided Missile
XTP	Express Transfer Protocol
XWIN	X Window
XYZ	Designation for an unknown competitive manufacturer
Y	Yes
YDS	Yards
YIG	Yttrium-Iron-Garnet [bandwidth filter]
YR	Year
Z	Zulu
ZBTSI	Zero Byte Time Slot Interchange
ZULU	General Military Time
	Greenwich Mean Time

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SHORE INSTALLATION STANDARDS AND REFERENCES

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1. Introduction

This appendix to the Shore Installation Process Handbook (SIPH) discusses the fundamental references that contain the rules that SPAWAR installations and drawings must comply with. Not every rule or reference that could possibly apply to a SPAWAR installation is covered. This appendix only addresses the most commonly applicable references and their most common applications to routine installation tasks. When uncommon issues need to be addressed, this appendix can often be used to help determine which documents need to be studied further to ensure that installations meet requirements. When appropriate, the following sections:

a. List some common installation mistakes in the hope that this will help to prevent them from being repeated.
b. Identify key requirements to increase awareness of the most important rules.
c. Specify when and where specific key information must be included in IDPs to avoid misinterpretations. **Note: Not all key information is called out in this way.**
d. Provide SPAWAR installation policy guidance covering common issues, like cabinet mounting, where the guidance in the standards cited is insufficient or not clear.
e. Identify processes for which SPAWAR intends to publish standard installation detail drawings to cover common installation practices such as cabinet mounting and grounding. These standard detail drawings will help to improve the consistency and quality of SPAWAR installations across the enterprise.
f. Provide a path for removing the total restriction against work within energized power panels as long as the IDP contains the information described within the Electrical Safety section (Section 16) and personnel performing and in the area near the work have received the specified training, protective gear, proper tools, and proper authorization as required by OSHA standards and Unified Facilities Criteria (UFC) 3-560-01. (The 2003 Edition of the Shore Installation Process Handbook Section 7.3.1 forbids the performance of work within energized power panels.)

1.1 SPAWAR Policy

Installation Design Plan (IDP) shall specify methods and materials in enough detail to ensure that typical installers can meet applicable requirements without needing to conduct their own research into the contents of the standards and other references. Installation drawings developed by SPAWAR or any of its direct report field activities, whether developed by government or contractor employees, shall only receive final approval from a SPAWAR certified Installation Design Approval Authority. SPAWAR 4.2 shall administer an installation design approval certification process that shall include a review of qualifications, specialized training, and periodic design compliance assessments. Only personnel with a thorough knowledge of the material discussed in this document and with convenient access to all of the key referenced documents will be certified to approve SPAWAR installation drawings.

1.2 Attachments

Stand-alone lists of checklist items are provided for several different types of installation work in attachments A through F. These checklist items were, for the most part, designed for use by personnel inspecting the compliance and quality of completed work, but they still contain information that can be included in design documents. Attachments G and H contain tables of reference information. Attachment I is the Index.

1.3 Special Emphasis on Electrical Installation and Grounding Requirements

This document goes into a much deeper discussion of electrical installation and grounding requirements than of other requirements. This is because almost all SPAWAR installations require power and grounding, and many standards violations have occurred in these areas.

2. NEMA Guidelines

The National Electrical Manufacturers Association (NEMA) publishes guidelines that can be of great use to design engineers and installers. These documents are periodically updated. The latest documents can be obtained from the NEMA website at http://www.nema.org/stds/. The two excellent documents discussed below were available for downloading at no charge.

2.1.1 NEMA Standards Publication VE-2-2006

VE-2-2006 contains very clear and easy to understand guidance for installing cable trays. (It could have been called "Cable Tray Installation for Beginners".) It discusses details such as fastener torque and cable tray support locations. PEs whose projects require cable tray installations should download the most recent version of this document, incorporate its guidance into their IDPs, and use it to monitor the practices of their installers.

2.1.2 NEMA Bulletin No. TCB-2-2000

TCB-2-2000 contains very clear and easy to understand guidance for installing underground conduits and covers some of the finest installation details. PEs whose projects require underground conduit installation shall download the most recent version of this document and incorporate appropriate portions of its guidance into their IDPs. It can also be used to monitor the installation practices of contractors.

3. NFPA 70: National Electrical Code (NEC) and Installation Design

The purpose of meeting the National Electrical Code is to safeguard "persons and property from hazards arising from the use of electricity."[1] It covers "the installation of electrical conductors, equipment, and raceways; and optical fiber cables and raceways"[2] for buildings (including floating buildings, but not ships), structures and parking lots. The 2008 Edition is more than 822 pages long, but only a small portion of it applies to a typical SPAWAR equipment installation. The purpose of the following is to explain the requirements of the code that apply most often to C4ISR equipment installations at U.S.

[1] NEC Article 90.1(A)
[2] NEC Article 90.2(A)

Navy shore facilities and to **cover areas where Navy requirements exceed those in the NEC.** Enforcement of the Code and the subject of waivers are addressed in Article 90-4. **The Project Engineer must obtain a waiver from the authority having jurisdiction (AHJ) if any part of the design will result in a violation of the NEC.** UFC 3-520-01 governs Army, Navy, and Air Force interior electrical systems and states that "The minimum requirements of National Fire Protection Association (NFPA) 70, …, must be met." The following paragraphs address common subject areas where knowledge of the code is vital to planning for SPAWAR shore installations.

3.1 Circuit Breaker Sizing

3.1.1 Breaker Size (Amperage Rating) Indication

The IDP shall indicate on the Power Distribution Drawings (Drawing Category Code 140) the ampere ratings of the circuit breakers (or fuses) required to supply the items being installed (e.g. equipment cabinets, racks, outlets, hard-wired equipment, and other items requiring a fixed electrical power source).

3.1.2 AIC (Ampere Interrupting Capacity) Indication

If new circuit breakers are being installed, the AIC (Ampere Interrupting Capacity) rating must also be determined and indicated on the drawing in the parts list description. This rating is sometimes referred to as the "Interrupting Rating". It is a rating of the amount of current that a protective device, such as a fuse or circuit breaker, can safely interrupt. If the new breaker is going into an existing panel, the AIC ratings of the panel's breakers have already been established, and should be easy to determine. In any facilities where the AIC rating has not been established or is in doubt, the AIC rating shall be established by the service provider or by a senior or licensed electrical engineer who shall be required to provide the calculations used to determine the appropriate AIC rating. Literature on how to calculate short circuit currents at each point in any distribution can be obtained by contacting the manufacturer's of overcurrent devices or by referring to IEEE 141-1993, *Recommended Practices for Electrical Power Distribution for Industrial Plants*. See NEC article 110.9. NEC Article 240.83 (C) requires that "Every circuit breaker having an interrupting rating other than 5000 amperes shall have its interrupting rating shown on the circuit breaker.

3.1.3 Electrical System Coordination

Electrical system coordination is the selection and application of circuit protective devices in series such that under overload or fault current conditions, only the device just up stream from the overload or fault will open to clear the fault. When the breaker nearest the circuit's faulted point does not trip and one above it does, a review of the degree of coordination shall be undertaken.

3.1.4 Ampere Rating Determination

Before a required circuit breaker amperage rating can be determined, the designer must determine two things. The first is the maximum load to be served. The second is continuous load. A continuous load is defined by the NEC as "a load where the maximum current is expected to continue for three hours or more." Circuit breakers shall be sized in accordance with the following requirement in Article 210.20(A): "Where a

branch circuit supplies continuous loads or any combination of continuous and non-continuous loads, the rating of the overcurrent device shall be not less than **the noncontinuous load plus 125 percent of the continuous load.**" (There is an exception if you purchase special breakers designed to operate at 100 percent of their rating.) If an Installation Requirements Drawing (IRD) or similar document (e.g., Installation Control Drawing (ICD) or standard plan) is available for the system being installed, these loads can be obtained from the Technical Data Summary tables provided in the IRD or similar document. If no such document is available, the designer must obtain the information from the manufacturer or by taking measurements.

3.1.5 Ground-Fault Circuit Interrupter (GFCI) Protection for Personnel

Article 210.8(B)(3) of the NEC requires that 15 and 20 amp rooftop electrical outlets (like antenna utility outlets) have GFCI protection. Any electrical outlet installed by SPAWAR — including temporary outlets at the end of extension cords used for power tools, etc. — that is at significant risk of exposure to moisture (including all outdoor, pier, garage, hangar, and boathouse outlets) shall have GFCI protection. See NEC Article s 210.8, 513.2 (Aircraft Hangars), 555.19(B)(1) (Boathouses and Marinas), 511.12 (Commercial Garages), 590.6 (Temporary Installations), 517.20(A) & 517.21 (Health Care Facilities).

3.1.6 Common Errors

Designers unfamiliar with the requirements in the National Electrical Code have mistakenly assigned continuous loads between 16 and 20 amps to 20 amp breakers. If the continuous current draw of the equipment in a rack is 16.01 amps, then a normal 20 amp circuit breaker is too small to supply the rack. The reason for this is that 125% of any current larger than 16 is more than 20 amps. The easiest way to avoid this type of error is to use the *CIRCUIT BREAKER AND COPPER CONDUCTOR SIZING CHART* shown in Figure 1.

3.2 Wire Sizing for Electrical Power (Current Carrying Conductors)

This section covers the sizing of electrical wires that are carrying current for electrical power. This includes neutral conductors for Navy C4ISR installations.

3.2.1 Wire Type and Size Indication

The IDP shall indicate on the Power Distribution Drawings (Drawing Category Code 140) the size and type (e.g. #12 AWG Copper THHN/THWN) of all wires connected to site circuit breakers and the size and type of wires being connected to the power panel neutral and ground busses. (The use of aluminum wiring for SPAWAR installations is prohibited by SPAWAR policy even where allowed by the NEC and UFC 3-520-01 Section 6-2.4.)

3.2.2 Wire Size Determination

If an IRD has been prepared for the system being installed, it will provide wire sizes and state the conditions under which the wire sizes shown are appropriate. The IRD should also provide guidance for dealing with the conditions under which the wires sizes would need to be increased. If no IRD guidance is available, the installation designer must be

familiar with all of the factors that affect the size of the wire to be chosen and their interrelationships. These factors are:

a. **Ampere Rating of Circuit Breaker and Minimum NEC and SIPH Specified Wire**. The minimum wire size shown in the IDP for connections to circuit breakers shall be #14 AWG for 15 amp breakers (rarely used for SPAWAR installations), #12 AWG for 20 amp breakers, and #10 AWG for 30 amp breakers per Article 240.4(D) of the NEC. (The minimum size of conductors for general wiring, according to NEC Table 310.5, is #14 AWG.) While the minimum sizes mentioned above are suitable for most SPAWAR installations, they are just minimums. Long wire runs, runs in areas subject to high temperatures, and runs with many wires in a single conduit can require the use of larger wire. Determining the minimum wire size for circuits larger than 30 amperes is more complicated and requires the use of the correct "Allowable Ampacity" Table in the NEC. In SPAWAR installations, electrical wires are typically installed in a raceway (conduit), so NEC Table 310.16 typically also applies. The minimum wire sizes shown in the NEC tables are based on safety considerations. When using these tables to determine the minimum AWG size of the larger wire to be installed, SPAWAR policy requires that the "Types TW, UF" column in the NEC table be used with the "Size AWG or kcmil" column to determine the minimum wire size. However, SPAWAR policy still requires that that type THHN/THWN or better wire be installed. The purpose of this policy is to prevent the required use of the higher temperature rated wire from leading to a waste of energy because engineers are substituting smaller gauge (less copper) high temperature wire for the low temperature wire. This policy also provides an increased safety margin and often means that violations caused by putting more than three low temperature wires in a conduit (and failing to derate the ampacity as discussed in the following paragraph) will be avoided.

b. **Number of Current Carrying Conductors in the Raceway (Conduit) or Cable or Bundle Longer than 24 inches.** Three-phase circuits for installing SPAWAR C4 (Command, Control, Computer, and Communications) equipment normally have four current carrying conductors because of the presence of harmonic currents caused by non-linear loads. If a conduit has more than three current-carrying conductors, the ampacity of the conductors must be reduced by the factor listed in NEC Table 310.15(B)(2)(a). Table 310.15(B)(2)(a) does not apply to sheet metal auxiliary gutters/metal wireways with less than 30 current-carrying conductors and under a 20% fill. See NEC Articles 366.22 and 376.22. The derating factors also do not apply to conductors in nipples or bundles not longer than 600 mm or 24 inches. (See Exception No. 3 to NEC 310.15(B)(2)a.)

c. **Temperature Rating of the Conductors.** At any given ambient temperature, wire with a higher temperature rating will almost always have a significantly higher ampacity than lower temperature rated wire. THHN/THWN wire is inexpensive and readily available. It is rated for use in dry locations up to 90° C and in wet locations up to 75° C. It has a higher ampacity, smaller size (due to thinner insulation), and is easier to get than type TW wire. It is the recommended wire for most SPAWAR installations. Choosing a lower temperature rated wire such as TW or THW wire is not allowed by SPAWAR policy. This is because TW and THW wire can carry less current, is generally harder to install, and generally harder to find. The value of using

THHN instead of TW or THW wire is easily shown when a 30 amp 3-phase circuit has four current carrying conductors in a conduit at an ambient temperature of 86°F or 30°C. The ampacity of #10 AWG TW wires in this situation is only 24 amps (0.8 derating factor (from NEC Table 310.15(B)(2)(a)) times 30 amps (ampacity from NEC table 310.16 of not more than three conductors in a conduit)), so it cannot be used. THW cannot be used either. However, the ampacity of THHN wire in this situation is 32 amps (40 amps (from NEC table 310.16) times 0.8), so it can be safely used.

d. **Ambient Air Temperature.** Tables 310.16 through 20 of the NEC consist of two parts. The top part of the tables give the allowable ampacities of wire of different types (different columns) and sizes (different rows). However, it is important to remember that the ampacities shown are only valid for ambient air temperatures from 26 to 30 °C. Ampacities increase at reduced temperatures, so reduced temperatures are not a problem. However, ampacities decrease significantly with increases in air temperature. This is especially true for low temperature rated wire like TW and UF wire (that we recommend not be used). The amount of the decrease in ampacity is calculated using the correction factors provided at the bottom of the tables. At ambient air temperatures of 46°C or 114°F (common in places like Bahrain and Iraq) the ampacity of TW wire is just 58% of its ampacity at 30 °C or 86 °F. The ampacity of THHN wire would be 82% of its ampacity at 30 °C or 86 °F under the same circumstances. In warm climates, ambient air temperatures over 30°C are common in non-air-conditioned spaces (typically attics). If the wire being installed is not housed in a permanently air-conditioned space, this factor must be considered.

e. **Maximum Potential Current on Return or Neutral Wires.** Wires connected directly to circuit breakers have the current flowing through them limited by the circuit breaker. Return wires that can only return current supplied by a single breaker have their current limited by that single breaker. The maximum current in these cases can be assumed to be equal to the ampere rating of the breaker. Neutral wires returning current from more than one phase of AC current can have maximum currents that exceed the rating of any of the supplying breakers. Designers requiring the installation of potentially unbalanced three phase equipment (especially small three-phase power distribution units for cabinets and small power panels) need to be aware that the potential current on the neutral or return wires of these circuits can be up to 1.73 times as large as the current flowing through the circuit breaker on the individual phases.

Note: Treatment of and Wire Size Determination of Neutral Conductors. Neutral conductors supplying C4ISR equipment shall be considered current carrying conductors for the purpose of determining ampacities. In addition, whenever there is a potential that the current on the neutral conductor will be greater than the current on the other conductors, the neutral conductor must be sized to carry the additional current. For example, if a three-phase circuit supplies a three-phase power distribution unit (PDU) that could have a potential 20 amp load on two phases, the ampacity of the neutral wire must be 1.73 times 20 amps or 34.6 amps. If THNN-THWN were used, the minimum wire size would be #10 AWG. (NEC Section 220.61 (A) only requires that the service neutral load be 140 percent of the maximum

net calculated load, but this only applies to 3-wire 2-phase or 5-wire 2-phase systems.)

f. **Maximum Length and Voltage Drop.** Wire sizes shall be chosen to ensure a maximum voltage drop of three percent for branch circuits and 2 per cent for feeder circuits. (These requirements are in accordance with the guidance provided in NEC Article 210.19(A) FPN No. 4. A circuit from a power panel to an equipment rack is a branch circuit. A circuit from the service entrance point to the power panel directly supplying the equipment cabinet is a feeder circuit.) The following charts shown in Figures 1 and 2 can be used to choose the appropriate wire sizes when the current requirements are known. These charts will were developed based on the assumption that the circuit power factor would be close to 1 (values of approximately 0.95 are typical for modern electronic equipment and have greatly improved) and the resistance values provided in Table 9 of Chapter 9 of the National Electrical Code. The use of these charts will prevent excessive voltage drop for equipment circuits of any power factor. The simple Microsoft Excel spreadsheet used to develop this chart is supplied with the SIPH CD.

3.2.3 Common Errors

The most common errors in wire sizing occur when designers assume that 12 AWG wire is suitable for use on any 20 ampere circuit, and that #10 AWG wire is suitable for use on any 30 ampere circuit without considering all of the factors listed above. This can lead to common errors such as:

a. Large quantities of conductors being placed into a single conduit without increasing the size of the wires to compensate for the reduced ampacity caused by the concentration of conductors within the confined space (not to exceed 40% fill).
b. Long power runs being installed with no consideration for voltage drop.
c. Undersizing the neutral wires supplying three-phase PDUs and other three phase circuits.

3.3 Electrical Safety Ground

All electrical installations are required to meet the grounding requirements in the National Electrical Code. This document also requires that all SPAWAR installations meet additional grounding requirements in MIL-STD-188-124B. MIL-STD-188-124B requires the use of a separate green wire safety ground on electrical outlets. UFC 3-520-01 Section 6-4.3 also states “Use a separate conductor (green wire or bare copper) to ground all grounding type outlets and receptacles.”

3.3.1 Equipment Grounding Conductor Indication

The IDP shall indicate on the Power Distribution Drawings (Drawing Category Code 140) the size and color (green) of all copper wires used to provide safety grounds for circuits. Notes on the drawing shall indicate that each circuit shall have a dedicated green wire safety ground and a dedicated connection to the ground bus. (Separate breakers shall not share connections to power panel safety ground busses.) The use of aluminum wiring is prohibited by SPAWAR policy.

CIRCUIT BREAKER AND COPPER CONDUCTOR SIZING CHART						
(Based on maximum 3% voltage drop and power factor = 1.)						
SINGLE PHASE BRANCH CIRCUITS						
MAXIMUM CONTINUOUS CURRENT LOAD (AMPS)	MINIMUM STANDARD CIRCUIT BREAKER SIZE (AMPS)	MAXIMUM LENGTHS (FT)				
		12 AWG MAX 1-WAY LENGTH	10 AWG MAX 1-WAY LENGTH	8 AWG MAX 1-WAY LENGTH	6 AWG MAX 1-WAY LENGTH	4 AWG MAX 1-WAY LENGTH
8	15	112	187	*	*	*
9	15	100	166	256	*	*
10	15	90	150	230	*	*
11	15	81	136	209	*	*
12	15	75	125	192	*	*
13	20	69	115	177	*	*
14	20	64	107	164	262	*
15	20	60	100	153	244	*
16	20	56	93	144	229	*
17	30	N/A	88	135	216	*
18	30	N/A	83	128	204	*
19	30	N/A	78	121	193	*
20	30	N/A	75	115	183	*
21	30	N/A	71	109	174	*
22	30	N/A	68	104	166	*
23	30	N/A	65	100	159	252
24	30	N/A	62	96	153	241
25	40	N/A	N/A	92	146	232
26	40	N/A	N/A	88	141	223
27	40	N/A	N/A	85	136	215
28	40	N/A	N/A	82	131	207
29	40	N/A	N/A	79	126	200
30	40	N/A	N/A	76	122	193
31	40	N/A	N/A	74	118	187
32	40	N/A	N/A	72	114	181
33	50	N/A	N/A	69	111	175
34	50	N/A	N/A	67	108	170
35	50	N/A	N/A	65	104	165
NOTES:						
* RUNS LONGER THAN 250 FEET SHOULD NOT BE NEEDED (SEE THE CONDUCTOR SIZING EXCEL SPEADSHEET SUPPLIED ON THE SIPH CD-ROM FOR MORE INFORMATION)						

Figure 1 – Single Phase Circuit Breaker & Copper Conductor Sizing Chart

CIRCUIT BREAKER AND COPPER CONDUCTOR SIZING CHART						
(Based on maximum **2 %** voltage drop for perfectly balanced resistive circuits.)						
THREE PHASE 4-WIRE 120/208 FEEDER CIRCUITS						
MAXIMUM CONTINUOUS CURRENT LOAD PER PHASE (AMPS)	MINIMUM STANDARD CIRCUIT BREAKER SIZE (AMPS)	MAXIMUM LENGTHS (FT)				
		12 AWG MAX 1-WAY LENGTH	10 AWG MAX 1-WAY LENGTH	8 AWG MAX 1-WAY LENGTH	6 AWG MAX 1-WAY LENGTH	4 AWG MAX 1-WAY LENGTH
8	15	150	250	*	*	*
9	15	133	222	*	*	*
10	15	120	200	*	*	*
11	15	109	181	*	*	*
12	15	100	166	256	*	*
13	20	92	153	236	*	*
14	20	85	142	219	*	*
15	20	80	133	205	*	*
16	20	75	125	192	*	*
17	30	N/A	117	181	*	*
18	30	N/A	111	170	*	*
19	30	N/A	105	161	257	*
20	30	N/A	100	153	244	*
21	30	N/A	95	146	233	*
22	30	N/A	90	139	222	*
23	30	N/A	86	133	212	*
24	30	N/A	83	128	204	*
25	40	N/A	N/A	123	195	*
26	40	N/A	N/A	118	188	*
27	40	N/A	N/A	113	181	*
28	40	N/A	N/A	109	174	*
29	40	N/A	N/A	106	168	*
30	40	N/A	N/A	102	163	258
31	40	N/A	N/A	99	158	249
32	40	N/A	N/A	96	153	241
NOTES:						
* RUNS LONGER THAN 250 FEET SHOULD NOT BE NEEDED						
2 PER CENT LIMIT USED FOR 3 PHASE INSTEAD OF 3 % BECAUSE ACTUAL LOAD WILL CAUSE HIGHER VOLTAGE DROPS THAN IDEAL LOADS.						

Figure 2 – Three-Phase Circuit Breaker & Copper Conductor Sizing Chart

3.3.2 Equipment Grounding Conductor Sizing

SPAWAR **recommends that as a general practice, equipment grounding conductors be sized the same as the current carrying conductors. However, testing and measurement should take place during the site survey if there is any doubt that this recommendation is not a sufficient measure for ensuring the safety of personnel.** If all impedances in the electrical circuit and all breaker ratings are known, the use of a smaller size wire that still meets the requirements of the NEC can be mathematically shown to be safe. Gathering all of the wire sizes and lengths needed to make the mathematical calculations might not be practical during a site survey. Table 250.122 of the US NEC provides minimum equipment grounding conductor sizes. It states that the minimum size equipment grounding conductor for a circuit with a 20 amp breaker is #12 AWG. It also states that the minimum size equipment grounding conductor for a circuit with a 30, 40, or 60 amp breaker is #10 AWG. The use of these (and other) minimum sizes does not guarantee a safe design. To illustrate, here is a very simplified example calculation.

If the breaker is a typical 60-amp breaker, its instantaneous trip rating could be from 5 to 10 times the 60 amp rating or from 300 amps to 600 amps. (Every manufacturer of circuit breakers provides charts that show this information for their breakers.) For this example, we will assume that the instantaneous overcurrent rating of the device is ten times the 60-amp rating or 600 amps.

"The impedance of the complete ground fault circuit, from the point of the fault back to the transformer, should never be higher than what would permit the minimum amount of current necessary for the overcurrent device (circuit breaker) to operate within its instantaneous range." (From Soares Book on Grounding and Bonding)

600 amps = 120 volts/maximum allowable impedance
maximum allowable impedance = 120 volts/600 amps = 0.2 ohms
The impedance of #10 AWG wire is 1.2 ohms per 1000 feet.
0.0012 ohms/ft multiplied by ? feet = 0.2 ohms
? = 0.2/0.0012 = 166.7

So if the distance to the transformer is over 166.7 feet, the use of #10 AWG wire is unsafe no matter how low the impedance of the current carrying conductors is. (In the real world, the path to the transformer and back will consist of conductors of varying sizes. You would need to calculate the impedances of the different conductors and sum them to get the total impedance. Most of the path would have larger wire than #10 AWG and therefore less impedance than the ground circuit path.

NOTE:
The green wire to the power panel is often allowed by the NEC to be much smaller than the neutral wire or current carrying wires. (SPAWAR policy forbids using an equipment grounding conductor that is smaller than the current carrying conductors even when this is allowed by the NEC.) The NEC philosophy is that the equipment grounding wire only

needs to carry the ground fault current long enough to trip the circuit breaker. This is a short time. It should be well under one second. The determining factor for the minimum size (not actual size) of the green safety ground wire is the circuit breaker size.

According to the US National Electrical Code Table 250.122:
a. #10 AWG wire (5.261 mm^2) is the minimum size equipment grounding conductor for 30, 40, and 60 amp circuit breakers. (Obviously, you would need to connect larger wire to the 40 and 60 amp breakers themselves.)
b. #8 AWG wire (8.367 mm^2) is the minimum size equipment grounding conductor for 100 amp circuit breakers.
c. #6 AWG wire (13.30 mm^2) is the minimum size equipment grounding conductor for 200 amp circuit breakers.

Making the ground wire larger is needed for long runs to ensure that the impedance will be low enough to trip the breaker.

Note for the curious: Number 10 AWG Copper 75 Degree C Thermoplastic Insulated wire is rated to carry 246 amps for five seconds. About 641 amps will cause the copper to melt. (No design should plan to approach putting either 246 or 641 amps through #10 AWG wire for any longer than a very small fraction of a second.) Additional information on the short term ratings of electrical wire are provided in "Soares Book on Grounding and Bonding" which is discussed in Section 22.

3.3.3 Common Errors

Outright violations of the green wire safety requirements in the NEC are rare in SPAWAR installation planning documents. However installations often fail to meet the stricter grounding requirements contained in MIL-STD-188-124B and the Guidance in MIL-HDBK-419A. These requirements are discussed in the section of this document dedicated to the discussion of Military Standard 188-124B and related references.

3.4 The Use of Plenum and Riser Rated Cable

UFC 3-600-01, *Fire Protection Engineering for Facilities*, dated 26 September 2006 states in Section 6-8.1.3 that "**Power and communication (data) cabling installed in spaces above ceilings or below raised floors must be plenum rated or installed in metallic conduit.** If this cannot be achieved, the spaces must be protected by an automatic fire suppression system as listed in 6-8.2(2)." This requirement requires the use of plenum cables in many areas where the NEC does not, and it applies to Army, Air Force and Navy facilities. The above UFC requirement combined with the below NEC requirements make plenum communications cable the only practical choice for most indoor SPAWAR installations.

Often the area underneath the raised floor of a communications site is used to distribute heated or cooled air. This makes it an "Other Space Used for Environmental Air" as defined by Article 300.22C of the NEC. (The NEC makes a distinction between plenum spaces and "Other Spaces Used for Environmental Air" which can cause some confusion. The American Heritage Dictionary defines a plenum as "An enclosure in which air or other gas is at a pressure greater than that outside the enclosure." The 2005 NEC defines

a plenum as "A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.") Areas above a suspended ceiling that are used to distribute/return environmental air fit into this category also. Article 300.22(C) (1) states that the wiring methods for such spaces "shall be limited to totally enclosed, nonventilated, insulated busway having **no provisions for plug-in connections**." Article 800.154(A) of the NEC states that cables installed in ducts, plenums, and other spaces used for environmental air shall be type CMP. Abandoned cables shall not be permitted to remain." Article 800.154(B)(1) states that "Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft shall be type CMR. Floor penetrations requiring Type CMR shall only contain cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain."

3.4.1 Special Requirements for Information Technology Equipment Rooms

Article 645 of the National Electrical Code has requirement for rooms that meet all of the "Special Requirements for Information Technology Equipment Rooms" as stated in Article 645.4 of the code. The requirements for cabling and wiring in areas beneath raised floors used for air handling these rooms are much less strict than the requirements for other spaces used for environmental air. However, the reason for this is that the requirements for fire and smoke protection in these rooms are very strict. If a designer cannot establish that a room meets and will continue to meet all of the requirements for an Information Technology Equipment Room as defined by Article 645.4 of the code, the working assumption must be that the room does not meet these requirements. This document does not intend to define all of the requirements for these rooms, but the following examples are provided to show some of the more common deficiencies that prevent rooms from meeting these requirements.

a. One or more improperly sealed (not firestopped) penetration (usually for a cable run).
b. No panic buttons for cutting power to IT equipment (including UPS power (except UPSs under 750 Volt-Amperes)) and HVAC systems located at the principal exit doors.
c. AC system serves other rooms without fire/smoke dampers that are activated by smoke detectors being provided at the room boundary.
d. A manager (or anyone) not required for the maintenance and functional operation of the equipment has an office in the space.

Note: Article 645 of the NEC applies only to equipment and wiring in an Information Technology Equipment (ITE) room. The rooms must be designed to meet the requirements of NFPA 75, *Standard for the Protection of Information Technology Equipment*.

3.4.2 Installing Plenum Cable in Metal Ducts

Power wiring and communications cabling can be completely enclosed in EMT conduit and flexible metallic tubing to eliminate the need to worry about plenum ratings for electrical wires and cables. The NEC also permits the use of metal ducts or "surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers." (We are calling these ducts to keep sentences simple.) However, at

Navy facilities, signal cables installed in ducts with removable covers often do not remain enclosed. The reason for this is that eventually a duct cover will end up being removed to install a cable and not replaced. Therefore SPAWAR policy has required for years that plenum rated communications cable shall be used when cables are installed in spaces used as plenums (or for environmental air). Now the UFC has also come up with the similar but stricter policy stated above.

3.4.3 Indicating Important Information on Drawings

Notes on floors plans should indicate when the area above or below the floor is used for environmental (HVAC) air. Descriptions in parts list shall clearly identify all plenum cables by including the word plenum or the designation CMP in the description. Riser cables shall be similarly identified in the parts list. If any equipment is to be removed and replaced, the cabling diagrams shall identify the cables that are to be removed and shall also indicate that a failure to remove these cables will result in a violation of the National Electrical Code and the creation of a fire hazard. (Section 800.3(C) of the National Electrical Code requires the removal of abandoned communications cable. Section 800.154 specifically forbids leaving abandoned cable in plenums and vertical runs.)

3.4.4 Common Errors

Common errors include:

a. The use of liquidtight flexible metal conduit in spaces used for environmental air. The 2002 and 2005 editions of the NEC no longer permit the use of liquidtight flexible metal conduit within “other spaces used for environmental air.” The previous exception for lengths under six feet was removed. (Liquidtight Flexible Metal Conduit (LFMC) is defined by Article 350.2 of the 2005 NEC as “a raceway of circular cross section having an outer liquidtight, nonmetallic sunlight-resistant jacket over an inner flexible metal core with associated couplings connectors and fittings for the installation of electrical conductors.)
b. Cutting and pasting design information from ship installation drawings has led to some shore IDP drawings calling for the use of LSZH cable in spaces used for environmental air (usually under a raised floor). Low Smoke Zero Halogen (LSZH) materials are flame retardant, non-toxic, and low smoke. The jacket can be made relatively flexible and is resistant to water, salt, and some solvents. It can be flame retardant enough for use in riser installations (check with the manufacturer), but **not for plenum installations**.
c. The use of other non-plenum cables in spaces used for environmental air is a mistake that has occurred often in the past. The NEC requirement for using plenum cable in these spaces has existed for very many years and has been widely publicized since 1990.
d. The use of non-plenum rated innerduct/raceways in spaces used for environmental air. Article 800.182 of the NEC discusses communications raceways.
e. Installing electrical outlets in spaces used for environmental air. Article 300.22(C)(1) states that the wiring methods for such spaces “shall be limited to totally enclosed, nonventilated, insulated busway having **no provisions for plug-in connections**.”

f. Ignoring/Abandoning Replaced Cable. Identifying and removing abandoned cable can be a time consuming and unpleasant task, and was therefore often not performed.

3.5 Raceways and Cable Trays

Raceways are defined by the NEC as an enclosed channel designed for holding wires, cables, etc. Conduit and enclosed cable ducts are raceways. The number and cross sectional area of the cables allowed in conduit, wireways (cable duct), and similar hardware is governed by the NEC. If conduit, cable trays, or any other cable pathway is to be used or installed as part of an installation, the Project Engineer shall consult the NEC to ensure that the number of wires to be installed will not violate it.

3.5.1 Indicating Important Information on Drawings

If new conduit or other raceway is needed, the Cable Routing Layouts (Drawing Category Code 160) in the IDP drawings shall show their location and shall also include details or notes stating how the raceway will be supported. (Details or notes stating how the raceway will be supported are not needed for self-adhesive surface raceway, but the description of the raceway in the parts list must state that it is self-adhesive.) The drawings shall indicate the locations of all fittings and other parts used to form and support the pathway and include all of these items in the parts list. (The NEC requirements in the area of support are legal minimums. The Project Engineer shall specify stricter support requirements if needed.) The drawings shall include elevation drawings for any vertical pathways. Firestop locations required by the NEC shall also be indicated on the drawings to fulfill the requirement of TIA/EIA-606-A Section 6.2.5. These drawings shall include:

a. Firestopping location identifier.
b. Location of the firestopping installation shown on a floor plan with a leader going from the firestop identifier to the location of the penetration.
c. Type and manufacturer for all firestopping parts and materials included on the parts list and called out in notes or by find numbers.
d. Date of the firestopping installation (only required on as-built drawings -- includes replacement dates for firestops that had to be removed and replaced as a result of the installation.)
e. Name of the installer of firestopping (only required on as-built drawings)

3.5.2 Common Errors

Common errors include:

a. Exceeding the allowed capacity of conduits and cable trays. This is often done to avoid the cost and effort of installing new pathways. It can also be the result of an incomplete site survey.
b. Failure to install firestopping material at wall penetrations for conduits, ducts, and cable trays.
c. Failure to list all of the fittings, adapters, firestopping material, grounding material, and other parts required to complete the cable pathway installation.

3.6 Outside Plant (OSP) Cables

Outside plant cables, including fiber optic cables, are often filled with flammable substances that are used to prevent water from entering the cable. For this reason, the

way that this kind of cable − and its associated innerduct − is installed within buildings is subject to special restrictions by the NEC. Article 770.12(D) no longer states (as it did int the 2005 NEC), "Unlisted underground or outside plant construction plastic innerduct shall be terminated and firestopped at the point of entrance." However, new Article 770.26 firestopping requirements combined with the fact that only listed innerduct is permitted by Article 770.12 mean that the practical requirements for termination and firestopping have not changed. Article 770.24 still covers the mechanical execution of the work and states that the code requires optical fiber cables to be installed in a neat and workmanlike manner. It also states in a fine print note that accepted industry practices are described in ANSI/NECA/BICSI 568-2001 (NECA/BICSI 568-**2006** is available) and other ANSI-approved installation standards. Different kinds of outside plant cable are subject to very different requirements when run inside of a building. According to Article 770.48 of the 2008 NEC, "Unlisted conductive and nonconductive outside plant optical fiber cables shall be permitted to be installed in locations as described in 770.154(C) (not in plenums or risers), where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters from the outside and is terminated in an enclosure." It goes on to state in a note that "Splice cases or terminal boxes, both metallic and plastic types, typically are used as enclosures…" According to the 2008 NEC, conductive unlisted outside plant fiber optic cable cannot extend more than 50 feet inside of a building. However, non-conductive unlisted fiber optic cable can extend more than 50 feet inside of the building if it is installed in PVC, EMT or better conduit in accordance with Article 770.48(B). **The exception that once existed (prior to the 2005 code) for conductive fiber optic cable has been removed.** These differences are why it is very important that the type of outside plant cable being installed be carefully considered and clearly identified in the IDP. The considerations include the cost and durability of the cable as well as the NEC requirements. NEC Articles 800.44 through 800.106 address requirements for "Wires and Cables Outside Entering Buildings", their protection (e.g., protection of copper cables with carbon protector blocks), and "Grounding Methods." The **2008** NEC has greatly expanded the requirements for the grounding of optical fiber cable in Article 770. A new Article 770.100 has been added to specify the grounding methods to be used, (The grounding conductor shall be insulated and listed, not smaller than 14 AWG, etc.) and Article 770.93 has also been greatly expanded. This basically makes the requirements practically identical to those for copper communications cables spelled out in Article 800.100.

3.6.1 Cable Description Information

The full description of all outside plant cables shall be included in the cable block diagrams. Most, but not all, of the following descriptive information required by SPAWAR policy can be used to help determine if NEC requirements are met. The description shall include:

a. Type of cable (Copper Twisted Pair, Fiber Optic, Heliax, etc.)
b. Fire resistance rating, if any (e.g. OFNP, OFNR, unlisted)
c. For twisted pair and Fiber optic cables, whether the cable is armored, double-armored, or non-armored and the armor type (e.g. copper clad steel tape).
d. Type of central member or built-in messenger, if any

e. If the cable is fiber optic, the number and types of strands(e.g. 24 MM 62.5/125, 12 MM 50/125, 48 SM 8.3/125)and whether the cable is loose tube or tight buffered, (Loose tube construction is highly recommended for outdoor use.) The use of tight buffered cables outside of buildings shall be explained by a note on the drawing.
f. If the cable is copper twisted pair, the number of pairs, the size/gauge of the wire, and the cable construction type. Copper Outside Plant (OSP) cables shall be jelly filled — not of air core construction. A fill compound shall be applied to fill voids and shall conform to REA PE-39/PE-54 requirements. Aerial plant filled cable must have an 80 °C rated or better filling compound per TIA-768-A Section 5.1.1.3 Note 1.
g. Cable manufacturer
h. Manufacturer's part number
i. Outside diameter of the cable and minimum bend radius information

If a full description cannot be entered in the parts list on the cable block diagram, it shall be entered in the notes or in the miscellaneous details. Only cables that are designed for outside plant use and meet the requirements for Outside Plant Cables in TIA-758-A shall be used.

3.6.2 Cable Termination

IDPs should ensure that the installation and termination of all OSP cables within buildings meets the requirements of the NEC. If a cable contains a conductive strength member or shield these conductors must be grounded. The methods of grounding and utilizing protective devices (e.g. carbon protector blocks) shall appear in the miscellaneous details along with a complete list of the parts required to accomplish the grounding.

3.6.3 Cable Separation

Minimum separation requirements for OSP cables inside of buildings are governed by the National Electrical Code. In most cases, the governing document for separation outdoors is the National Electrical Safety Code (NESC). NEC Articles 800.44 through 800.53 provide clearance and separation requirements for communications cables entering buildings.

NEC Article 810.18 applies to clearances for radio receiving stations. Article 810.18(A) states that "Indoor antennas and indoor lead-ins shall not be run nearer than 50 mm (2 in.) to conductors of other wiring systems". However, if the other conductors are in metal raceways or cable armor, there is no clearance requirement. If the antenna lead-in is "Permanently separated from such other conductors by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing", that is OK (no clearance requirement) too.

NEC Article 810.70 applies to transmitting stations, and requires 4 (four) inches of clearance from "the conductors of any electric light, power, or signaling circuit" except for where the antenna cable is separated from the other conductors "by raceway or some firmly fixed nonconductor such as porcelain tubes or flexible tubing."

The above NEC requirements are for safety only. They have nothing to do with RF interference concerns. Whenever it is practical to do so, four inches of clearance should be provided for all transmitting antenna conductors to reduce both safety and interference risks.

3.6.4 Examples of Past Errors

Outside plant cable (usually fiber optic) has been run over fifty feet inside of buildings without being terminated or protected by conduit. Copper cables have been run between buildings without the required protective devices (protector blocks) being installed.

3.7 Inside Plant Cables

3.7.1 Cable Separation

The NEC requires in Article 800-52 that, with exceptions (e.g., when power cables are installed in metallic conduit), communications wire and cable be at least two inches from power circuits. When applicable, notes in the assembly and miscellaneous details shall state that "Installers shall not tie-wrap power cords to signal cables."
ANSI/NECA/BICSI 568-2006, Table 2 provides minimum separation distances from possible sources of EMI exceeding 5 KVA. When applicable, notes in the assembly and miscellaneous details shall state that installers are specifically forbidden to attach communications conduit to the outside of conduit or raceway by National Electrical Code article 800-52. IDPs shall separate communications cable (especially copper cables) and power cable as much as is practical. Article 800.133(A)(1)(c) states that "Communications conductors shall not be placed in any raceway, compartment, outlet box, junction box, or similar fitting with conductors of electric light, power, Class 1, non-power-limited fire alarm, or medium power network-powered broadband communications circuits." The NEC follows this statement with three exceptions. They are:

"Exception No. 1: Where all of the conductors for electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits are separated from all of the conductors of communications circuits by a permanent barrier or listed divider.

Exception No. 2: Power conductors in outlet boxes, junction boxes, or similar fittings or compartments where such conductors are introduced solely for power supply to communications equipment. The power circuit conductors shall be routed within the enclosure to maintain a minimum of 6 mm (0.25 in.) separation from the communications circuit conductors.

Exception No. 3: As permitted by 620.36." Note: Article 620 applies to "Elevators, Dumbwaiters, Escalators, Moving Walks, Wheelchair Lifts, and Stairway Chair Lifts".

3.8 Power Panel Clearances

All installation designers need to be aware of the requirements of NEC Article 110-26 so that they can avoid intruding into the workspaces defined by this article. For example, designers must keep equipment cabinets away from the front of power panels (at least 3

feet of clearance for typical power panels with a nominal voltage to ground of 150 volts or less) and must not run signal conduits in the workspace directly above (within 6 feet of the power panel) or below (between the power panel and the true floor) power panels. Designers also need to be aware of the need for a workspace (30 inch wide or width of the equipment, whichever is greater) in the front of all power panels, and that the minimum headroom of working spaces around power panels must be 2.0 meters (6.5 feet) or the height of the panel, whichever is greater. (See article 110.26 (E) for headroom requirements.)

3.8.1 Indications on Drawings

Floor plans without reference points (such as raised floor tiles) to fix the exact locations of cabinets and power panels, shall use notations to ensure that clearances mandated by the National Electrical Code, and discussed in the preceding paragraph (Section 3.8) are maintained. Elevations of power panel locations shall show that the workspace above and below the power panel is not used for LAN drops or signal cable pathways.

3.8.2 Examples of Past Errors

Signal cables have been run above and below power panels, and cabinets have been installed too close to the front of power panels when insufficient or incorrect guidance was included in the drawings.

4. Military Standard 188-124B and Related Guidance Documents for Grounding, Bonding and Shielding

MIL-STD-188-124B (with Notice 3) is the main governing document for grounding at Naval C4ISR facilities. MIL-STD-188-124B Notice 3 was published 18 December 2000, and contains revisions to ten pages of the standard. It states in Section 1.3 that:

"This standard shall be used in the design and engineering of new ground-based military communication systems, subsystems, and equipment installations as well as those C-E facilities undergoing major retrofit requiring Military Construction (MILCON) Funding. This includes air traffic control and navigational aid facilities, radio, radar, satellite ground terminals, telephone central offices, microwave and data communications systems, as well as C-E transportables, aircraft simulators, computer centers, and weapon assembly facilities. When upgrading existing facilities for installation of minor C-E equipment, the requirements of this standard shall be established on a case-by-case basis by the cognizant engineering agency. Use of this standard for other ground C-E facilities or equipment is also encouraged. It is not to be used solely as the basis for retrofit of existing C-E facilities. It does not apply to general construction such as barracks, administration buildings, dining facilities, warehouses, and non-communications facilities, nor does it apply to mobile units such as tanks, trucks, jeeps, etc. When MILCON Funding improvements are made to any structure housing a communications, computer, or electronic facility this standard does apply."

MIL-STD-188-124B states in Section 5.1.1.2.6, *Secure Facilities*, that:

"All areas required to maintain communications security equipment and associated power systems shall be grounded in accordance with **MIL-HDBK-419**."

It states in Section 5.1.1.3.2, *Buildings and Structures*, that:

"Lightning protection shall be provided as required for buildings and structures in accordance with the additions and modifications specified herein and the applicable paragraphs of **NFPA No. 780**. This protection shall be extended to all electrical, electronic, or other elements which are a part of, or are in support of all C-E facilities. Such elements shall include, but shall not be limited to, substations (to the extent that additional protection beyond that provided by the electric utility is necessary), power poles, towers, antennas, masts, etc."

Fully implementing a strict interpretation of MIL-STD-188-124B and/or MIL-HDBK-419A can require considerable time, money, and skill with no obvious return on much of the investment. Portions of the standard can be impractical, or open to different interpretations. These factors have led to wide variations in grounding, bonding and shielding methods. One goal of the SPAWAR policy contained in the following paragraphs of this section is to standardize the interpretation and implementation of MIL-STD-188-124B and MIL-HDBK-419A.

4.1 Color Codes

4.1.1 Signal Ground Color Code

MIL-HDBK-419A calls for the use of **yellow** to color code signal grounds. (See MIL-HDBK-419, Volume II, Section 3.2.1.1.3 and 3.2.1.1.2.b) This has led to the widespread use of yellow wire to indicate signal grounds (and connections to the ground plane) at some DOD facilities. Yellow wire should be identified in the details where signal ground appears and shall be called for and listed in the parts list when the signal ground wire is #6 AWG or smaller. Yellow electrical tape or heat shrink tubing, suitable for use in the environment where it is to be installed, shall be used to color code wires larger than #6 AWG.

Note: This matter is controversial because commercial standards call for green color coding - not yellow for cabinet and ground plane and telecommunications ground connections. This matter will be settled by the publishing of the standard rack and cabinet grounding detail drawings, and equipment grounding details by SPAWAR. Standard details are discussed further in Sections 4.4 and 4.5.)

4.1.2 "Equipment Grounding Conductor", "Safety Ground" or "Fault Protection" Ground Color Code

MIL-STD-188-124B states in a footnote at the bottom of page 14 that "The grounding conductor (green wire) may be comprised of green, green with yellow stripes, or bare wire **with green tape**." Article 250.119 of the NEC states that "…equipment grounding conductors shall be permitted to be bare, covered or insulated. Individually covered or insulated equipment grounding conductors shall have a continuous outer finish that is

either green or green with one or more yellow stripes except as permitted by this section…"

4.1.3 "Grounded Conductor" Color Code

This wire should have continuous white insulation for SPAWAR installations. The grounded conductor is defined by Article 100 of the NEC as "A system or circuit conductor that is intentionally grounded." It is commonly referred to as the "neutral conductor" even on systems which technically have no neutral. Article 200 addresses the use and Identification of Grounded Conductors and should be read by those who want to find out all of the exceptions and variations to the rules.

NEC Article 200.7(A) states that "The following shall be used only for the grounded circuit conductor, unless otherwise permitted …:
(1) A conductor with a continuous white or gray covering
(2) A conductor with three continuous white stripes on other than green insulation.
(3) A marking of white or gray color at the termination."

NEC Article 200.6(A) states that "An insulated grounded conductor of 6 AWG or smaller shall be identified by a continuous white or gray outer finish or by three continuous white stripes on other than green insulation along its entire length."

4.2 Resistance Requirement (Ohms to Earth)

MIL-STD-188-124B states, "The resistance to earth of the earth electrode subsystem should not exceed 10 Ohms at fixed permanent facilities." The NEC requires that electrodes that do not have a resistance to ground of 25 ohms or less be augmented. If SPAWAR has assumed the responsibility to upgrade or install the facility electrical ground, the design should ensure that the resistance to ground is under ten ohms. TIA-942 (for Data Centers) states that "No portion of the grounding systems should exceed 5 ohms to true earth ground as measured by the four point fall of potential method."

4.3 Connection of Safety Grounds and the "Grounded Conductor"

The Main Bonding Jumper is an unspliced jumper "used to connect the equipment grounding conductor(s) and the service disconnect enclosure to the grounded conductor of the system within the enclosure for each service disconnect". This should be the only direct connection between the fault protection system and the return path for current. At other power panels, the neutral or return bus bar shall be isolated from the panel enclosures and the green wire ground bus. MIL-STD-188-124B states in Section 5.1.1.2.5.1 that "In each facility, all power distribution neutrals shall be isolated from the C-E equipment case and the structure elements so that no ac return current flows through the equipment and fault protection subsystem or the signal reference network."

4.4 Cabinet Grounding

The ways that MIL-STD-118-124B and its previous revisions have been implemented for cabinet grounding vary widely. In some cases, all the requirements in the MIL-STD and in the MIL-HDBK for cabinet grounding have not been followed. The goal of the following SPAWAR policy is to improve the effectiveness of grounding practices and consistency of compliance with the governing standard.

4.4.1 Standard Cabinet Grounding Detail Drawing Policy

SPAWAR will work with the SPAWAR System Centers and PMW-790 to develop and promulgate standard drawing details containing guidance for the grounding of equipment cabinets and racks to be mounted indoors. The guidance in these drawings will be based on the requirements in MIL-STD-188-124 B, the guidance provided in MIL-HDBK-419A, TIA-942 (Section G.5.1.7), the best available existing drawings showing cabinet and rack grounding details, and the best commercial practices. Once these drawings are approved and promulgated, they shall be applied to all new equipment cabinet installations. These procedures shall specifically address the following requirements that have not always been complied with during past installations:

a. "The chassis or case of equipment shall be directly bonded to the rack, frame or cabinet in which it is mounted … Adjacent cabinets and racks shall be bonded to each other. (Editorial comment: This is also required by and discussed in TIA-942 G.5.1.7.5.) Flange surfaces and the contact surface on the supporting element shall be cleaned of all paint or other insulating substances… (Editorial comment: This is almost never done on commercial equipment on actual installations, is labor intensive, and seems to be contradicted by Figure 3-11 of MIL-HDBK-419A Volume 2 which shows a ground wire bonding the equipment to the cabinet ground bus.) The grounding conductor shall not penetrate equipment cabinets or cases, but rather shall be terminated on a ground stud peripherally welded to the metal barrier." (MIL-STD-188-124B, Section 5.2.10.2)
b. "Racks and cabinets shall also be grounded to the equipotential ground plane with a copper strap." (MIL-STD-188-124B, Section 5.2.1.1.2)
c. "Each bonded joint shall be protected against corrosion by ensuring that the metals to be bonded are galvanically compatible. Bonds shall be painted with a moisture-proof paint conforming to the requirements of Federal Specification TT-P-1757 or shall be sealed with a silicone or petroleum-based sealant…" (MIL-STD-188-124B, Section 5.2.3.1) (This document recommends clear silicone sealant for indoor use.)
d. "Star washers smaller than 1.3cm (1/2 in) shall not be used." (MIL-STD-188-124B, Section 5.2.5.4) (This document recommends the use of split washers instead if the purpose is to maintain pressure. Type B internal-external tooth lock washers can be effective in cutting through paint. See TIA-942 Figure 18.)
e. Flat washers shall not be surface treated; they shall be plated as specified in 5.2.9 for corrosion control purposes. (MIL-STD-188-124B, Section 5.2.5.4)
f. All bonding surfaces shall be cleaned (paint removed too) over an area that extends at least 0.6 cm (1/4 in) beyond all sides of the bonded area on the larger member. (MIL-STD-188-124B, Section 5.2.31)
g. After initial cleaning with chemical paint removers or mechanical abrasives, the bare metal shall be wiped or brushed with dry cleaning solvent meeting the requirements of Federal Specification P-D-680. Surfaces not requiring the use of mechanical abrasives or chemical paint removers shall be cleaned with a dry cleaning solvent to remove grease, oil, corrosion preventives, dust, dirt, and moisture prior to bonding. (MIL-STD-188-124B, Section 5.2.8.4)

If meeting all of the requirements of MIL-STD-188-124B proves to be too impractical, and if any SPAWAR Code has a practical and effective method for grounding cabinets that is not in compliance with what is required by MIL-STD-188-124B (See note below.) then that code shall prepare a "**STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL" form (provided at the end of the MIL-STD. A copy of this form should be routed to SPAWAR Code 4.2 and the PMW-790 Chief Engineer for their endorsement prior to submittal of the document to:**

JIEO/CFS/JEBB
BLDG 283, Squier Hall
Fort Monmouth, NJ 07703-5613

(Note: Cabinets can be effectively grounded by using two studs inserted through holes designed to match terminal lugs with two bolt holes. Paint must be removed from the bonding areas of the cabinet. The bond would be a pressure bond created by dual sets of flat washers, lock washers, and nuts in lieu of the peripheral welding required by the MIL-STD. The bond would be protected from moisture using a clear silicone based sealant to prevent moisture from reaching the bond area.)

4.4.2 Custom Cabinet Grounding Detail Drawings

Once standard approved SPAWAR cabinet grounding installation details become available, SPAWAR policy is that they shall be used as the basis for all cabinet grounding detail drawings. In the meantime, each project engineer that needs to install a cabinet or rack will be responsible for providing customized miscellaneous details for cabinet grounding. The details shall, when applicable, contain illustrations showing how adjacent cabinets and/or racks are to be bolted and bonded together.

4.5 Equipment Grounding

The ways that MIL-STD-118-124B and its previous revisions have been implemented for equipment grounding vary. The goal of this document is to improve the consistency of compliance with the governing standard.

4.5.1 Standard Equipment Grounding Detail Drawings

SPAWAR will work with the SPAWAR System Centers and PMW-790 to develop and promulgate standard equipment grounding details containing guidance for the grounding of equipment mounted in cabinets and racks. These drawings shall be based on the requirements in MIL-STD-188-124B, the guidance provided in MIL-HDBK-419A, and the best available existing drawings showing equipment grounding details. Once these drawings are approved and promulgated, SPAWAR Policy is they shall be applied to all new equipment installations. These procedures shall incorporate the following guidance:

a. Each individual unit or piece of equipment shall either be bonded to its rack or cabinet in accordance with (MIL-STD-188-124 Section) 5.2.4 (This just requires a maximum dc resistance of 1 milliohm (0.001 ohm)) or shall have its case or chassis bonded to the nearest point of the equipotential plane.

b. Section 5.2.3.3.1 of MIL-STD-188-124B notes that "Bonding straps with a width-to-length ratio approximately l-to-5 and thickness of approximately 0.76 mm (0.030 in) are better than wires, due to lower inductance per unit length."
c. MIL-HDBK-419A, Volume II, Figure 3-11.

4.5.2 Custom Equipment Grounding Detail Drawings

Once standard SPAWAR equipment grounding installation details become available, they shall be used as the basis for all equipment grounding detail drawings. In the meantime, each project engineer is responsible for providing their own miscellaneous details for equipment grounding.

4.6 Equipotential Ground Planes

One major point, if not the main point, of MIL-STD-188-124B is that modern communications facilities should have an equipotential ground plane. This has been a mandatory requirement for new facilities since MIL-STD-188-124A was published in 1984. The standard is not to be used as a sole justification to retrofit older facilities. However, all IDPs for new communications facilities shall include or reference drawings that describe the equipotential ground plane installation.

4.6.1 Equipotential Ground Plane Drawings

IDPs for existing facilities should contain a plan for installing an equipotential ground plane if none exists and the cost of installation is manageable. (Sometimes the installation of the equipotential ground plane is site preparation work or building construction performed prior to the start of the installation. In these cases, the IDP may reference drawings prepared for the site preparation or building construction.) Drawing details in the Miscellaneous Details drawings shall describe how cabinets and equipment will be connected to the ground system, and shall show the locations of these connections. This is required no matter what type of ground system is used (equipotential ground plane, or single or multi-point point ground system).

4.7 Grounding of Data Cable Shields at DB and Similar Connectors

Some of the guidance provided in the past for grounding DB and similar type connectors has been conflicting. This has led to a multitude of methods being used to ground the shields of cables. This handbook requires that IDPs for installations requiring the installation of DB and similar type connectors clearly indicate that:

a. All cables terminated with a DB type of connector shall have at least one braided copper overall shield in addition to any foil shield. This requirement shall be indicated in the description that appears on the cabling block diagram's parts list. The reason for this is that "Foil shields are not acceptable for peripheral bonding and do not provide mechanical durability." (See MIL-STD-188-124 Section 5.2.12) In addition, NSTISSAM TEMPEST/2-95 Section 4.4.1 states that "metallic cables should have a minimum of one overall braided metallic shield." Note: If plenum cable is required to make use of below-raised-floor or above-drop-ceiling cable trays or ducts, cable connections will rarely be moved, and no appropriate commercially

available cable has a braided copper shield, the requirement for a braided shield can be waived.

b. The braided shield and any drain wires shall be peripherally grounded to suitable Commercial Off The Shelf (COTS) metallic EMI/RFI type hoods (back shells). See MIL-HDBK-419A, Section 1.6 and NSTISSAM TEMPEST /2-95, Section 4.4.1.2.) In all cases the method for peripherally grounding the cable shield shall be illustrated in the miscellaneous installation details or described in notes on the cabling block diagrams. If there is scientific proof based on testing at the site or at a SPAWAR lab showing that grounding the cable at both ends creates ground loops or a TEMPEST hazard, the shields do not need to be grounded at both ends. However, notes on the affected drawings (e.g., circuit diagrams, cable running sheets, miscellaneous installation details) need to fully describe the proof that justifies the departure from standard guidance and provide a POC for obtaining the test results.)
c. Pigtails for grounding cable shields should not normally appear outside of a connector. Pigtails will only be used if the connector plug used in the equipment is not grounded to metal on the outside of the equipment chassis. In other words, only use a pigtail if there is no other way to get to ground without passing through the inside of the equipment. (A strict reading of MIL-STD-188-124B, Section 5.2.12 limits the length of connector pigtails to 2.5 cm (1 inch). NSTISSAM TEMPEST /2-95 also gives a good justification for not using long pigtails in Section 4.8.1. These override MIL-HDBK-232A's encouragement of the use of pigtails in Section 5.4.3.5.1)
d. All spare (unused) wires shall be shown in the circuit diagrams and in the miscellaneous details to be grounded to the cable shield. (Section 1.3.3.5.27 of MIL-HDBK-419A states that "All unused wires/pairs of Communication cable runs should be connected to ground at each end. This action will reduce transients on the unused lines which otherwise could be coupled to in-service lines of the cable."
e. Signal Ground and Chassis Grounds should be at the same potential as the equipotential ground plane at a site. Short jumpers shall be used to connect signal ground and chassis ground pins to shields (both the cable shield and the shielded connector shell) and (looped back) unused wires at each connector. As previously stated in item c, if there is scientific proof (based on testing at the site or at a SPAWAR lab) showing that grounding the cable at both ends creates ground loops or a TEMPEST hazard, the shields do not need to be grounded at both ends. In all cases, the method for grounding the unused wires shall be illustrated in the miscellaneous installation details or described in notes on the cabling block diagrams.

4.7.1 Standard Detail Drawings for Grounding of Data Cable Shields at DB and Similar Connectors

SPAWAR will work with the SPAWAR System Centers and PMW-790 to develop and promulgate standard drawing details containing guidance for the grounding of DB type connectors. Until that happens, designers shall provide their own detail drawings in accordance with the guidance provided above.

4.8 Grounding of Antenna Cables, Waveguide, Towers, and Associated Air Terminals (Lightning Rods)

Antenna Layouts and Elevations (Drawing Category Code 50) shall indicate the locations of air terminals (lightning rods) providing protection. They shall provide enough dimensional data to show that antennas installed on towers or platforms are within a 1:1 zone of protection of an air terminal (lightning rod) as required by Section 5.1.1.3.8.3 (Antennas) of MIL-STD-188-124B. This means that the drawings shall indicate the height of the lightning rod above the antenna and the horizontal distance between the top of the antenna and the top of the lightning rod or rods. IDPs for projects involving the installation of large array type antennas (now rare) shall show how these antennas are protected by 0.6 meter (2 foot) air terminals installed on top of the mast or structure supporting the antenna. (For additional information see MIL-HDBK-419A.)

4.8.1 Grounding of Antenna Towers and Associated Lightning Protection

IDPs for installations involving new antenna towers shall contain details showing how the down conductors will meet the requirements of MIL-STD-188-124B, Section 5.1.1.3.3. These details shall include:

a. The overall size (AWG or square mm), construction (copper or copper clad steel), strand size, and quantity of down conductors where down conductors are used. According to MIL-HDBK-419A Section 1.3.2.2.2, “At least two down conductors are required on all structures except on slender objects like flag poles, antenna masts (not substantial towers), light poles, and the like.” NFPA 780 requires in Section 5.2.1 that “these slender structures shall require one strike termination device, down conductor, and ground terminal.” NFPA 780 Section 4.9.10 states that “At least two down conductors shall be provided on any kind of structure, including steeples.”
b. Notes providing minimum bend radius information for down conductors (ground cables). (See Figure 5 in the MIL-STD.)
c. Bonding methods for all bonds between elements of the lightning protection system. This includes bonding between structural elements when structural elements are substituted for separate down conductors in accordance with Section 5.1.1.3.5 of the MIL-STD.
d. Bonding method and locations for bonds between the lightning protection system and the earth electrode subsystem. (Required by the MIL-STD and NFPA 780 Article 4.14.1 which states that “All grounding media in or on a structure shall be interconnected and provide a common ground potential...This interconnection shall include lightning protection, electric service, telephone, and antenna system grounds, as well as underground metallic piping systems.") (MIL-STD-188-124B requires in Section 5.1.1.3.8.1 that an earth electrode subsystem conforming to its requirements be installed for “all supporting structures. If a tower is adjacent to another structure such that the minimum distance between the tower and the structure is 6m (20 feet) or less, one earth electrode subsystem encompassing both the tower and the other structure shall be provided. For distances greater than 6m (20 feet), separate earth electrode subsystems shall be installed. These subsystems shall be interconnected for separations up to 200 feet. Two bare 1/0 AWG copper cables shall be used by independent routes to bond the earth electrode subsystem of the tower to the earth

electrode subsystem of buildings and structures that have signal, control, or power line interfaces with the tower and are separated less than 60m (200 feet)."

e. Bonding method and locations between the antenna tower structure and the earth electrode subsystem.
f. Bonding method and location between the lightning protection system and antenna masts and supports (See NFPA 780 Sections 4.17).
g. Bonding method and location between metal bodies that contribute to lightning hazards and the lightning protection system (See NFPA 780 Sections 4.19 and 4.20)
h. Dimensions indicating separation distance between communications cable and down conductors. Section 5.1.1.3.3 of the MIL-STD requires "Where practicable, a separation of at least 1.8m (6 feet) shall be maintained between open conductors of power and communications systems and lightning down conductors (see NEC Article 800)."

4.8.2 Grounding of Waveguide

When waveguide is installed, IDP drawings shall include bonding methods and locations for waveguides including copper strap dimensions and/or wire size and strand size. See the following quote from MIL-STD-188-124B Section 5.1.1.3.8.5, Waveguide Grounding:

"As a minimum, all waveguides shall be grounded as follows:
a. All waveguides to the antennas shall be grounded at three points: near the antenna, at the vertical-to-horizontal transition near the base of the tower, and at the waveguide entry port.
b. Metallic supporting structures for waveguides shall be electrically continuous and shall be connected to the exterior earth electrode subsystem at the first and last support columns as a minimum. **The wire leads shall be as direct as possible.**
c. Waveguides shall be grounded with solid copper strap or copper wire at least equal to No. 6 AWG. The size of wires (This is referring to the size of the strands.) in this cable shall not be less than No. 14 AWG. Braid or finer-stranded wire than No. 14 AWG shall not be used. All bends of ground conductors shall have a radius of 20 cm (8 in) or greater and the angle of any bend shall not be less than 90 degrees."

4.8.3 Grounding of Coaxial Antenna Cables

MIL-STD-188-124B Section 5.1.1 .3.8.6 states "Coaxial cables shall be bonded to the building or facility entrance plate and in turn to the earth electrode subsystem. For additional information see MIL-HDBK-419." This is similar in concept to the requirement of NEC article 820.93 (applies to community antenna TV and radio distribution systems including cable television) which states that "The outer conductive shield of the coaxial cable shall be grounded at the building premises as close to the point of cable entrance or attachment as practicable.

4.8.3.1 Surge Suppressor Requirement and Discussion

SPAWAR installation design drawings shall show the installation of surge suppressors when surge suppressors are recommended by the receiving equipment manufacturer. This is required even when a grounded entrance plate is used. If a MIL-HDBK-419

compliant building entrance plate is not used, surge suppressors must be installed on coaxial antenna cables. When coaxial cables are installed, floor plans shall show locations and miscellaneous details shall show mounting and grounding methods for new surge suppressors and building entrance plates. (Antenna cables that are not grounded or supplied with antenna discharge units can also be in violation of the NEC. (See NEC Articles 810-20 and 810.57)) Technical data (frequency range, etc.) for the surge suppressor shall be included on the parts lists (via a note if necessary) along with the manufacturer and part number. Mounting details for the surge suppressor shall also be provided in the Mechanical Assembly and Mounting Details.

The 2005 NEC handbook states in Section 810.20(B) that:

"An antenna discharge unit (lightning arrestor) is not required if the lead-in conductors are enclosed in a continuous metal shield … A lightning discharge will take the path of lower impedance and jump from the lead-in conductors to the metal raceway or shield rather than take the path through the antenna coil of the receiver. However, MIL-HDBK-419A states in Volume 2, Section 1.3.3.5.22, *Transient Suppression*, that "In order to provide effective equipment protection against lightning generated transients, externally exposed lines must have transient suppression installed on each end where the line directly interfaces electrical/electronic equipment. This requirement applies in all cases when the withstand level of the interfaced equipment is below the transient levels projected to occur at the line/equipment interface. As previously noted, transient amplitudes projected to occur on lines enclosed end-to-end in electrically continuous, ferrous metal conduit are only 10% of the transient amplitudes projected to occur on lines not enclosed in metal conduit (Table 1-16). Primarily because of insertion losses and impedance mismatch, transient suppression is not currently available that is satisfactory for installation on externally exposed rf coaxial lines at building penetration when the lines carry signals above 3 MHz in frequency." **(NOTE: This was written before 1992 and is no longer true, high frequency transient suppressors are readily available and recommended for use by equipment manufacturers.)** It continues to state: "Therefore, all protection for these line/equipment interfaces must be designed as an integral part of the equipment. **The most effective design for equipment protection is provided by installing a high energy level transient suppressor at building penetration** (on all lines that carry signals 3 MHz or less in frequency) connected line to earth ground, and including low-energy suppression as a part of integral equipment design." SPAWAR policy is that SPAWAR designs shall install surge suppressors when recommended by the receiving equipment manufacturer even when a grounded entrance plate is used. If a MIL-HDBK-419 compliant building entrance plate is not used, surge suppressors must be installed on coaxial antenna cables.

4.8.3.2 Building Entrance Plate Requirement

Building entrance grounding details shall be provided for all antenna cables and waveguide. MIL-STD-188-124B Section 5.1.1.3.8.6 requires coaxial cable to be bonded to the building or facility entrance plate. MIL-HDBK-419A, volume 2, Section 1.3.3.5.26 *Coaxial Cable Shield Connection Through an Entrance Plate,* states that:

"The entry plate should be a minimum of 0.64 cm (1/4-inch) thick, and constructed of steel. The entry plate must contain the required number of appropriate coaxial feedthrough connectors to terminate all applicable incoming lines. The connectors must also provide a path to ground for connected cable shields. If external and internal coaxial cables are of a different physical size, the changeover in connector size should be accomplished by the feedthrough connectors of the entry plate. The entry plate should be connected to the earth electrode subsystem with a 1/0 AWG (minimum) insulated copper cable. The cable should be bonded to the entry plate and the earth electrode subsystem with exothermic welds."

4.9 MIL-STD-188-125 Parts 1 and 2 and Related Standards Governing High-altitude Electromagnetic Pulse (HEMP) Protection

Electromagnetic Pulse (EMP) is an intense energy field that can instantly overload or disrupt electrical circuits at a distance. EMP can be produced on a large scale using a single (High Altitude) nuclear explosion, and on a smaller, non-nuclear scale using a device with batteries or chemical explosives. Part 1 of MIL-STD-188-125 states that "This two-part document contains technical requirements and design objectives for high altitude electromagnetic pulse (HEMP) protection of ground-based systems and facilities that are nodes in HEMP-hardened networks for performing critical and time-urgent command, control, communications, computer, and intelligence (C4I) missions. This part 1 of the document addresses HEMP hardening for fixed facilities; Part 2 addresses transportable systems. The requirements are stringent, in order to avoid both damage and functional upsets that prevent mission accomplishment within operationally prescribed timelines. The standards apply uniformly to all systems and facilities in the end-to-end chain, since disruption of a single node may result in network failure." It states in the next paragraph, "Use of the standard for HEMP protection of other fixed ground-based communications-electronics facilities that require HEMP hardening is encouraged to the extent permitted by cost constraints."

4.9.1 MIL-STD-188-125-1, High-altitude Electromagnetic Pulse (HEMP) Protection for Ground-Based C4I Facilities Performing Critical, Time-Urgent Missions Part 1, Fixed

This document is part 1 of MIL-STD-188-125. It was validated by Notice 1 dated 7 April 2005.

4.9.2 MIL-STD-188-125-2, High-altitude Electromagnetic Pulse (HEMP) Protection for Ground-Based C4I Facilities Performing Critical, Time-Urgent Missions Part 2 Transportable Systems

This document is part 2 of MIL-STD-188-125. This document was also validated by a Notice 1 dated 7 April 2005.

4.9.3 HEMP Discussion

HEMP hardening has not been implemented as often as we would like because of funding constraints. However, all project engineers should be aware that it is a requirement for mission critical facilities and is desirable for all CE facilities when funds are available.

4.9.4 MIL-HDBK-423, High-altitude Electromagnetic Pulse (HEMP) Protection for Fixed and Transportable Ground-Based C4I Facilities

An Electromagnetic Pulse (EMP) is an intense energy field that can instantly overload or disrupt numerous electrical circuits at a distance. Modern electronic circuits are especially sensitive to power surges. EMP can be produced on a large scale using a single nuclear explosion, and on a smaller, non-nuclear scale using a device with batteries or chemical explosives. The two-volume MIL-HDBK-423 handbook set provides information to managers and engineers responsible for the design, construction, testing, and hardness maintenance/hardness surveillance of fixed and transportable ground-based facilities that must be hardened against the high altitude electromagnetic pulse (HEMP). (The two volumes are Controlled Distribution Document(s).) The primary purpose of Volume I is to provide detailed guidance to implement HEMP protection of fixed facilities in accordance with requirements of MIL-STD-188-125-1.

5. Guidance Documents for Information Protection

Installation designers and project engineers need to be aware of the standards that govern the security documentation that must be prepared to obtain permission to connect to existing DoD networks. In addition, installation designers and engineers need to be aware of the security standards that govern the physical installation of equipment.

5.1 DoD Instruction 5200.40 and Department of Defense (DoD) Information Assurance (IA) Certification and Accreditation (C&A) Process Guidance (DIACAP)

The DoD Information Technology Security Certification and Accreditation Process (DITSCAP) defined by DoD Instruction 5200.40 is being replaced by DIACAP. (DoD Instruction 5200.40 requires the development of System Security Authorization Agreements (SSAA). The SSAA is a formal agreement among the DAA(s), the CA, the IT system user representative, and the program manager. It is used to guide actions, document decisions, specify ITSEC requirements, document certification tailoring and level-of-effort, identify potential solutions, and maintain operational systems security. All “systems” that process DoD information are required to have SSAA’s.) Effective 1 February 2007, all certification and accreditation packages submitted to the Navy Certification Authority (CA) must utilize the Navy System Identification Profile (SIP) with artifacts for certification and accreditation.

5.1.1 Navy SIP

The SIP aligns with the DIACAP process. The Navy SIP will consolidate the information that was submitted on the following documents onto one form, eliminating the need to provide separate documents:

a. ATO/IATO Request Letter
b. IA Compliance Letter
c. IAVA Compliance Letter
d. FAM Status
e. Echelon II POC Information

5.1.2 Information Security Web Site

A copy of the Navy SIP is posted on the Navy INFOSEC web site at https://infosec.navy.mil. (Once there click on the "Documentation" tab, then click "C&A" on the row of headings, and then click on "C&A Documentation Templates" in the column with folder icons.) The same web site also provides the latest Navy DIACAP Guidance. (Once there click on the "Documentation" tab, then click "C&A" on the row of headings, and then click on "DON DIACAP Guidance" " in the column with folder icons.)

5.2 NSTISSAM TEMPEST /2-95, RED/BLACK Installation Guidance

NSTISSAM TEMPEST /2-95, RED/BLACK Installation Guidance shall be consulted during the design of any installation within a space used to process national security (classified) information. It states in Section 3.2 that "The cognizant CTTA (Certified TEMPEST Technical Authority) must be consulted in the initial planning phases for facilities that will process classified information." This document is used to determine separation distances between RED equipment, cables, and power lines and BLACK equipment, cables, and power lines. (The IDP must be designed to meet all of the separation distances required by this document.) The strictest requirements are for separation distances between radios and RED equipment. Planners need to be very careful when designing installations where RED equipment will be near radio frequency transmitters and public address systems. Before choosing signal cables, designers should read Section 4.4 of this document. This document is not easy to follow and deliberately avoids setting firm requirements. Installers shall not be required to interpret this document. They shall be provided with clear guidance on what the actual installation requirements are in IDPs. Attachment J provides additional guidance regarding the application of NSTISSAM TEMPEST/2-95.

5.2.1 Drawing Requirements for meeting NSTISSAM TEMPEST /2-95, RED/ BLACK Installation Guidance

NSTISSAM TEMPEST /2-95, RED/BLACK Installation Guidance (with NSTISSAM TEMPEST/2-95A Amendment of 3 February 2000) divides facilities into nine different categories and provides installation recommendations for each of those categories. The drawing notes shall state which set of recommendations were used to develop the design, and shall also annotate key dimensions that are required to meet those recommendations (TEMPEST requirements). For example, if Recommendation C is being followed (the recommendation for the highest risk combination of equipment and space), and RED equipment is being installed in the same room as BLACK equipment, then notes on the floor plans, cable path, and other appropriate drawings shall state something similar to:

1. NSTISSAM TEMPEST /2-95 "Recommendation C" followed per CTTA John Doe, via e-mail to SSC Joe Engineer dated 7 Jan 2007.
2. RED and BLACK equipment cabinets must be installed as shown to meet TEMPEST requirements. No design changes shall be made that reduce the separation between RED equipment and the following items to less than 1 meter, without obtaining permission from the PE and CTTA:
    a. BLACK equipment.

b. BLACK wire lines that leave the room
c. BLACK power lines
d. Equipotential Ground Plane Conductors that leave the room

3. Cable pathways must be installed as shown to meet TEMPEST requirements. No design changes shall be made that reduce the separation between RED cables and BLACK cables that leave the room, and RED cables and BLACK power lines to less than 5 centimeters.
4. Shielded cables are required to have a 360 degree termination at each end to shielded connectors as shown to meet TEMPEST requirements.
5. RED equipment must be at least three meters from the RF transmitter per NSTISSAM TEMPEST /2-95 "Recommendation C", paragraph 5.

5.3 CMS-1, COMMUNICATIONS SECURITY MATERIAL SYSTEM (CMS) POLICY AND PROCEDURES MANUAL

Designers planning to install COMSEC material and controlled cryptographic items (military cryptos), especially in areas where none had previously existed, need to be aware of the requirements in this standard for the protection of both COMSEC and controlled cryptographic items.

5.4 Chairman of the Joint Chiefs of Staff Instruction CJCSM 6510.01, Defense-in-Depth: Information Assurance (IA) and Computer Network Defense (CND), 25 Mar 03, CH1 10 Aug 04, CH 2 26 Jan 06, CH 3 8 Mar 06

Installation designers of DoD unclassified networks need to be aware of requirements for protecting unclassified as well as classified information. These requirements are updated frequently. Designers of installations that require the transport of unclassified data over public networks need to be aware that in most cases this data is required to be protected by some kind of bulk encryption device such as a VPN device. Designers should also be aware that the Joint Chiefs of Staff (JCS) require that VPNs operate in FIPs mode, use a standard configuration, and utilize authentication certificates and digital signatures. Release of the information in the most recent CJCSM 6510.01 changes is apparently restricted, so the following quote is provided from CJCSM 6510.01, 25 March 2003, C-14 Enclosure C.

"l. Virtual Private Network Security Requirements
(1) A standard VPN configuration by an organization is required for effective security.
(2) Authentication certificates and digital signatures must be employed."

CJCSM 6510.01 Change 1 states that "*Technical IA solutions in the defense-in-depth strategy will be at one of three defined levels of robustness – high, medium, or basic – corresponding to the level of concern assigned to the system*."[3] (The least secure solution is the basic solution.) It also states: "*DOD information systems processing sensitive information as defined in section 20 of the NIST 15 USC 278g-3 (reference zz) are assigned a basic level of concern. Such systems will employ IA products that satisfy the*

[3] CJCSM 6510.01, dtd 25 March 2003, APPENDIX H TO ENCLOSURE C, Section 2.a. (Appendix H to Enclosure C is entitled "PROTECTION MECHANISMS -- LEVELS OF CONCERN AND ROBUSTNESS")

*requirements for **at least basic robustness** when the information transits public networks or the system or network handling the information is accessible by individuals who are not authorized to access the information on the system.*"[4] It goes on to state: "*Basic-robustness solutions are equivalent to good commercial practice. **Basic robustness requires**, at a minimum, all of the following:*
*(1) **NIST FIPS 140-2 level 1 or 2** (reference zz) validated cryptography (algorithms and implementation) for encryption, key exchange, digital signature, and hash (see algorithms at Table C-H-4) as specified in NSTISSAM INFOSEC/1-00 (reference pp)….*"[5]

5.5 SECNAVINST 5510.36A and SECNAV M-5510.36 Department of the Navy Information Security Program (ISP)

SECNAVINST 5510.36A (6 Oct 2006) along with the SECNAV M-5510.36 (June 2006) establishes the Department of the Navy Information Security Program (ISP) under the authority of Executive Order 12958, as amended, and in compliance with Department of Defense Regulation 5200.1-R, "Information Security Program, January 1997." The ISP applies uniform, consistent, and cost-effective policies and procedures to the classification, safeguarding, transmission, and destruction of classified information. This regulation also provides guidance on security education and the industrial security program. See http://www.navysecurity.navy.mil/info-551036.htm for copies of these documents. Exhibit 8A of this document contains "Procedures for Assigning Distribution Statements on Technical Documents"

5.6 OPNAVINST 5530.14D CH-1, Navy Physical Security, dated July 11, 2007

Enclosure (1) to OPNAVINST 5530.14D is the Navy Physical Security Manual.

5.7 OPNAV C5510.93F, Navy/Marine Corps Implementation of National Policy on Control of Compromising Emanations, dated 1/10/2002

The Navy Policy OPNAV C5510.93F contains a TEMPEST certification procedure. All facilities and systems processing National Security Information must follow the procedure to become TEMPEST certified. However, this does not mean that all facilities and systems must implement TEMPEST countermeasures. As a part of the certification procedure, some facilities and systems are required to submit a TEMPEST Requirements Questionnaire (TRQ) (Appendix P SIPH). Navy Policy requires that fixed communication systems be installed using RED/BLACK separation. The requirement for RED/BLACK separation applies to communication systems installed in U.S. facilities, non-U.S. facilities, ships, submarines, and transportables. OPNAV C5510.93F is not available on the Department of the Navy Issuances (DONI) web site. It can e ordered from the Naval Logistics Library (NLL) web site at http://nll.ahf.nmci.navy.mil/. Contact your Supply Office or NLL government account holder in your organization. If your activity does not currently have an account with NLL, refer to the web site to obtain one. Due to constant changes, the current stock number might not be listed on the NLL. The NLL help desk number is 1-866-817-3130. For discrepancies, contact the Navy Directives Office at (202) 433-4935/6. The DSN number is 288-4935/6.

[4] CJCSM 6510.01, dtd 25 March 2003, APPENDIX H TO ENCLOSURE C, Section 1.c.
[5] CJCSM 6510.01, dtd 25 March 2003, APPENDIX H TO ENCLOSURE C, Section 2.d.

5.8 SECNAV INSTRUCTION 5239.3A, Department of the Navy Information Assurance (IA) Policy, dated 20 December 2004

This document defines INFOSEC as "the protection of information and information systems against unauthorized access or modification, whether in storage, processing, or transit, and against the denial of service to authorized users, including those measures necessary to detect, document, and counter such threats."

5.8.1 Training Requirement

Section 7.b states that "reference (k) of SECNAV INSTRUCTION 5239.3A (DoDD 8570.1, Information Assurance Training, Certification, and Workforce Management, 15 Aug 2004) requires all personnel who access DON Information and Information Systems receive annual IA and Security Awareness Training, to include emphasis on Internet security. This training shall ensure all personnel are aware of best security practices, the information security risks associated with their activities, and their responsibilities in complying with agency policies and procedures designed to reduce these risks. Reference (k) also requires that all personnel with privileged access to DON information systems and networks, and Designated Approving Authorities (DAAs), shall receive training and be certified for their position."

5.8.2 Network Intrusion and Computer Virus Detection and Neutralization

Intrusion Detection and Virus Detection are covered by Sections 7.c(4) and 7.c(5).

5.8.3 NIAP Evaluation or Validation Requirement

Section 7.d(3) requires that "DON organizations shall acquire and utilize National Information Assurance Partnership (NIAP) evaluated or validated Government-off-the-Shelf (GOTS) or Commercial-off-the-Shelf (COTS) IA and IA-enabled IT products for all IT systems in accordance with reference (d)." (Reference (d) is DoDI 8500.2, Information Assurance (IA) Implementation, 2 Jun 2003.)

5.8.4 VPN Requirements

Section 7.c(6) states that "Commanders of DON organizations shall consider the use of virtual private networks (VPN) to protect and control internal and external access to their IT systems. Administrators' access to IT systems from outside the enclave **must** use VPN connections. VPNs help to ensure that network services provide appropriate confidentiality and integrity of information."

5.9 MIL-HDBK-232, RED/BLACK Engineering-Installation Guidelines

MIL-HDBK-232A is obviously dated and is no longer a primary reference for Navy RED/BLACK Installation design. NSTISSAM TEMPEST /2-95 is the primary reference and governing document. However, MIL-HDBK-232 is easier to understand and it addresses subjects not covered by the NSTISSAM document. It shall only be used when it does not conflict with the NSTISSAM guidance. It should be available to those designing installations (of, in, or near classified areas or equipment) until it is replaced by something better.

5.10 IA PUB-5239-22/ October 2003, Protected Distribution System (PDS) Publication

IA PUB-5239-22/ October 2003, supersedes NAVSO P-5239-22, dated October 1997 and provides guidance to support OPNAVINST C5510.93F/MCO 5510.19. "This module, 'Protected Distribution System (PDS) Publication', provides the Information Systems security Managers/Information Assurance Managers (ISSMs/IAMs) and Information Systems Security Officers/Information Assurance Officers (ISSOs/IAOs) with guidance and procedures to be used when designing and installing PDSs." According to the distribution statement, "Electronic versions of this document may be downloaded via the INFOSEC/IA Web Site on the NIPRNet at https://infosec.navy.mil and on the SIPRNET at http://infosec.navy.smil.mil." There have been recent problems with getting the document from this site. However, the document has been readily available at: https://www.mfp.usmc.mil/TeamApp/security/Topics/20061115193016/5239-22USN-USMC070803_30Sep03_Rev1RFW.doc.

5.10.1 Purpose of a PDS

A PDS is used to move National Security Information (NSI) between two or more controlled areas. A PDS is needed when cable carrying classified information must cross an area that is controlled at a lower level of classification than the level of the NSI carried. A PDS is used in lieu of encryption. A PDS is typically used for short distances when it is more cost effective than installing COMSEC devices. While a PDS protects NSI, the emphasis is on detection of penetration not prevention of penetration. Based upon National Policy of risk management, a short period of data loss was accepted to save the cost of complete physical protection as long as the loss could be detected and stopped. Hence, the most important aspect of PDS design and operation is the capability to inspect the PDS and detect penetration. If the PDS cannot be adequately inspected, it must be hardened or the data must be encrypted.

5.10.2 Points of Contact for Obtaining PDS Guidance

SPAWAR Installation activities may contact Larry Leverette at 843-218-4493 (SPAWARSYSCEN Charleston) for more information:

5.10.3 PDS Related Definitions

Section 2 of IA PUB-5239-22/ October 2003 provides PDS definitions. Key terms that are defined include, Approved PDS Lock, Controlled Access Area (CAA), Restricted Access Area (RAA), Limited Access Area (LAA), Secure Room, and Uncontrolled Access Area (UAA).

5.10.4 PDS Design Approvals

All Navy PDS design approval requests shall be submitted to SPAWARSYSCEN Charleston Code 723, P. O. Box 190022 North Charleston, SC 29419-9022 for approval. PDS designs should be approved before beginning installation to avoid potentially costly revisions and/or unnecessary installations.

5.10.5 Construction Requirements

Section 4 of IA PUB-5239-22/ October 2003 provides guidance on the construction of walls, floors and roofs, doors, windows and openings of RAAs and CAAs. PEs who are planning to install equipment that processes classified information (especially into areas where classified information is not currently held or processed) need to ensure that these requirements will not be violated by the installation being planned. This often requires some "hardening" of the installation area.

5.10.6 Site Preparation Drawing Requirements

In most cases, reinforcing walls, installing locks, sealing windows, and other room hardening is covered as part of site preparation work that occurs prior to the installation. In many cases this is the responsibility of the site, and not the responsibility of the installing activity. In these cases, the SPAWAR PE should encourage the site to obtain and provide drawings that show the work to be accomplished. In cases where room hardening is a responsibility of the (Team SPAWAR) installing activity, the work to be accomplished shall be described on complete drawings that show what materials were used and how and where the materials were installed. These details shall be incorporated into the final IDP for the project on floor plans, miscellaneous detail drawings, and in other drawings (as required) that meet the requirements of the SPAWAR Shore Installation Process Handbook (SIPH).

5.10.7 IDP Drawing Requirements

According to the CTTA, PDS drawings must show the path of the PDS, the locations of terminations and boxes, and the boundaries of the areas where the PDS passes through including type of area for terminations (SR/CAA/RAA). Typically both floor plan and elevation type drawings are needed. Elevation views are required to show details such as distances below false ceilings, mounting methods, labeling methods and locations, and separation distances. The PDS drawings shall also contain details or notes instructing installers on the materials and methods used to complete tasks such as:

a. Epoxying EMT conduit joints
b. Securing conduit and boxes to walls
c. Firestopping penetrations (when required)
d. Locating the conduit for ease of inspection
e. Locking or sealing boxes
f. Performing room hardening (e.g. installing new doors, locks, bars on openings, etc.)

5.10.8 Director of Central Intelligence Directive No. 6/9

Director of Central Intelligence Directive No. 6/9, *Physical Security Standards for Sensitive Compartmented Information Facilities,* dated 18 November 2002, "established governing the construction and protection of facilities for storing, processing, and discussing Sensitive Compartmented Information (SCI) which requires extraordinary security safeguards. Compliance with this DCID 6/9 Implementing Manual (hereafter referred to as the "Manual") is mandatory for all Sensitive Compartmented Information Facilities (SCIFs) established after the effective date of this manual, including those that make substantial renovations to existing SCIFs. Those SCIFs

approved prior to the effective date of this Manual will not require modification to meet these standards."

5.10.8.1 SCIF Cable Control

Section 2.8. of Annex G, of Central Intelligence Directive No. 6/9 contains the following requirements:

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"2.8.1 All unclassified telecommunications cabling 8[8] should enter the SCIF through a common opening. The cables should be installed in a professional manner, such that they can be visually inspected without difficulty.

2.8.2 Each conductor (fiber or metallic) should be accurately accounted for from the point of entry. The accountability should identify the precise use of every conductor through labeling, log, or journal entries. Spare conductors will be identified and appropriately grounded. 2.8.3 Unused conductors will be removed. If removal is not feasible, the CSA may require the metallic conductors be stripped, bound together, and grounded at the point of ingress/egress. Unused fiber conductors will be uncoupled from the interface within the SCIF, capped, and labeled as unused."

5.10.8.2 Conductive Penetrations

Section 3.3.4.2 of Central Intelligence Directive No. 6/9states "Based on the TEMPEST accreditation, it may be required that all vents, ducts, and pipes must have a non-conductive section (a piece of dissimilar material e.g., canvas, rubber)."which is unable to carry electric current, installed at the interior perimeter of the SCIF.

5.10.9 Protecting Sensitive Compartmented Information within Information Systems (DCID 6/3)—Manual dated 24 MAY 2000

This manual contains a wide variety of requirements that personnel working within SCIFs need to be aware of. It contains requirements for all diagnostic equipment and other devices carried into a facility by installation personnel. It also requires that communication devices with transmit capability (e.g., pagers, [RF] LAN connections) belonging to the maintenance (or installation) personnel or any data storage media not required for the maintenance (or installation) visit shall remain outside the system facility for return to the maintenance personnel upon departure from the facility.

6. Industry Standards and Best Industry Practices

The trend in the Department of Defense for many years has been to move away from the use of military standards and towards the use of commercial standards. This section discusses the commercial standards that have been applied most often to SPAWAR installations. Theses standards were for the most part designed to cover the installation of telephone and computer networking equipment. The main standards are published by the Telecommunications Industry Association (TIA).

6.1 ANSI/TIA/EIA-568-B.1-2001, Commercial Building Telecommunications Cabling Standard and Related Standards

All of the ANSI/TIA/EIA-568-B set of standards has been superseded (as of 4 August 2009) except for TIA-568-B.2.

6.2 TIA-568-C.0, TIA-568-C.1, and TIA-568-C.3

TIA-568-C.0, TIA-568-C.1, and TIA-568-C.3 are available for purchase from www.tiaonline.org or global.ihs.com. The following information was mostly obtained from http://www.tiaonline.org/news_events/press_room/documents/evolution_of_structured_cabling.cfm.

"What's New in TIA-568-C?

The new Commercial Building Cabling Standard gives users and network designers more standards compliant solutions: new media choices are included along with their appropriate installation and testing procedures. However, in addition to the technical updates, 568-C reflects a new organizational structure that is designed to simplify and streamline future standards processes by reducing duplicated information, and establishing a common foundation for future documents. (Note: Tiaonline neglects to mention that what was formerly covered by TIA/EIA-568-B.1 is now covered by two standards that sometimes use conflicting terminology.

The standard is comprised of four documents:

- TIA 568-C.0 Generic Telecommunications Cabling (targeted to users/designers/installers) dated 02/00/09. This document houses most information common to structured cabling in one place and becomes the foundation for future standards. This is where the minimum requirements for generic telecommunications cabling are specified such as cabling architecture, what applications the cabling is intended to support and over what distances, and other general requirements. The document thus serves two purposes - as a "default" standard for structured cabling in locations that are not office-oriented or covered by another standard, and as a foundation for future standards that can now focus on exceptions and allowances for that location rather than having to reconstruct all the generic information.
- TIA 586-C.1 Commercial Building Telecommunications Cabling Standard (Targeted to users/designers/installers) dated 02/00/09. . This document specifies the requirements for telecommunications cabling within and between commercial (office-oriented) buildings. This document builds on 568-C.0 and focuses on the requirements and guidance for office-oriented buildings. There are some technical changes to the information in 568-B.1 that are reflected in this document. These include the addition of:
    - Category 6 balanced twisted-pair cabling
    - Augmented category 6 twisted-pair cabling
    - 850 nm laser-optimized 50/125 µm MM fiber
    - Telecommunications enclosures (TEs)

  - Centralized cabling
  - A recommendation to select 850 nm laser-optimized 50/125 µm as the multimode fiber for commercial buildings

  Some information was also removed:
  - 150-Ohm STP cabling
  - Category 5 cabling
  - 50-ohm and 75-ohm coaxial cabling
  - Balanced twisted-pair cabling performance and test requirements (these will be in the ANSI/TIA-568-C.2 document)

- 568-C.2 Copper Cabling Components (Targeted to manufacturers). This standard includes component and cabling specifications for copper cabling, including testing requirements. The document incorporates Cat 3, Cat 5e, Cat 6 and Cat 6A.
  - Status: Unknown – not published as of 4 August 2009.

- TIA-568-C.3 Optical Cabling Components (Targeted to manufacturers) dated 06/00/08 - errata issued in October, 2008. This document addresses component and cabling specifications for fiber optic cabling. The standard now includes all three types of multimode fiber (82.5-micron, 50-micron and 850nm laser-optimized 50-micron). The addition of array connectors is particularly noteworthy.

6.3 Common Violations

The following paragraphs describe some examples of violations that have occurred in the past and that PEs should understand and avoid.

6.3.1 Improper Backbone Cabling Topology

LAN or network topologies that require patchcords in more than two buildings (or rooms) in order to connect equipment in a remote building (or room) to a central office or network operations were in violation of TIA/EIA-568B.1 Section 5.2.1 and are now in violation of ANSI/TIA-568-C.0. (Daisy chains of more than 3 cables interconnected with patchcords are not allowed.) Section 5.2.1 of TIA/EIA-568B.1 stated that "The backbone cabling shall use the hierarchical star topology…There shall be no more than two hierarchical levels of cross connects in the backbone cabling." Section 4.2.1 of ANSI/TIA-568-C.0 contains the same requirement but words it differently. It states that "Generic cabling shall be installed in a hierarchical star topology. There shall be no more than two Distributors between Distributor C and an EO." (If you study the both standards, you will notice that "Optional consolidation points" are allowed between the equipment outlet and the Telecommunications Closet/Distributor A.) Notes 2 in Section 4.1 of ANSI/TIA-568-C.0 states that "It may be necessary to divide the facility (e.g., a campus) into smaller areas within the scope of this standard and then connect these areas together." This note is obviously designed to accommodate large campuses and shall not be used as a license to violate the spirit of the standard.

6.3.2 Improper Polarity of Fiber optic Connectors

Past designs often failed to meet the requirement of TIA/EIA-568B.1 that "Each (fiber optic) cabling segment shall be installed such that odd numbered fibers are Position A at

one end and Position B at the other end while the even numbered fibers are Position B at one end and Position A at the other end." ANSI/TIA-568-C.0 retains this basic requirement and contains an entire annex (Annex B) containing guidance dedicated to "Maintaining Optical Fiber Polarity". As long as the installation is symmetrical, following this guidance will ensure that one side's transmit is the other side's receive. If this practice is not followed, what usually happens is that transmit goes to transmit and receive goes to receive and nothing works until someone reverses the polarity in a connector. The problem with this is that, in most cases, the location of the polarity reversal is never documented.

6.3.3 Use of T568B Pin-Outs

Many past government installations have been installed using T568B pin-outs on their RJ-45 connectors due to the mistaken assumption that T568B replaced or superseded T568A. T568A pin assignments should be used for all new Government LAN installation unless T568B must be used to maintain consistency with the existing base infrastructure. See Table 1 and Figure 4 on the following page for T568A and T568B wiring information. UFC-3-580-01 states "All connectors must be 8-pin/8-position insulation displacement terminations wired per T568A. **The T568B configuration must only be used by exception** if required to maintain system configuration uniformity, security or other user-specified reasons."

Pin	T568A Pair	T568B Pair	Wire	T568A Color	T568B Color
1	3	2	tip	white/green stripe	white/orange stripe
2	3	2	ring	green solid	orange solid
3	2	3	tip	white/orange stripe	white/green stripe
4	1	1	ring	blue solid	blue solid
5	1	1	tip	white/blue stripe	white/blue stripe
6	2	3	ring	orange solid	green solid
7	4	4	tip	white/brown stripe	white/brown stripe
8	4	4	ring	brown solid	brown solid

Figure 3 - T568A and T568B Wiring

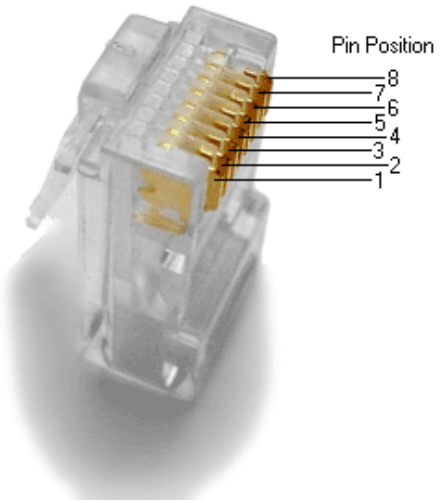

Figure 4 - RJ-45 Connector Pin Locations[6]

6.4 TIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces (October 2004)

This standard discusses inter-building pathways, entrance facilities, equipment rooms, intra-building backbone pathways (conduits, cable trays, etc.), telecommunications closets, and horizontal pathways. It contains many more requirements than we can list or discuss here. All PEs should have a personal copy of this document. Many of the requirements are very specific. For example, it requires in Section 8.8.2.1 that "No section of conduit shall be longer than 30 m (100 ft) between pull points." It requires in Section 8.8.2.2 that "No section of conduit shall contain more than two 90 degree bends, or equivalent (see annex B) between pull points (e.g. outlet boxes, telecommunications rooms, pull boxes)." Section 8.8.2.2 provides minimum bend radii for conduit. Table 9 shows conduit sizing for horizontal cables and Table 10 shows maximum EMT conduit fills for backbone cables.

6.4.1 Common Violations

The following list is not a comprehensive list of all of the violations of the standard that have occurred. Some of the below violations are examples of practices that are obviously wrong. Others are not so obvious. Project Engineers and drawing reviewers need to study this very important standard to determine all requirements and potential violations.

6.4.1.1 Overloading Cable Trays

Section 8.6.1.1 of TIA-569-B states that "Cable trays shall be designed to accommodate a maximum calculated fill ratio of 50% to a maximum of 150 mm (6 in) inside depth. For planning cable tray pathways, the maximum pathway **fill should be 25%".** The standard notes that "A calculated fill ratio of 50% will physically fill the entire tray due to spaces between cables and random placement". It also provides an example for determining the minimum cable tray width in Section 8.6.1.1.

[6] http://en.wikipedia.org/wiki/TIA-568B

Notes:
1. Cable trays should be sized to accommodate reasonable anticipated future expansion. If a site survey shows that existing cable trays do not have sufficient capacity to meet the above requirement then new cable pathways are required.
2. ANSI/TIA/EIA-568-B1.6-Additional Cabling Guidelines PoE (Power Over Ethernet) was not yet available at the time this was written.

6.4.1.2 Undersizing Pull Boxes
Section 8.8.2.5 gives detailed design guidance for pull boxes. Table 12 covers pull box sizing. The sizes given in the table are much larger that necessary for most cable types. However, permission to install a smaller box than what is required by the TIA standard must be obtained from the Authority Having Jurisdiction (AHJ) before an undersized box is installed.

6.4.1.3 Using Pull Boxes in Lieu of Bends
Section 8.8.2.5.2 of TIA-569-B states that "Pull boxes should be placed in a straight section of conduit and not used in lieu of a bend." See Figure 4.5 of the BICSI TDMM for potential ways to avoid this very common problem. (The TDMM is discussed in Section 7.1.) There are some situations such as wall penetrations where using a pull box to make a bend could be the most practical solution. However, this practice should be avoided whenever it is practical to do so.

6.4.1.4 Using Bends of Insufficient Radii
Section 8.8.2.2 states that "For conduits with an internal diameter of 50 mm (2 in) or less, the inside radius of a bend in conduit shall be at least six times the internal diameter. For conduits with an internal diameter of more than 50 mm (2 in), the inside radius of a bend in conduit shall be at least 10 times the internal diameter. Bends in the conduit shall not have any kinks or other discontinuities …" Meeting this requirement can be very difficult or even impossible in some cases, especially for building entrance risers and pier risers, but this requirement should be met whenever it is possible to do so. When it is not possible to meet this requirement, the bend radius should be as large as practical. Horizontal bends in Outside Plant conduit should generally have much larger radii. These bends are referred to as sweeps. Additional guidance for outside plant conduit bends was provided in the BICSI Customer-Owned Outside Plant Design Manual (3rd Edition). It stated in Chapter 3, Section 1, under "Designing Curved Conduit Sections" that "Where the radius is less than 12 m (40 ft), 4.6 m (15.0 ft) radius manufactured bends must be used. If possible, the entire change of direction should be made with a single arc of 4.6 m (15.0 ft) radius." The BICSI Customer-Owned Outside Plant Design Manual is discussed in Section 7. The fourth edition was current, but unavailable, when this was written.

6.4.1.5 Cable on Ceiling Tiles or Support Rails - Not Including Support in Design
Section 8.4.2.1 of TIA-569-B states that "The design shall provide a suitable means and method for supporting cables. Cable shall not be laid directly on the ceiling tiles or rails." IDPs that require the running of cables above ceilings shall include Cable Routing Layouts (Drawing category code 160) that include details showing how the cable

pathway hardware will be independently supported. The parts list shall include all pathway and mounting hardware.

6.4.1.6 Excessive Use of Flexible Metal Conduit

Section 8.8.1 of TIA-569-B states that "If flexible metal conduit is used, the lengths should be less than 6 m (20 ft) for each run…" This applies to all types of flexible metal conduit including liquidtight flexible metal conduit.

6.4.1.7 Failure to Install Pull Strings

Section 8.8.3.2 of TIA-569-B states that "Pull string or rope shall be placed in installed conduits." The parts list in IDP's that require conduit installation shall include pull string or rope. String or rope should be sized to match the conduits. (Conduits 1.5" or larger should have pull ropes.) SPAWAR policy is that if there is any chance that the pull string or rope will be useful, the pull string or rope shall be installed. Exceptions may be considered by the authority having jurisdiction if pull strings have already been used to pull the maximum allowable amount of cable through a conduit.

6.4.1.8 Failure to Use Insulated Bushings

Section 8.8.3.1 of TIA-569-B states that "Conduits shall be reamed to eliminate sharp edges. Metallic conduit shall be terminated with an insulate bushing." Insulated bushings shall appear on parts lists for installations requiring the use of metal conduit.

6.4.1.9 Failure to Install at Least Two 4" Building Entrance Conduits

Section 4.5.2 of TIA-569-B states that "As a minimum, two 103 (4) (This means 103 millimeter or 4 inches) trades size, with at least one spare 103 (4) trade size, conduits shall be placed for each entrance point."

6.5 TIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces Addendum 1- Temperature and Humidity Requirements for Telecommunications Spaces

According to the publisher, this addendum "specifies revised requirements for temperature and humidity in commercial building telecommunications spaces to harmonize with environmental guidelines developed by ASHRAE. These revised requirements should reduce energy consumption for heating, ventilation, and air conditioning; and should provide more flexibility in maintaining temperature and humidity in telecommunications spaces."

6.6 J-STD-607A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

This standard shall be used at sites where MIL-STD-188-124B does not apply. (The entire standard is only about 48 pages including the cover sheet. The main body of the standard is only 27 pages.) This entire document should be carefully studied by PEs for all projects that require its use. It requires the installation of a telecommunications main grounding busbar (TMGB) and a Bonding Conductor for Telecommunications between the TMGB and the electrical service equipment ground. According to Section 5.2.1 of the standard, the TMGB serves as the "dedicated extension of the building electrode system for the telecommunications infrastructure." The standard calls for larger building

to also have telecommunications grounding busbars (TGB) that serve as "the grounding connection point for telecommunications systems and equipment in the area served by that telecommunications room or equipment room." (See Section 5.5 of the standard.) The standard requires that each telecommunications grounding and bonding conductor shall be labeled.

6.6.1 IDP Requirements

IDPs for buildings where J-STD-607A applies shall show on the floor plans the locations of the TMGB and of all TGBs. Locations for the telecommunications bonding backbone and bonding conductor for telecommunications shall also be shown. If the TMGB is to be installed as part of the installation, the miscellaneous details shall identify all grounding hardware and shall detail how connections shall be made to the TMGB, TGB (if any), power panel safety ground busses, and to the building service entrance ground. The labeling details shall include instructions for meeting the labeling requirements of both J-STD-607A and TIA/EIA-606A.

6.6.2 Common Errors

Common errors are:

a. Failure to connect power panels safety grounds to TGBs in the mistaken belief that these grounds should be isolated.
b. Failure to properly label grounding conductors in accordance with Figure 5.1-1 of the standard.
c. Placing grounding or bonding conductors in ferrous conduit when not necessary. (See Section 5.1.4 of the standard.)
d. When placing grounding or bonding conductors in ferrous conduit that exceeds 1 m (3 ft) in length, not bonding the conductors at each end using a grounding bushing or #6AWG or larger wire.

6.7 TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure

This standard requires in Section 10.2 that "All labels shall be printed or generated by a mechanical device." Section A.4 states, "A key requirement of this standard is that all labels must be mechanically printed, and not written by hand." It also provides an industry standard for the color coding of cable termination fields (at patch panels) in Section 9.2.2. (Terminations of horizontal cable should be blue, first level backbone should be white, etc.) This standard "establishes classes of administration to address the different needs of small, medium, large, and very large telecommunications infrastructure systems" and "specifies labeling formats." (See foreword of TIA/EIA-606-A.) It contains examples of outlet faceplate labeling, patch panel labeling, punch-down block labeling, firestop location labeling, and main grounding busbar labeling. It also contains examples of optional pathway labeling. This standard also contains sample drawings and standard layers, descriptions, colors, and line types.

6.8 TIA-598-C, Optical Fiber Cable Color Coding

Fiber optic cable positioning and color code shall be in accordance with TIA-598-C.

6.9 TIA-758-A, Customer-owned Outside Plant Telecommunications Infrastructure Standard

TIA-758-A does not apply to most SPAWAR installations. However, it has applied to the kind of installations that SPAWAR has spent the most money on over the past five or six years. It is very important that all PEs working on outside plant (OSP) installations know this standard very well. It shall be used to establish basic requirements for OSP cable installations. TIA-758-A uses the term "maintenance hole" instead of "manhole" to avoid offending those who consider the word "manhole" to be a sexist term. The National Electrical Safety Code (NESC) still uses the word manhole. Maintenance holes and manholes are the same thing.

6.9.1 IDP Requirements for OSP Cable Installations

IDPs for OSP Installations shall contain:

a. Cabling Block Diagrams showing all of the new cables to be installed between buildings. See above discussion of OSP cable under the NEC for required description information.
b. Cable Routing Layouts (drawing category code 160) superimposed on site maps showing all manholes, handholes, utility poles, cable locations, conduit locations, innerduct runs, building entrance locations, building locations, riser locations (e.g. Pier risers), trenching locations and notes (encased or non-encased etc.) , distances between access points (manholes, handholes, buildings), and cable numbers. Leaders pointing to conduit or aerial runs shall be used to indicate which notes apply to the particular run.
c. Manhole Layout Diagrams (also known as butterfly drawings) for all manholes and handholes affected by the installation. Butterfly drawings shall identify vacant ducts, innerduct locations, vacant innerducts.
d. Patch Panel Layouts showing all outside plant cable terminations
e. Circuit Diagrams for all installed circuits
f. Cable Running Sheets
g. Miscellaneous details covering:
    1. Building entrance methods
    2. Grounding methods for manholes and cables (if applicable)
    3. Manhole racking and ladder details (if applicable)
    4. Details for connecting conduits to manholes and handholes
    5. Trenching details showing depth and fill methods and conduit separation methods
    6. Sealing methods for ducts and innerducts
    7. Methods of concrete encasement (if applicable)

6.9.2 OSP Cable Topology Requirements

Section 3.2 of TIA-758-A states that "A large campus should be designed in a hierarchical star configuration." This is consistent with the discussion of topology provided above for TIA/EIA-568.B.1. While the standard recognizes that this is not always possible, this should not be used as an excuse to ignore the recommendation. Fiber optic cable connections that require the use of patchcords in more than two buildings shall be justified in the BESEP and coordinated with the AHJ over cabling at the site.

6.9.3 OSP Pathway Recommendations

Section 4.1 of TIA-758-A states that "Underground or direct buried pathways are generally preferred over aerial pathways because of aesthetics and security. Of the two, underground pathways (e.g. conduit, duct) are generally preferred over direct-buried because of security, ease of future cable installation and maintenance." Since the use of underground ducts or conduits is clearly the preferred method, it should be employed whenever possible. However this standard discusses other options such as aerial cable and utility tunnels.

6.9.4 Other Key Requirements and Recommendations

The following TIA-758-A requirements and recommendations should be known by all PEs responsible for OSP installations:

a. "The section length of conduit shall not exceed 183 m (600 ft) between pull points." (See Section 4.1.1.2.3.)
b. "Where bends are required, manufactured bends should be used whenever possible." (See section 4.1.1.2.4) These manufactured bends shall appear on the Parts List with a full description, manufacturer, and part number. (See also TIA-569-B Section 8.8.2.2 for guidance on bends.)
c. "There shall not be more than the equivalent of two (2) 90-degree bends, or equivalent between pull points (e.g. handholes, maintenance holes, and vaults). If there is a reverse bend in the section, a pull box shall be installed. Back-to-back 90-degree bends shall be avoided." (See Section 4.1.1.2.5.)
d. "Underground conduit should be installed such that a slope exists at all points of the run to allow drainage and prevent the accumulation of water. A drain slope of no less than 10 mm per meter (.125 per foot) is desirable when extending conduit away from building structures. Where conduit extends between maintenance holes, a slope of 10 mm per meter (.125 per foot) should extend from the middle of the span to each maintenance hole." (See Section 4.1.1.2.6.)
e. "Ducts shall be sealed to resist liquid and gas infiltration at all maintenance holes and building entrance point locations." (See Section 4.1.1.2.8.)
f. "Nonmetallic conduits shall be encased in concrete of minimum 17225 kPa (2500 lb/in^2) compressive strength where vehicular traffic (i.e., automotive, railway) is above the pathway or where a bend or sweep is placed." (See Section 4.1.1.2.2.)
g. "Where maintenance holes are installed in roadways, the lid shall support heavy vehicular traffic." (See Section 4.3.1.1) Note: The NESC, discussed below, provides additional guidance in this area.
h. "Maintenance holes shall be provided with corrosion resistant pulling irons and cable racks, that are grounded, and a sump for drainage. Telecommunications maintenance holes shall not be shared with electrical installations other than those needed for telecommunications equipment." (See Section 4.2.1.1.)
i. "A handhole shall not be used in place of a maintenance hole or in a main conduit system. Handholes shall not be used for splicing cables together. Handholes shall have provisions for drainage … Telecommunications handholes shall not be shared with electrical installations other than those needed for telecommunications equipment." (See Section 4.2.2.1.)

j. "A handhole shall not exceed 1.2 m (4 ft) in length by 1.2 m (4 ft) in width by 1.2 m (4 ft) depth and should not be used in runs of more than three 103 (4) trade size conduits." (See Section 4.2.2.3.)
k. "Optical fiber cables, connecting hardware and patchcords shall maintain the correct polarity throughout the cabling system to support two-fiber transmit and receive applications. Each cable segment shall be installed in a pair-wise cross-over orientation as shown in Figure 1. The 568SC connector and adapter "A" and "B" positioning labeling system shall be used for keyed duplex connectors. Single fiber systems shall use a consistent "A" and "B" labeling system to support the installation of cable plant cross-over polarity." (See Section 5.3.5.)
l. **Outside Plant Cables must be designed for outdoor use and meet TIA-758-A requirements.** According to TIA-758-A Section 5.1.1.1, twisted pair OSP cables used in campus (or military base) environments "shall consist of 19 AWG (0.9 mm), 22 AWG (0.64 mm), 24 AWG (0.5 mm) or 26 AWG (0.4 mm) thermoplastic insulated solid copper conductors in one of the following designs." (Performance and construction requirements are contained in the subsequent sections.) Sections 5.3.2 and 5.3.3 provide OSP optical fiber cable performance and construction requirements. Meeting these requirements is easy if OSP cable is ordered from a reputable manufacturer or supplier. Problems usually only occur when people use inside plant (ISP) cable for OSP installations. Cable that is designed for indoor use should only be used indoors.

6.10 TIA-590-A, Standard for Physical Location and Protection of Below-Ground Fiber Optic Cable Plant

This standard was published in January 1997. According to its scope, "The purpose of this document is to establish a national standard that defines the location of installed outside fiber optic cable plant relative to its physical environment, including related protective measures … The standard addresses fiber optic cables that are directly buried, placed in duct, …, or in transition from underground to aerial structures. It further specifies the location marking and … protection of such cables." The body of the standard is only 18 pages long.

6.10.1 Uniform Color Code

Table 1 in TIA-590-A provides the color code that is to be used to temporarily mark locations of underground utilities. This color code is also recommended for permanent markings. The color for communications lines is orange.

6.10.2 Depth of Plant

Table 2 in TIA-590A provides the minimum depth of cover for buried or conduit plant. It states that "In conditions where this depth is not feasible or permitted, additional physical protection should be afforded the facility." The minimum cover required for trunk lines or multiple-duct underground conduit runs with manhole access is 750 mm or 30 inches, cover required for feeder or distribution cable is 24 inches, and cover required for service/drop lines is 450 mm or 18 inches.

6.10.3 Separation from Other Utility Lines

Table 4 in TIA-590A provides the minimum distances that communications cables (and underground conduits installed for the purpose of containing communications cables) should be from other utility lines. Portions of this table have been superseded by the 2007 NESC which states in Rule 354.A.2 that "Radial separation of supply and communications cables or conductors from steam lines, gas, and other lines that transport flammable material **shall not be less than 300 mm (12 in)** and shall meet Rule 353. The NESC rules must be researched whenever communications cables will be placed where they could impact other utilities. Rule 320.B address the issue of separation of separation of underground conduit systems in greater detail than the TIA standard. The NESC is the governing standard.

6.10.4 Permanent Markings

Section 4.2.4 of the standard states "Either permanent above-ground markers or underground warning tape, or both, are recommended to identify the general location of the facility route … When a warning tape is used, it should be buried at least 300 mm (12 in.) above the cable …" In addition, SPAWAR recommends that tracer wire be installed with all all-dielectric OSP fiber optic cable to facilitate locating the cable.

6.11 TIA Standards for Fiber Optic Cable Testing

The following TIA standards apply to the testing of fiber optic cable. Some of the descriptions are based on descriptions from the BICSI ITS Installation Manual (Revised November 2004).

6.11.1 TIA TSB-140, Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber (2004)

TIA TSB-140—*Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber* (2004) provides guidance on Tier 1 and Tier 2 testing specifications and the use of the Optical Loss Test Set (OLTS) and the Optical Time Domain Reflectometer (OTDR) for premise cabling.

6.11.1.1 Tier 1 Testing

According to TSB140, Tier 1 testing is required in all fiber optic cabling links. The Tier 1 tests are attenuation (insertion loss), length and polarity. When conducting Tier 1 testing, each fiber link is measured for attenuation with an Optical Loss Test Set (OLTS). Fiber length is measured optically or calculated via the cable sheath markings. Polarity is verified either with the OLTS or a visible light source, such as a Visual Fault Locator (VFL). [7]

6.11.1.2 Tier 2 Testing

Tier 2 testing is optional but equally important. Tier 2 testing supplements Tier 1 testing with the addition of an Optical Time Domain Reflectometer (OTDR) trace of each fiber link. An OTDR trace is a graphical signature of a fibers attenuation along its length. You

[7] http://www.flukenetworks.com/fnet/en-us/supportAndDownloads/KB/Datacom+Cabling/optifiber/TIATSB-140_Additional_Guidelines_for_Field_Testing_Length__Loss_and_Polarity_of_Optical_Fiber_Cablin.htm

can gain insight into the performance of the link components (cable, connectors and splices) and the quality of the installation by examining non-uniformities in the trace. An OTDR trace does not replace the insertion loss measurement with an OLTS, but is used for complementary evaluation of the fiber link. By incorporating the proposed two-tier testing method, installers have the most complete picture of the fiber installation and network owners have proof of a quality installation."[8]

6.11.2 TIA-526-7, OFSTP-7—Measurement of Optical Power Loss of Installed Singlemode Fiber Cable Plant (1998) (2002) (ANSI approval withdrawn July 2003)

The intent of TIA-526-7 is to ensure that meaningful data describing the optical loss performance of an installed single-mode cable plant can be obtained. It is not intended for component testing, nor does it define the elements of an installation that must be measured. The document that invokes this procedure establishes the requirements for installation, maintenance, repair, and conformance testing. (Editorial comment: This document does not contain very much useful or helpful information other than to describe what is meant when this standard is referenced. This would seem to be a high margin product for the TIA. The body of the document is only 11 pages long and those pages contain a lot of empty space.)

6.11.3 TIA-526-14-A, OFSTP-14—Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant, (1998) (R2003) (ANSI approval withdrawn August 2003)

"The intent of TIA-526-14-A is to establish preferred measurement principles and practices to ensure that meaningful data describing the optical loss performance of an installed cable plant can be obtained. It is not intended for component testing, nor does it define the elements of an installation that must be measured. Establishment of requirements for installation, maintenance, repair, or conformance testing is left to the specifier of this test method."[9]

6.11.4 ANSI/TIA/EIA-455-78-B-2002, FOTP 78—IEC 60793 Optical Fibres Part 1-40: Measurement Methods and Test Procedures—Attenuation

"This part of IEC 60793 established uniform requirements for measuring the attenuation of optical fibre, thereby assisting in the inspection of fibres and cables for commercial purposes. Four methods are described for measuring attenuation, one of which being that for modeling spectral attenuation: Method A - Cut-back; Method B - Insertion Loss; Method C - Backscattering; and Method D - Modelling (sic) spectral Attenuation."[10]

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[8] http://www.flukenetworks.com/fnet/en-us/supportAndDownloads/KB/Datacom+Cabling/optifiber/TIATSB-140_Additional_Guidelines_for_Field_Testing_Length__Loss_and_Polarity_of_Optical_Fiber_Cablin.htm

[9] BICSI ITS Installation Manual (Revised November 2004) page 1-60

[10] http://www.tiaonline.org/standards/catalog/search.cfm

6.12 ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling

Much of the information in this standard is similar to the information in the TIA standards that were previously discussed. Its table 2 has been revised to only provide separation distances for potential sources of EMI that are larger than 5 kVA (kilo volt-amperes). For some circuits, this table requires more separation than the NEC (Article 800.113(A)(2)) which requires a minimum 2" separation from AC power circuits not in metal raceway. (TIA-569-B removed more severe guidance in the previous version of the standard and replaced it with guidance which is very soft.) NECA/BICSI 568-2006 provides a lengthy discussion of the use of mandrel wraps with Optical Loss Test Sets (OLTS) and of firestopping.

6.12.1 Requirement to Secure Racks and Provide Access

One important portion of this standard is Section 3.3.2 which states "**Racks shall be secured to the building structure** and should be accessible from the front and rear. Typical spacing is 914 mm (36 in) in front and back of the rack, and 762 mm (30 in) on the sides. Cables should be routed on the rear sides of the rack using cable management accessories attached to the rear of the rack's vertical channels or in cable management channels on the sides of the rack." See the discussion of ANSI/TIA-942-2005 below for more guidance in this area.

6.12.2 Requirement to Install Firestops

Section 5 of ANSI/NECA/BICSI 568-2006 provides five pages of guidance in this important area. Section 3.2.1 states that "Penetrations through fire rated walls and floors should be accomplished before installing the hangers, clamps, and trapezes. Once the pathway and cables are installed, firestop the penetrations per local code requirements." Note: Firestopping is also required by the NEC and Building Construction and Safety Code NFPA 5000, 2006 Edition, Section 8.8.2.

6.12.3 Requirement for Mandrel Testing

NECA 568-2006 requires the use of mandrels for optical loss testing as does TIA/EIA-568.B, and discusses the subject at length. Mandrels remove optical power from the area near the core-cladding boundary. The requirement is somewhat controversial, for a variety of reasons, and the Fiber Optic Association has recommended its deletion from the C revision to TIA-568. Until such time as the requirement is removed, SPAWAR policy is to follow the existing standard.

6.13 ANSI/TIA-942-2005 Requirements

The purpose of TIA-942 is to "provide requirements and guidelines for the design and installation of a data center or computer room." Note: ANSI/TIA-942-1 (March 2008) replaces a very small portion of ANSI/TIA-942-2005. The body of the document is less than seven full pages long. TIA-942-1 addresses *Data Center Coaxial Cabling Specifications and Application Distances*. Section 1 of this document states that "This Addendum:

- Specifies additional requirements for connectors to be used for 75-ohm coaxial cabling in data centers.

- Specifies testing requirements for 75 ohm coaxial cabling in data centers.
- Provides an allowance for longer horizontal cabling originating from the MDA for coaxial cabling.
- Amends E1, T1, E3, and T3 maximum circuit distances specified in Annex A of TIA-942.

6.13.1 Seismic Guidance

TIA-942 does not provide much guidance for seismic design other than to state, more than once, (e.g., in Sections 5.3.4.9 and 5.4.8.9) that "Specifications for related facilities shall accommodate the applicable seismic zone requirements. Refer to Telcordia specification GR-63-CORE for more information regarding seismic considerations." However, it does state in Section 5.11.6 that "Seismic racks shall either be bolted to a seismic stand or bolted directly to the slab."

NOTE: SPAWAR policy is that floor-mounted cabinets and racks be mounted to the true floor without any auxiliary support or bracing attached to walls or ceilings because the walls and ceiling can have their own independent movements in a seismic event. This policy may be overruled for any particular installation by a licensed structural engineer familiar with the construction of the installation site.

6.13.2 Mounting of Racks and Cabinets

Mounting of cabinets (as opposed to racks) to the true slab or floor is unfortunately not discussed. Mounting of seismic racks is discussed as stated above. Mounting of non-seismic racks is covered by Section 5.11 which states "Racks that are supported by the access floor shall be bolted to the cement slab or a metal channel secured to the slab by threaded rods that penetrate through the floor tiles.

6.13.2.1 Standard Equipment Rack and Cabinet Mounting Details

SPAWAR will work with the SPAWAR System Centers and PMW-790 to develop and promulgate standard drawing details for cabinet and rack mounting that implement SPAWAR policy requiring:

a. All cabinets and racks on floors to be securely mounted to the true floor.

b. The use of "Zone 4" rated racks and cabinets in seismically active regions of the United States and overseas, including coastal California, Washington State, Alaska, Guam, Crete, Italy and Japan.

6.13.3 Arrangement of Cabinets and Cable Pathways

TIA-942 contains guidance for arranging cabinets that keeps air flow and cooling in mind. It states in Section 5.11.2 that "Cabinets and racks shall be arranged in an alternating pattern, with fronts of cabinets/racks facing each other in a row to create 'hot' and 'cold' aisles." "Cold" aisles are in front of racks and cabinets. If there is an access floor, power distribution cables should be installed here under the access floor on the slab. "Hot" aisles are behind racks and cabinets. If there is an access floor, cable trays for telecommunications cabling should be located under the access floor in the "hot" aisles." Figure 6 of TIA-942 shows examples of cabinet placement to create "hot" and "cold" aisles.

6.13.4 Equipment Placement

Section 5.11.3 of TIA-942 discusses equipment placement to ensure proper front to rear air flow and states that "Blank panels should be installed in unused rack and cabinet spaces to improve the functioning of the "hot" and "cold" aisles. Perforated access floor tiles should be located in the "cold" aisles rather than in the "hot" aisles to improve the functioning or the "hot" and cold aisles. Additionally, no cable trays or other obstruction should be placed in the cold aisles below the perforated tiles."

6.13.5 Access Floor Tiles

Section 5.11.4 of TIA-942 discusses the placement of equipment cabinets relative to the floor tile grid. Section 5.11.5 discusses access floor tile cuts. It basically provides common sense advice and requires that "Floor tile cuts shall have edging or grommets along all cut edges."

6.13.6 Threaded Rods

Section 5.11.6 of TIA-942 states "Sharp edges on the top of the threaded rods shall be covered using domed nuts or other method. Exposed threads under the access floor should be covered using split tubing or other method. The standard cabinet and rack mounting detail drawing to be produced by Team SPAWAR shall identify materials and methods to be used to accomplish this.

6.13.7 Cabinet and Rack Specifications and Clearances

Section 5.11.7 of TIA-942 contains guidance for cabinet/rack clearances, ventilation, height, depth, width, adjustable rails, finishes, and power strips. Most of the guidance is basically common sense and/or common practice. However, it requires in Section 5.11.7.7 that "Power strips shall be labeled with the PDU/panel identifier and circuit breaker number." Because clearances around cabinets are often an issue, all PEs should be aware that this standard states the following in Section 5.11.7.1:
"A minimum of 1 m (3 ft) of front clearance shall be provided for installation of equipment. A front clearance of 1.2 m (4 ft.) is preferable to accommodate deeper equipment. A minimum of 0.6 m (2ft) of rear clearance shall be provided for service access at the rear of racks and cabinets. A rear clearance of 1 m (3 ft) is preferable. (See below SPAWAR policy statement regarding this issue.) Some equipment may require service clearances of greater than 1 m (3 ft). See equipment manufacturer requirements."

6.13.7.1 SPAWAR Policy Statement

SPAWAR policy is that a minimum of 3 feet of clearance at the rear of racks and cabinets and a minimum of four feet of clearance at the front of cabinets (covering at least two standard floor tiles) shall be provided if it is reasonably practical to do so. A failure to provide this clearance on new installations must be agreed to in writing by the AHJ prior to proceeding with the installation, and the reasons for allowing less clearance summarized by a note or notes on the floor plans.

7. Building Industry Consulting Service International (BICSI) Manuals

BICSI is a professional association supporting the information transport systems (ITS) industry that was formed in 1977. It publishes two documents that are widely recognized to represent "best industry practices" for installations. They are the BISCI

Telecommunications Distribution Methods Manual (TDMM), and the BICSI Customer-Owned Outside Plant Design Manual. These documents are analogous to military handbooks in that they show the user practical ways for implementing the requirements of standards. BICSI also publishes other documents that installation designers can find to be useful. More information is available at www.bicsi.org.

7.1 BISCI Telecommunications Distribution Methods Manual (TDMM)

The TDMM remains a comprehensive resource, covering the areas of design through construction, installation and maintenance. The 11th edition Telecommunications Distribution Methods Manual is the latest available. The two-volume manual contains 22 chapters, six appendices, and concludes with an extensive glossary. Chapters include:

a. Principles of Transmission
b. Electromagnetic Compatibility
c. Work Areas
d. Horizontal Distribution Systems
e. Backbone Distribution Systems
f. Telecommunications Spaces
g. Firestopping
h. Grounding, Bonding, and Protection
i. Power Distribution
j. Telecommunications Administration
k. Field Testing
l. Design, Construction, and Project Management
m. Private CATV Distribution Systems
n. Overhead Paging Systems
o. Building Automation Systems
p. Data Network Design
q. Wireless
r. Electronic Safety and Security
s. Customer-Owned Outside Plant
t. Data Centers
u. Special Design Considerations
v. Residential Cabling

7.1.1 TDMM and Link Loss Budget Calculations

The TDMM provides guidance in many areas, including the important area of calculating link loss budgets for optical fiber links. Link loss budgeting is an important concept for all types of communications links. The basic purpose of link loss budgeting is to ensure that the signals arriving at the receiver input are within the range that the receiver is designed to receive. A signal that is weaker than this range will not allow the link to operate properly because not enough energy is received to drive the receiving circuitry. If a signal is too strong, the receiving equipment could be overdriven (saturated) causing bit errors or worse. Therefore, designers of many kinds of communications links need to be aware of the signal strength of the transmitting equipment that they are using, the range of attenuation that can be expected in the link, and the range of signal strengths that the receiving equipment can handle. Nowadays, most link loss budgeting is performed

for optical fiber links. Table 1.33 of the TDMM, 11th Edition lists the steps that should be used to verify that an optical link has been designed so that sufficient signal strength can be expected at the receiving end of the link throughout the design life of the link. The table is followed by an example that shows a typical series of calculations. The example is followed by text that provides guidance for estimating connector and splice losses, operating margins, and repair margins for ensuring that the cable plant provides the required minimum amount of loss to avoid overdriving the receiver.

NOTE: Corning Cable Systems provides a Link Loss Budget Worksheet at http://www.corningcablesystems.com/web/privnet/webapp.nsf/linkloss?OpenForm. http://www.fiber-optics.info/articles/loss-budget.htm and http://www.thefoa.org/tech/lossbudg.htm provide a discussion of the subject as well. Guidance in this area is available from many sources for those without access to the TDMM.

7.2 Outside Plant (OSP) Design Reference Manual, 4th Edition

BICSI's 4th edition Outside Plant Design Reference Manual (OSPDRM) was released in February 2007. Known in its previous three editions as the Customer-Owned Outside Plant Design Reference Manual, the title has changed to reflect the merging of customer-owned and other information transport systems (ITS) infrastructure. The new OSPDRM is useful for anyone involved in the design or construction of OSP information transport systems, and remains the cornerstone of BICSI's OSP Specialty.

The OSPDRM is unique. Its application of global best practices makes this a truly universal reference. A new chapter on legal considerations has been added to highlight potential issues and problems the OSP designer may encounter. In addition, content (including illustrations and charts) has been updated and reflowed to ensure timely and organized material. A chapter on special design considerations has also been added and will be extremely beneficial to those designers with limited experience overbuilding existing infrastructure.

The OSPDRM, 4th edition, contains 764 pages and 13 chapters:[11]

- Overview
- Legal Considerations for the OSP Designer
- Cable Types
- Cabling Infrastructure
- Pathways and Spaces
- Splicing Hardware
- Grounding, Bonding and Protection
- Right-of-Way
- Scope of Work
- Design Documentation
- Cost Estimating
- Maintenance and Restoration

[11] http://www.bicsi.org/Content/Index.aspx?File=osppubs.htm

- Special Design Considerations

7.2.1 Link Loss Budget Calculations

Chapter 4 of the BISCI Customer-Owned Outside Plant Design Manual, 3rd Edition provides guidance and an example for creating and using link-loss budgets similar to the guidance in the TDMM discussed above.

7.3 Information Transport Systems Installation Methods Manual (ITSIMM), 5th Edition

"This 5th edition of the BICSI installation manual, now titled the Information Transport Systems Installation Methods Manual (ITSIMM), provides cabling installers around the world with access to the best practices for ensuring a solid foundation of the ITS requirements of their clients." Illustrated and indexed, complete with an appendix, glossary, and bibliography, the ITSIMM includes nine chapters. They are, according to the website (https://www.bicsi.org/its_installation.aspx):

a. Installation Foundations: "Chapter 1 discusses the foundations of information transport systems (ITS) installation practices with emphasis on the essentials of transmission, safety, and professionalism. ITS installers will gain the knowledge of copper and optical fiber media factors and requirements, personal and work area protection guidelines, and best communication practices, among other related topics."
b. Pathways and Spaces: "In Chapter 2, ITS installers can expect to learn about different types of cabling systems, spaces, support structures, and installation practices along with specific steps for performing the most common procedures."
c. Grounding (Earthing), Bonding, and Electrical: "Chapter 3 explains the telecommunications grounding (earthing) and bonding practices that ensure life safety and code compliance. The ITS installers will learn how to plan, set up and test grounding and bonding systems."
d. Firestopping: Firestopping is one of the most important facets of ITS installation. Chapter 4 explores the regulations, technology, and practices related to firestopping system selection."
e. Copper Structured Cabling Systems: "Chapter 5 describes copper cable structured cabling systems, with specific procedures for pulling, splicing, termination, testing, and troubleshooting balanced twisted-pair cable."
f. Optical Fiber Structured Cabling Systems: "The focus of Chapter 6 is optical fiber structured cabling systems. This chapter provides detailed information about cable types, pulling, splicing, termination, testing, and troubleshooting, with steps for performing the related procedures."
g. Field Coordination: "Chapter 7 focuses on specific project management skills and practices required of ITS installers, including developing project plans, schedules, and documentation. Installers can also find out more about materials storage and the importance of collaborating with other trades."
h. Retrofits: "Chapter 8 describes the best practices for planning and implementing retrofit installations, including the procedures for verifying the existing structures, verifying regulatory compliance, performing system cutover, and removing abandoned cable and equipment."

i. Specific Applications: "Chapter 9 focuses on specific applications found in health care facilities as well as conditions of installation work on security, wireless, paging, sound masking, clock systems, special circuits, and building automation systems (BAS)."
j. Codes, Standards, and Regulations: The manual has an appendix that "serves as a repository of United States (U.S.) and international codes, standards, and regulations governing the construction of ITS installation. It provides information about specific codes as well as their sources for obtaining further information."
k. Glossary: "This Glossary provides concise and up-to-date terminology that reflects the ITS installation industry worldwide. It includes specific definitions from standards bodies where appropriate, in an effort to harmonize terms within the industry. Symbols have also been updated."

7.3.1 Depth of Information

The following excerpt from a revision to BICSI ITS Installation Manual, 4th edition shows some of the depth of the information contained in a previous version of the document.

Primary Protectors

Many different components are used by manufacturers to implement protection functions. The following components are typical of primary protectors.

Carbon Blocks

These are the original protectors. An air gap between carbon elements is set to arc at about 300 V to 1000 V and conducts surge current to a grounding conductor. When the surge current finally drops low enough, the arc stops and the protector resumes its normal isolation of ground.

A fail-safe function causes carbon blocks to short permanently to ground when an extended hot surge or permanent fault current overheats them. They are typically installed as pairs and are the lowest cost option; however, carbon blocks tend to wear out quickly under extreme conditions and can cause leakage and noise in voice circuits.

Gas Tubes

These are improved arresters that operate the same as carbon blocks, arcing over a gap to a grounding conductor. They have a wider gap because of special gas and therefore a higher reliability. They have tighter tolerances on arc breakdown voltage and are typically set to arc at a lower voltage, providing better protection than carbon blocks. Another type of gas tube, the dual-gap, provides a common arc chamber that grounds both wires of a pair together and minimizes metallic surges that would otherwise occur from individual arrester operation.

Solid State

This is the newest type of arrester. It relies on high-power semiconductor technology. Though more expensive than either carbon block or gas tube, the cost is recovered over the extended life of the protector. They are fast acting and well balanced and do not deteriorate with age below a rated maximum surge current.

Fuses and Fuse Links

The NEC 800.90(A)(1) and (2) identify the two types of primary protectors as fused and fuseless. In case of extended overcurrent situations, the exposed side must fuse open without damaging the ground conductor or indoor circuit. The fused type accomplishes

this with an integral line fuse (See Figure 1.99). The fuseless type must be installed with fine-gauge fuse wire (a fuse link) on the exposed line side (provided by the manufacturer). Both types will operate the same way when installed.

7.4 Network Design Reference Manual (NDRM) - Sixth Edition

This is a very basic manual that provides a broad treatment of networking. Much of it is below the level of many of SPAWARs skilled network design engineers. However, the manual covers the fundamentals of network architecture, connectivity, communications and administration very well. Design examples are also provided for departmental, backbone, wide-area and remote-access networking.

7.5 Wireless Design Reference Manual, 3rd Edition (2008)

While Team SPAWAR has a vast depth and breadth of experience in the installation of conventional wired networks, the same is not true for wireless networks. Because of the history of security issues with wireless networks, wireless installations by SPAWAR personnel has been rare until fairly recently. Network designers who are put in charge of design for a wireless installation should find this manual to be useful and informative. The manual provides new information on such topics as WiMAX, Wi-Fi, 4G cellular communications and distributed antenna systems (DASs). A chapter on wireless project management has also been added. The manual provides in-depth information on the following topics:

a. Introduction to Wireless Design
b. Legal Aspects of Wireless Design
c. Regulations, Standards, Codes, and Organizations
d. Overview of Wireless Fundamentals
e. Components of a Wireless System
f. General Wireless Design Considerations
g. Point-to-Point and Point-to-Multipoint Systems
h. Distributed Antenna Systems
i. Cellular and Paging Systems
j. Special Wireless Technologies
k. Wireless Local Area Networks

8. Rural Utilities Service (RUS) Standards

The RUS is widely recognized for its expertise in the area of outside plant cable installation, and unlike the TIA, its standards are readily available on the web at no cost. Those involved with the planning of Outside Plant Cable Installations should visit http://www.usda.gov/rus/telecom/publications/bulletins.htm, and view the list of available RUS standards. The standards discussed below are not all of the standards that are available.

8.1 Acceptance Tests and Measurements of Telecommunications Plant, RUS Bulletin 1753F-201 (PC-4)

RUS Bulletin 1753F-201 (PC-4) covers the United States Department of Agriculture Rural Utilities Service (RUS) acceptance tests and measurements to be performed on installed copper and fiber optic cable telecommunications plant. This standard is

especially useful to those who need to plan the installation and testing of twisted-pair copper Outside Plant OSP cable.

8.2 Specifications and Drawings for Construction of Underground Plant, RUS Bulletin 1753F-151

"This specification provides Contractors, Engineers, and RUS Borrowers with assembly unit descriptions, materials, construction and installation, and drawings for underground plant associated with RUS Form 515, Telecommunications System Construction Contract." This specification can be useful to those trying to interpret drawings prepared in accordance with this RUS standard.

9. National Electrical Safety Code (NESC) Requirements

Those familiar with the National Electrical Code (NEC) but unfamiliar with the NESC can think of the NESC, for introductory purposes, as the outdoor version of the NEC. TIA-758-A (discussed above) states "In the absence of applicable codes, follow the most current version of the NESC" in Section 4.1.1.1 and "In the absence of applicable codes, follow the NESC." UFC 3-560-01 also references the NESC on several occasions. The abstract of the 2007 edition of the NESC states that "This standard covers basic provisions for safeguarding of persons from hazards arising from the installation, operation, or maintenance of (1) conductors and equipment in electric supply stations, and (2) overhead and underground supply and communication lines.

9.1.1 Aerial Cable Installation

Part 2 of the NESC contains "Safety Rules for the Installation and Maintenance of Overhead Electric Supply and Communications Lines". Section 23 (part of part 2) addresses clearances. Those planning to install aerial cable need to review this document, identify areas where there could be potential for clearance violations, and include in the IDP specific plans (drawings with dimensions) and instructions (in the notes) for avoiding these potential violations. This does not change the fact that aerial cable installation is not recommended for most outside plant cable installations.

9.1.2 Underground Cable Installation

Part 3 of the NESC contains "Safety Rules for the Installation and Maintenance of Underground Electric Supply and Communication Lines". Rule 32 addresses "Underground conduit systems". Rule 323 contains detailed requirements for manholes, handholes, and vaults. Rule 34 addresses "Cable in underground structures", and 341.B.2.a.(1) requires all cables to be permanently identified at each manhole or other access opening. Rule 35 addresses direct buried cable.

9.2 Unified Facilities Criteria (UFC) and Unified Facilities Guide Specifications (UFGS) Requirements

Project Engineers should perform quarterly research to determine if there are any UFC's or UFGS's that might apply to the installations that they are working on. Unified Facilities Guide Specifications (UFGS) are a joint effort of the U.S. Army Corps of Engineers (USACE), the Naval Facilities Engineering Command (NAVFAC), the Air Force Civil Engineer Support Agency (AFCESA), and the National Aeronautics and Space Administration (NASA). UFGS are for use in specifying construction for the

military services. According to the Whole Building Design Guide at http://www.wbdg.org/ccb/browse_org.php?o=70:

"As of June 2008, updated UFGS will be posted quarterly in February, May, August and November. Unified Facilities Guide Specifications (UFGS) are a joint effort of the U.S. Army Corps of Engineers (USACE), the Naval Facilities Engineering Command (NAVFAC), the Air Force Civil Engineer Support Agency (AFCESA) and the National Aeronautics and Space Administration (NASA). UFGS are for use in specifying construction for the military services."

And:

"UFGS that have been unified for use by all participating agencies have a level 3 or level 4 MasterFormat™ number. UFGS that are agency-specific have a fifth level number indicating it as an agency specific specification. A specification that has a fifth level number "10" indicates USACE, a "20" indicates NAVFAC, a "30" indicates AFCESA, and a "40" indicates NASA. Preparing agencies are indicated in the UFGS header of each specification. Users of UFGS should first consider a unified UFGS if one is available, next a UFGS identified as specific to their agency and lastly a UFGS identified as specific to another agency.
Points of contact and procedures for the development and maintenance of UFGS documents are prescribed in the latest edition of MIL-STD-3007."

9.2.1 Applicability

According to MIL-STD-3007F, Section 1.2, "UFC and UFGS provide facility planning, design, construction, operations, and maintenance criteria for DoD components and participating organizations. UFC and UFGS apply to all construction, repair, and maintenance projects."

9.2.2 Where to Find UFC and UFGS

The Unified Facilities Criteria can be found at http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4 and an index at http://65.204.17.188//report/doc_ufc.html. The following quote from MIL-STD-3007F shows that UFGS documents and a master index should be readily available on the internet. The www.wbdg.org site also contains useful links for finding UFC and UFGS documents. MIL-STD-3007D contains the following section:

"5.2.1.6 UFGS Master Index. A UFGS master index shall be maintained on the Internet, with links to the actual documents. The database manager develops the Internet index and links it to the compressed SEC files and to the Adobe Acrobat (.PDF) files residing on the UFGS master server."

9.2.3 UFC 3-560-01, Electrical Safety, O & M

This is a standard that SPAWAR project engineers need to be aware of. It was originally dated 6 December 2006 and change 2 is dated 31 March 2008. This document contains new requirements associated with working on exposed, energized circuits."

SPAWAR employees and their contractors working in or around live electrical power circuits need to be aware of the safety requirements, including training requirements, contained in this document. Here is what it says in its Section 8.1:

"Do not work on energized electrical circuits operating at 50 V or more except when required to support a critical mission, prevent human injury, or protect property. In all instances of work on energized electrical circuits, workers must be qualified for energized line work and all required protective equipment and special tools must be available at the work site. OSHA 29 CFR 1910.333 limits work on live energized electrical equipment as follows: "Live parts to which an employee may be exposed shall be deenergized before the employee works on or near them, unless the employer can demonstrate that deenergizing introduces additional or increased hazards or is not feasible due to equipment design or operational limitations." Refer to Paragraph 1.5 for specific requirements for each service."

9.2.3.1 Lockout Procedures
Chapter 6 of UFC 3-560-01 covers lockout and tagout procedures.

9.2.3.2 Personal Protective Equipment
Section 4-4.1.1 of UFC 3-560-01 requires that any worker whose normal job includes working on or near exposed electrical equipment shall wear to work as a minimum:

"• FR (Fire Resistant) shirt (long-sleeve) and pants (or FR coveralls) with minimum arc rating of 8 cal/cm2 (33.47 J/cm2).
• Cotton underwear (conventional short sleeve t-shirt and briefs/shorts).
• Leather electrical hazard-rated (EH) work shoes/boots. *Note: High voltage linemen are not required to wear EH work shoes or boots while climbing."*

Section 4.4.1.2 requires that any employee who goes to a job site that involves working on or near exposed electrical equipment shall wear all of the following (with the exception of gloves which will be dictated by the work task) as a minimum:

"• FR shirt (long-sleeve) and pants (or FR coveralls) with minimum arc rating of 8 cal/cm2 (33.47 J/cm2).
• Cotton underwear (conventional short sleeve t-shirt and briefs/shorts)
• Leather electrical hazard-rated (EH) work shoes/boots. *Note: High voltage linemen are not required to wear EH work shoes or boots while climbing*.
• Safety glasses (ANSI Z87.1) with side shields. Safety goggles (ANSI Z87.1) shall be worn over metal frame and non safety glasses.
• Hardhat (ANSI Z89.1 Class E approved). Long hair must be secured under the hardhat.
• Leather work gloves must be available and shall be worn for work tasks classified as Category 2 or higher **(Note: SPAWAR employees and their contractors should not be involved in tasks classified as Category 2 or higher.)** Rubber glove protectors must not be used as work gloves.

• Hearing protection as required in accordance with local procedures and whenever the sound level exceeds 84 decibels or 140 decibels peak sound level pressure for impulse or impact noise, regardless of the exposure duration. Combination of insert type and circumaural types of hearing protectors (double protection) shall be worn when sound levels exceed 104 db(A)."

9.2.4 UFC 3-580-01, Telecommunications Building Cabling Systems Planning and Design, dated 22 June 2007

UFC 3-580-01, *Telecommunications Building Cabling Systems Planning and Design,* supersedes MIL-HDBK-1012/3, dated MAY 1996 but does not cover everything that was covered by the handbook concerning the installation of outside plant infrastructure. This UFC (Unified Facilities Criteria) document provides guidance on how to design and implement building telecommunications cabling systems for military construction. It contains much material that is similar to that in the EIA/TIA standards discussed elsewhere in this Appendix. Section 1-4 states "UFC-3-580-01 is intended to address only the requirements for telecommunications pathways and cabling necessary to support voice, data and video systems housed in new facilities." **UFC-3-580-01 dated 22 June 2007 contains serious errors pertaining to the grounding of copper and fiber optic cables that are addressed in the following paragraphs.** It also contains other errors that SPAWAR is in the process of addressing with NAVFAC.

9.2.4.1 Error in Fiber Optic Cable Guidance

Following the current guidance in UFC 3-580-01 could result in conductive fiber optic cables becoming a path to ground for lightning strikes and cause significant damage to the cable and any equipment or personnel in contact with it. This standard states in Section 2.7.2.3 that "If the designer must extend the OSP fiber cable past 50 feet in accordance with NFPA 70 section 770.50, the metallic strength member must be bonded to the lightning protection ground as close as possible to the conduit egress point with a No. 6 AWG or larger copper ground wire. If inside/outside cable is used, a cable shield isolation gap must be incorporated." There is no section 770.50 in the 2008 or 2005 National Electrical Code (NEC). In addition, according to the 2005 and 2008 editions of the NEC, conductive fiber optic OSP cable must be terminated in an enclosure within 50 feet of entering a building. (Non-conductive fiber optic cable can be run further into the building if it enclosed in the proper conduit.) Also, the metallic strength member is not supposed to be grounded to the lightning protection ground as close as possible to the egress point. It is not supposed to be connected to the lightning protection system at all. As a last resort, Section 770.100(B)(3)(2) of the 2008 NEC states that if the building or structure has no grounding means the grounding conductor shall be connected to "an effectively grounded metal structure or to a ground rod or pipe . separated from lightning conductors as covered in 800.53. Section 800.53 of the NEC states that "Where practicable, a separation of at least 1.8 m (6 ft) shall be maintained between communications wires and cables on buildings and lightning conductors."

9.2.4.2 Error in Copper Cable Entrance Guidance

Following the current guidance in UFC 3-580-01 could result in copper communications cables becoming a path to ground for lightning strikes and cause significant damage to

the cable and any equipment or personnel in contact with it. Section 2-7.2.2 states that "If the designer must extend the OSP copper cable past 50 feet (15 m) in accordance with NFPA 70 section 800.50, the metallic strength member must be bonded to the lightning protection ground as close as possible to the conduit egress point with a No. 6 AWG or larger copper ground wire." The 50 foot limitation is in Article 800.48 of the 2008 NEC. Extending the copper OSP cable past 50 feet inside the building is not allowed by the 2008 NEC. Neither the 2005 nor the 2008 NEC allows the use of the lightning protection ground for grounding communications cables. Both address the need to keep the communications cable grounding conductor separated from lightning conductors in Section 800.100(B)." **SPAWAR requires the grounding conductor to be connected to the grounding electrode in accordance with NEC Article 800.100(B). The first choice would be a connection to the intersystem bonding termination. The second choice would be the building or structure grounding electrode system as covered by NEC 250.50.**

9.2.4.3 Error in Primary Protector Guidance

Section 2-7.2.4 contains the following guidance. "All OSP copper cables must be terminated on primary protector blocks, equipped with 5-pin solid state or gas protector modules. The protector blocks must be bonded to the Lightning Protection Subsystem with a No. 6 AWG or larger copper ground wire. Blocks must be UL listed. Place the protector block as close as possible to the lightning protection ground." The primary consideration for locating the primary protector should be in locating it as close as practicable to the point of entrance (IAW NEC 800.90(B)) while recognizing the benefits of achieving the shortest practicable grounding conductor length. That grounding conductor for the protectors should not be directly bonded to the lightning protection ground under any circumstances. The guidance in NEC 800.100 that also applies to copper cable grounding should be followed.

9.2.4.4 Errors in Telecommunications Signal Ground Guidance

Section 2-7.3 states: "All TRs must have a high frequency signal ground designed in accordance with MIL-STD-188-124B for Army installations and J-STD-607-A for Air Force, Navy and Marine Corps installations. The signal ground should consist of a ground ring around the inside perimeter of the room for TR (telecommunications room) or a ground bus bar for telecommunications closets. … The telecommunications designer must ensure that the different signal grounding system does not interconnect with the fault protection and lightning protection sub-systems within the building." Having different requirements for telecommunications rooms and telecommunications closets makes no sense because a telecommunications room and a telecommunications closet are the same thing according to TIA-569B and Section 2-5 of UFC 3-580-01. In addition, a ground ring is not going to satisfy MIL-188-124B requirements for a high frequency signal ground. Another problem is that both MIL-STD-188-124B HF Signal Ground Systems and J-STD-607A telecommunications ground systems require connections between the signal and fault protection systems. For example, Section 5.5.2.5 of J-STD-607-A states that "Where a panelboard (electrical power panel) for telecommunications equipment is located within the same room or space as the TGB (Telecommunications Grounding Busbar), that panelboard's ACEG bus (when equipped) or the panelboard enclosure shall be bonded to the TGB." The ACEG bus is the Alternating Current

Equipment Ground bus which is the same thing as the fault protection system. Therefore J-STD-607A is requiring interconnections between the fault protection system and the signal grounding system at each telecommunications room.

9.2.4.5 Requirement for the Use of Cat 6 Cable

UFC 3-580-01 requires the use of Category 6 cable and hardware throughout the document for Army and Navy projects. Section 2-3.3, *Outlets* states "use Category 6 for all voice and data circuits on Army and Navy projects, and use Cat 5 or better for USAF projects." (It should be noted that Cat 5 cable has been removed from recent TIA standards and that Cat 5e or better cable should be used instead. The tables in ANSI/TIA-568-C.0 only address Category 3, 5e, 6 and 6A cables.)

9.2.4.6 Telecommunications Room Equipment Rack Requirements

Section 2-5.7 of states, "Equipment racks must be floor mounted 19 inches (475 mm) wide located at or near the center of the TR (Telecommunications Room). If mounting requirements for oversize equipment are anticipated, 23 inches (580 mm) may be substituted, however, use only 19-inch (475 mm) equipment racks on Navy projects. **In narrow or crowded closets, equipment racks may be floor mounted adjacent to a wall, but must provide a minimum 36 inches (900 mm) space both in front and in back of the rack, behind any installed equipment, and a minimum side clearance of 24 inches (600 mm) on end racks.** Provide 100% spare rack capacity based on the amount of rack capacity utilized by the patch panels provided. Spare racks must be provided for the mounting of government purchased and installed LAN equipment.

9.2.4.7 Telecommunications Room Equipment Cabinet Requirements

Section 2-5.8 states, "Equipment cabinets should be used where physical security is required, to mount secure or mission critical equipment, in circumstances where controlled access is desired, such as CATV or CCTV, distribution in barracks, or by specific user request. Cable may be terminated in an enclosed 19-inch (475 mm) cabinet to provide enhanced protection for terminations and patching facilities. Use only 19-inch (475 mm) equipment cabinets on Navy projects. Cabinets must provide, at a minimum, sufficient space for current and anticipated future equipment requirements. Equipment cabinets may be floor or wall mounted and should be logically grouped based on the purpose of the equipment they enclose. Cooling fans must be provided in all equipment cabinets." SPAWAR recommends that cooling fans should only be used when needed and that their use be controlled by thermostats.

9.2.4.8 Fiber Optic Patch Panel Requirements

Section 2-5.10 states that a "3-foot (1-meter) slack loop of fiber must be provided within each panel, and panels must provide strain relief for cables. Patch panels must properly provide termination, splice storage, routing, radius limiting, cable fastening, storage, and cross-connection. Provide a minimum spare capacity of 10% for Army projects and 25% for Navy projects. Provide a maximum panel size of 12 SC or RJ-45 and 24 ST ports for fiber panels for Navy projects." **Note: The last sentence is not considered to be proper guidance for SPAWAR projects.** RJ-45 connectors are copper connectors, not fiber optic connectors. ST connectors should not be used unless they are required for compatibility with existing facilities.

9.2.5 UFC 3-580-10, Navy and Marine Corps Intranet (NMCI) Standard Construction Practices

UFC 3-580-10, *Navy and Marine Corps Intranet (NMCI) Standard Construction Practices* contains many criteria that should be of interest to those responsible for the design and installation of Navy networks. For example, its Section 2-6.4 requires that:

• Horizontal wiring must not be run closer than 51 mm (2.0 in) in parallel with electrical wiring or lighting fixtures.
• Horizontal wiring must be placed no closer than 1220 mm (48.0 in) to electrical transformers
• Horizontal wiring must be placed no closer than 200 mm (8.0 in) to fluorescent lighting ballasts
• Horizontal wiring must be placed no closer than 76 mm (3.0 in) to other horizontal wiring when crossing
• Crossing of horizontal wiring should be at 90-degree angles

9.2.6 UFC 3-600-01, Fire Protection Engineering for Facilities

This standard when published on 26 September 2006 had a large effect on SPAWAR installation planning because it requires the use of plenum cable in areas where it has never been required by the National Electrical Code. These areas are spaces below raised floors or above drop ceilings that are not used as air plenums (or for environmental air as defined by article 300.22(C) of the NEC). This standard states simply in its Section 6-8.1.3, *Power and Communication Cabling*, that "Power and communication (data) cabling installed in spaces above ceilings or below raised floors must be plenum rated or installed in metallic conduit. If this cannot be achieved, the spaces must be protected by an automatic fire suppression system as listed in 6-8.2(2)." Section 2-11.3 of UFC-3-600-01 states "Under no circumstances may combustible materials be located within the plenum space. Electrical wiring passing through the space, including telephone and communication wiring, must be plenum rated or must be in metal conduit." Section 2-12.2 states "Plastic pipe and conduit must not be installed in exit stair enclosures, or in air plenum spaces unless specifically listed for that application." Section 1-5 notes that "For **Navy** projects, Unified Facilities Guide Specification (UFGS) 01525, *Safety and Occupational Health Requirements*, must be used."

9.2.7 UFGS Documents of Interest to SPAWAR Project Engineers

The following documents, and others, could be of interest to SPAWAR PEs. They were listed on http://www.wbdg.org/ccb/browse_org.php?o=70. The entire series of documents can be downloaded in less than thirty seconds in a master zip archive available from this web site. The purpose of showing the titles of a few of these documents here is to give the reader an idea of the breadth of installation types covered by USFG's. The documents of most interest are listed in bold text.

UFGS 01 35 26 (February 2009) supersedes UFGS-01 35 29 (August 2008).) Governmental Safety Requirements ***Note: The above UFGS shall be used on Navy construction projects.***

UFGS 07 84 00 Firestopping(Oct-2007) (Called out in UFC for NMCI)

UFGS 27 05 13.00 10 Two-Way Radio Data Ethernet Transmission System (Apr 2006)
UFGS 27 05 14.00 10 Cable Television Premises Distribution System (Apr-2006)
UFGS 27 05 28.36 40 Cable Trays for Communications Systems (Nov-2008)
UFGS 27 10 00 Building Telecommunications Cabling System (Jan-2008)
UFGS 27 13 23.00 40 Communications Optical Backbone Cabling (Nov-2008)
UFGS 27 15 19.00 10 Wire Line Data Transmission System (Apr-2006)
UFGS 27 21 00.00 20 Intercommunication System (Apr-2006) Note: Prepared by NAVFAC.
UFGS 27 21 00.00 40 Intercommunication System (Nov-2008) Note: Prepared by NASA and is similar to UFGS 27 21 00.00 20.UFGS 27 33 30.00 10 Stand-Alone One-Way Radio Control System (Apr-2006)
UFGS 27 33 31.00 10 One-Way FM Radio Data Control System (UMCS) (Apr-2006)
UFGS 27 41 00.00 10 Nurse Call Audio-Visual (NCAV) System (Apr-2006)
UFGS 27 41 16.00 10 Television Signal Reception System (Apr-2006)
UFGS 27 51 13.00 10 Radio Paging System (Apr-2006)
UFGS 27 51 16 Radio and Public Address Systems (Apr-2006)
UFGS 27 52 23.00 20 Nurse Call System (Apr-2006))
UFGS 27 52 32.00 10 Nurse Call Tone-Visual (NCTV) System (Oct-2007)
UFGS 27 54 00.00 20 Community Antenna Television (CATV) (Apr-2006)
UFGS 28 05 26.00 40 Grounding and Bonding for Electronic Safety and Security (Nov-2008) Note: Do NOT use this guide for SPAWAR installations.
UFGS 28 16 00.00 20 Basic Intrusion Detection Systems (IDS) (Apr-2006)
UFGS 28 16 01.00 10 Small Intrusion Detection System (Nov-2008)
UFGS 28 20 00.00 20 Electronic Security System (ESS), Commercial (Apr-2006)
UFGS 28 20 01.00 10 Electronic Security System (Oct-2007)
UFGS 28 20 02 Central Monitoring Services for Electronic Security Systems (Nov-2008)
UFGS 28 23 23.00 10 Closed Circuit Television Systems (Apr-2006)
UFGS 28 26 23 Duress Signal System (For Brig Facilities) (Apr-2006)
UFGS 28 31 00.00 10 Fire Detection and Alarm System, Direct Current Loop (Nov-2008)
UFGS 28 31 02.00 20 Fire Alarm Reporting Systems - Digital Communicators (Apr-2006)
UFGS 28 31 33.00 10 Fire Alarm Reporting System, Radio Type (Nov-2008)
UFGS 28 31 33.13 20 Exterior Fire Reporting System, Radio Type (Apr-2006)
UFGS 28 31 49 Carbon Monoxide Detectors (Apr-2006)
UFGS 28 31 63.00 20 Analog/Addressable Interior Fire Alarm System (Oct-2007)
UFGS 28 31 64.00 10 Fire Detection and Alarm System, Addressable (Nov-2008)
UFGS 28 31 73.00 20 Exterior Fire Alarm System, Closed Circuit Telegraphic Type (Apr-2006)
UFGS 28 31 74.00 20 Interior Fire Detection and Alarm System (Apr-2006)
UFGS 28 31 75.00 10 Central Fire Alarm System, Digital Alarm Communicator Type (Nov-2008)
UFGS 28 31 76 Interior Fire Alarm and Mass Notification System (Nov-2008)
UFGS 28 33 00.00 40 Fuel-Gas Detection and Alarm (Aug-2008)
UFGS 28 40 01 Watchtour System (For Brig Facilities) (Apr-2006)

UFGS 33 71 02.00 20 Underground Electrical Distribution (Aug-2008)
UFGS 33 81 27 Pier Telephone Distribution Systems (Apr-2006)
UFGS 33 82 00 Telecommunications Outside Plant (OSP) (Apr-2006)
UFGS 33 82 01 Intercommunication System (Apr-2008) **Note: Prepared by USACE. One of three UFGS's with the same title.**
UFGS 33 82 33.00 10 Coaxial Cable Data Transmission Media (Apr-2006)

9.2.8 UFGS 01 35 26 Governmental Safety Requirements

This standard applies to a variety of construction type work which may be required to complete an installation. It should be reviewed by Project Engineers prior to performing or tasking others to perform construction work, work inside of manholes, or work where there is a fall hazard (e.g., installing antennas on towers or roofs). When work will take place in confined spaces (like inside of manholes) on Navy projects, Section 1.6.1.5 of this UFGS says to include the following paragraph (in contracts or task orders):

"Provide a competent person for confined space meeting the definition and requirements of EM 385-1-1,"

Section 1.7.1 states:

"Develop a confined space entry plan in accordance with USACE EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, and any other federal, state and local regulatory requirements identified in this contract. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include procedure for rescue by contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work exists and none will be created.)

Section 2.1 requires the following for confined spaces for Navy projects only:

Provide permanent signs integral to or securely attached to access covers for new permit-required confined spaces. Signs wording:
"DANGER--PERMIT-REQUIRED CONFINED SPACE - DO NOT ENTER -" in bold letters a minimum of 25 mm one inch in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" shall be red and readable from 1520 mm 5 feet."

Section 3.11, *Work in Confined Spaces*, states:

"Comply with the requirements in Section 06.I of USACE EM 385-1-1, OSHA 29 CFR 1910.146 and OSHA 29 CFR 1926.21(b)(6). Any potential for a hazard in the confined space requires a permit system to be used.
a. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 06.I.06 of USACE EM 385-1-

1 for entry procedures.) All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.
b. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its action level.
c. Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection."

9.2.9 UFGS 33 82 00 (16711) Telecommunications Outside Plant (OSP)

The policy that each outside plant fiber optic cable installed contain at least 12 strands of single mode fiber is from this document and should be known by all SPAWAR Project Engineers. The document states **"Provide a minimum of 12 single-mode fibers per fiber optic cable."** This document also contains requirements for cable tags in manholes and handholes. Section 2.8.1 contains detailed requirements for copper conductor cable and requires the use of filled cable for all outside plant applications. See http://www.wbdg.org/ccb/DOD/UFGS/UFGS%2033%2082%2000.pdf for a soft copy of this document **.**

9.2.9.1 Warning Tape Requirements

Buried warning tape requirements are specified in the paragraph entitled "BURIED WARNING AND IDENTIFICATION TAPE" in UFGS Section 31 00 00, EARTHWORK per UFGS 33 82 00 Section 3.1.3.

10. NAVFACINST 11010.45

NAVFACINST 11010.45 is made up of three Comprehensive Regional Planning Instructions.

10.1 NAVFACINST 11010.45 and Site Approval

The first Comprehensive Regional Planning Instruction is entitled, "Site Approval Process". Obtaining Site Approvals will normally take several months. Installation designers need to be aware of this, and need to prepare the drawings and other paperwork needed to obtain site approval as soon as possible. The Site Approval instruction provides guidance and forms for submitting site approval requests. According to this instruction, "Site approval is required for all Navy projects and non-Navy projects on Navy-controlled land holdings regardless of funding source for the following situations:

- Any project site that will have explosives safety criteria implications associated with ammunitions and explosives
- Any project that affects or is affected by airfield safety criteria.
- Any project that creates or is proposed to be in an area of electromagnetic illumination or involves electromagnetic transmission.
- Any project that proposes changing the use of a facility.
- Any project that changes or has the potential to change the land use or physical layout of an area. "

10.2 NAVFACINST 11010.45, Special Projects and Cultural Resources

The second Comprehensive Regional Planning Instruction is entitled, "Special Project Program". This program can apply to installations, and Special Project equipment installations over $200,000 require validation by the major claimant. The third Comprehensive Regional Planning Instruction is entitled, "Cultural Resources". This provides guidance that is not tailored towards typical SPAWAR installations, but SPAWAR designers of installations that could impact historic buildings or disturb archeological sites need to be aware that some consultation with the local authorities is required before proceeding.

11. Older Military Handbooks of Limited Usefulness

The military handbooks discussed below were very useful at one time, but are of limited usefulness now because they have not been updated for many years. Many advances have occurred in telecommunications technology since these standards were updated. However, Project Engineers should be aware of their existence and consult them when appropriate. These handbooks should only be used by experienced engineers and designers with enough experience to know which portions are out-of-date.

11.1 MIL-HDBK-1012/3, Telecommunications Premises Distribution Planning, Design and Estimating

MIL-HDBK-1012/3 provides criteria for the planning, design, and estimating of premises distribution systems required for military construction (MILCON) projects. It was last updated 30 Nov 1996 (Change 1). UFC 3-580-01 (also discussed in this appendix), dated 22 June 2007, states on page i, that it "supersedes MIL-HDBK-1012/3, dated MAY 1996." However, as of 31 July 2009, MIL-HDBK-1012/3 was still listed as an active document at the http://assist.daps.dla.mil/quicksearch web site. The UFC document does not replace the guidance in Section 1.8.4.2 of MIL-HDBK-1012/3 for manhole sizing and placement or the guidance Section 1.8.4.4 of the handbook concerning the installation of aerial outside plant cable.

11.2 MIL-HDBK-1012/1, Electronic Facilities Engineering

MIL-HDBK-1012/1 provides design criteria for communications facilities, antennas and transmission lines. It has not been updated since 15 May 1989, but it still contains some useful information. MIL-HDBK-1012/1, Electronic Facilities Engineering is mostly used during the BESEP phase of the installation planning because it governs the building of new facilities from the ground up. However, all IDP developers must have a clear understanding of the concepts of Critical and Non-Critical Technical Loads, described in Section 5.2.2.6 and 5.2.2.7 to ensure that proper power panels are used. (For example, items like heater circuits for radomes, utility outlets and test equipment bays should not go to UPS power panels.) Developers should also be aware of the requirement in Section 5.2.8.2 that "Separate circuit breakers shall be provided at power panels for each equipment rack, cabinet or piece of electronic equipment. Another important requirement in MIL-HDBK-1012/1 is the requirement in Section 7.4.2 that appropriate warning signs be posted when new radiating antennas are installed. Section 8.10.4 contains requirements for wiring in transportable facilities and must be studied by anyone

designing an installation for one of these facilities. It, for example, mandates the use of stranded cable for all power wiring in these facilities.

11.3 MIL-HDBK-1004/7, Wire Communications and Signal Systems

This handbook provides design criteria for telephone and telecommunications systems, hospital nurse call systems, doctor paging systems, intercoms, sound systems, TV systems, alarm systems etc. It has not been updated since 30 September 1991.

12. Naval Shore Electronics Criteria

During the 1970's, the Department of the Navy, Naval Electronic Systems Command published a series of Naval Shore Electronics Criteria Documents. At the time that they were published, these were excellent references in every respect. However, these documents, in general, have not been kept up to date. The most important of these documents at this time is SPAWAR 0101,108A. The other standards in this series are not needed by most installation designers and have not been kept up-to-date. Therefore, they are not listed in this guidance. However, many of them contain insights and design/planning/testing information that might not be readily available elsewhere. They should only be used by those with enough knowledge to be able to distinguish between out-of-date and useful information.

12.1 Naval Shore Electronics Criteria, SPAWAR 0101,000, Designers Planning Manual for Naval Computer and Telecommunications Facilities Ashore

Naval Shore Electronics Criteria, SPAWAR 0101,000, Designers Planning Manual for Naval Computer and Telecommunications Facilities Ashore dated September 1993, is superseded by the Shore Installation Process Handbook (SIPH). SPAWAR 0101,000 previously superseded the Designers Planning Manual for Naval Communications Facilities Ashore, 0280-LP-901-5000, dated June 1975. The 1975 document has been followed in recent documents but is no longer applicable or a valid reference.

12.2 Naval Shore Electronics Criteria, Naval Security Group Elements, SPAWAR 0101, 108A

Naval Shore Electronics Criteria, Naval Security Group Elements, SPAWAR 0101,108A was updated in October of 1989, and change 1 was issued in December of 1990. Engineers who will be designing installations for Security Group Sites need to be familiar with the contents of this standard. The requirements of this standard protect national security information.

12.3 Naval Shore Electronics Criteria, Electromagnetic Compatibility and Electromagnetic Radiation Hazards, NAVELEX 0101, 106

Naval Shore Electronics Criteria, Electromagnetic Compatibility and Electromagnetic Radiation Hazards, NAVELEX 0101, 106. This handbook is old but is still used and referenced. It is mostly used during BESEP development.

12.4 Naval Shore Electronics Criteria, Installation Standards and Practices, NAVELEX 0101, 110A

Naval Shore Electronics Criteria, Installation Standards and Practices, NAVELEX 0101, 110A dated January 1977. NAVELEX 0101, 110A is basically a thorough but largely outdated textbook for learning how to be an installer. It has some good information for those planning to design and install waveguide runs.

13. Using Building Code Guidelines and Seismic Design

Building codes contain requirements related to fire safety and seismic design. The issue of fire safety has been well covered by other standards address by these documents. Therefore, the following emphasizes seismic design considerations. Many installations have occurred in earthquake zone regions with little or no thought being given to ensuring that the installation will not present a hazard or cause a failure during an earthquake. TIA-569-B recognizes seismic considerations several times, but provides no useful guidance. It contains phrases like "Specifications for related facilities shall accommodate the applicable seismic zone requirements."

13.1 SPAWAR Policy for Seismic Design

SPAWAR policy recommends that all SPAWAR installations in earthquake prone areas like California, Japan, and Guam utilize "Zone 4" Equipment cabinets and racks attached to the floor with bolts and/or rods larger than the usual 3/8" hardware. SPAWAR also recommends that extra bracing be installed on cable trays and similar installed systems in earthquake prone areas. When funding permits, specific designs for this purpose should be reviewed by a licensed structural engineer. Unistrut Corporation has a seismic product line for bracing and useful information on their website. Cooper B-Line also has a Seismic Restraints catalog that is available on the web. Associated AutoCAD drawings are available from B-Line. Chatsworth also sells seismic bracing products.

13.2 Building Construction and Safety Code, NFPA 5000, 2006 Edition

Note: The 2009 edition of the Building Construction and Safety Code is available from the publisher, but was not available from the SPAWAR 4.2 library at the time this was updated.

Section 4.1.6.3.2 states that "Buildings that provide a public welfare role … shall be designed and constructed **to provide reasonable assurance of continued function following** a fire, **an earthquake**, a flood and other internal and external events."

Section 8.8.2 states that "Penetrations for cables, cable trays, pipes,…and communication systems that pass through a wall, floor, or floor-ceiling assembly constructed as a fire barrier shall be firestopped."

13.3 Documentation for the 2008 Update of the United States National Seismic Hazard Maps

This document is available for free from http://pubs.usgs.gov/of/2008/1128/. It contains maps and notes that "The Charleston region (fig. 7) was affected by an earthquake of about M7.3 in 1886." The 2008 U.S. Geological Survey (USGS) National Seismic Hazard Maps display earthquake ground motions for various probability levels across the

United States and are applied in seismic provisions of building codes, insurance rate structures, risk assessments, and other public policy. The National Seismic Hazard Maps represent our assessment of the "best available science" in earthquake hazards estimation for the United States (maps of Alaska and Hawaii as well as further information on hazard across the United States are available at http://earthquake.usgs.gov/research/hazmaps/.[12]

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13.4 2009 International Building Code (IBC)

This document can be viewed at http://www2.iccsafe.org/states/2009ICodes/Building/Building_Frameset.html. This document is designed for use by Building Structural Engineers. Most PEs will never need to use it. The reason that it is mentioned here is that it contains detailed maps showing earthquake risks and wind speeds in different areas of the United States.

13.4.1 Seismic Design

More recent versions of the International Building Code have made determining earthquake risks for installation and other purposes much more complicated than it used to be. Zone designations (as in "Zone 4 cabinets") may become a thing of the past. The following from the USGS web site (http://earthquake.usgs.gov/research/hazmaps/haz101/faq/zone01.php) explains why:

"Building code maps using numbered zones, 0, 1, 2, 3, 4, are practically obsolete. 1969 was the last year such a map was put out by this staff. The 1997 Uniform Building Code (UBC) (published in California) is the only building code that still uses such zones. Generally, over the past two decades, building codes have replaced maps having numbered zones with maps showing contours of design ground motion. These maps in turn have been derived from probabilistic ground motion maps. Probabilistic ground motion maps have been included in the seismic provisions of the most recent U.S. model building codes, such as the new "International Building code," and in national standards such as "Minimum Design Loads for Buildings and Other Structures," prepared by the American Society of Structural Engineers.

Zone maps numbered 0, 1, 2, 3, etc., are no longer used for several reasons.
(1) A single map cannot properly display hazards for all probabilities or for all types of buildings. Probabilities: For very small probabilities of exceedance, probabilistic ground motion hazard maps show less contrast from one part of the country to another than do maps for large probabilities of exceedance. Buildings: Short stiff buildings are more vulnerable to close moderate-magnitude events than are tall, flexible buildings. The latter, in turn, are more vulnerable to distant large-magnitude events than are short, stiff buildings. Thus, the contrast in hazard for short buildings from one part of the country to another will be different from the contrast in hazard for tall buildings.

(2) Building codes adapt zone boundaries in order to accommodate the desire for individual states to provide greater safety, less contrast from one part of the state to another, or to tailor zones more closely to natural tectonic features. Because of these zone

[12] http://pubs.usgs.gov/of/2008/1128/

boundary changes, the zones do not have a deeper seismological meaning and render the maps meaningless for applications other than building codes.

Section 1707.8 states that "Periodic **special inspection is required during the anchorage of electrical equipment for emergency or standby power systems** in structures assigned to Seismic Design Category C, D, E, or F." (Be sure to anchor your UPS.)

13.4.2 Wind Loads

IBC Figure 1609 shall be used to determine basic wind speeds (3-second gust) in accordance with Section 1609.3. PEs need to be aware that an antenna or tower design that is suitable for California (where the basic wind speed is 85 mph (per 2009 IBC page 320) is probably not suitable for Guam (where the basic wind speed is 170 mph – (from 2009 IBC page 321)). Mountainous terrain, gorges, ocean promontories, ocean promontories and areas identified as special wind regions need to be examined for unusual conditions when designing structures subject to wind loads.

13.5 Uniform Building Code Maps and Zone 4 Cabinets

The map at
http://www.idahogeology.org/Services/GeologicHazards/Earthquakes/images/ubc.gif
shows earthquake zones from 1 to 4. Several manufacturers have designed cabinets and racks specially designed for Zone 4 regions like coastal California.

13.6 GR-63-CORE

The GR-63-CORE document presents minimum spatial and environmental criteria for all new telecommunications equipment used in Central Offices (COs) and other environmentally controlled telephone equipment spaces. These criteria were developed jointly by Telcordia and industry representatives. They are applicable to switching and transport systems, associated cable distribution systems, distributing and interconnecting frames, power equipment, operations support systems, and cable entrance facilities. This document is sold only as an enterprise license.

13.6.1 Zone 4 Cabinets and Racks

Zone 4 cabinets, racks, and bracing are designed by manufacturers to meet these requirements under certain conditions (Not all cabinets and racks are tested the same way. One major difference between manufacturers is the amount of weight the cabinets held during testing.

13.6.2 NEBS (Network Equipment Building System) Level 3 Certified Equipment

NEBS Level 3 certification assures that the equipment will perform well in harsh environmental conditions and will not interfere with other electronic devices. NEBS Level 3 certified networking equipment should be used in mission-critical applications. NEBS testing is based on the Telcordia (Bellcore) standard reliability testing methods. NEBS testing is required for vendors that sell networking products to Competitive Local Exchange Carriers (CLECs) and Incumbent Local Exchange Carriers (ILECs).

13.6.2.1 SPAWAR Policy Statement

NEBS Level 3 certified equipment shall be purchased for mission critical applications whenever this equipment already exists and can be obtained for a reasonable premium over standard networking equipment.

14. Laws of Physics

It is impossible for any actual installation to violate the laws of physics, no matter what is stated on the drawings. Even some of the largest defense companies have provided IDPs that show a lack of knowledge of basic physics. All SPAWAR PEs are required to have a thorough knowledge of the basic physics and electrical power calculations that govern installation planning and design. PEs should not assume that a contractor design deliverable is correct. Government PEs need to be knowledgeable enough in the standards and electrical theory to adequately review the contractor's deliverable.

14.1 Law of Conservation of Energy

All drawings shall be reviewed by PEs to ensure that they do not show that under normal circumstances the heat energy coming out of a cabinet is greater than the electrical energy going into that cabinet. (We realize that if the cabinet has an Uninterruptible Power Supply (UPS) and power to the cabinet is interrupted, the heat output of the cabinet will be temporarily greater than the electrical energy input. We also realize that while the UPS battery is charging, the electrical energy entering the cabinet will be greater than the heat energy output.)

14.2 Mathematics of AC Power

All drawings shall be reviewed by PEs to ensure that the data presented does not violate the mathematical relationship between voltage, current, real power, and apparent power. (Some past drawings from major defense companies have been provided to the government indicating that their engineers had no understanding whatsoever of this relationship. For example, sometimes real power (expressed in watts on the drawings) would exceed apparent power (expressed in VAs or KVAs). Equipment that could do this would violate the laws of physics/electricity.)

14.2.1 Single Phase AC Circuits

When you are talking about a single phase AC circuit, and you multiply the current by the voltage the result is Volt-Amps or VAs. VAs represent apparent power, not true power (or watts). Watts (for a one phase AC circuit) are equal to volts times the current times the "power factor". The "power factor" will be discussed in detail later in this document.

14.2.2 Three Phase Circuits

There is a formula that states that the Service Amperage (3-phase, minimum) requirement is equal to:

Three-Phase-Service-Amperage = (KVAs x 1000) / (Three-Phase-Service-Voltage x 1.73) = VAs / (Three-Phase-Service-Voltage x 1.73))

You can rework this formula to state that (apparent power) KVAs = (Three-Phase-Service-Amperage x Three-Phase-Service-Voltage x 1.73)/1000

In a purely resistive, perfectly balanced system (Power Factor equals 1), KVAs = Kilowatts:

KVAs = 1.73 x (Three-Phase-Service-Amperage x Three-Phase-Service-Voltage) /1000

Note 1: 208 volts x 1.73 = 120 volts x 3.

Note 2: A 100 amp three-phase service can provide 100 amps on each of the three phases (or an 80 amp continuous load on each phase.) In the past some engineers who have needed 100 amps three phase service have told service providers that they needed 300 amps service (thinking that they had to add the three phases up). Project engineers need to be careful that this kind of misunderstanding does not occur on their projects. The 300 amp service would work, but it could be much more expensive to provide.

14.2.3 Real-World Power Factors

Most modern networking equipment has a true power factor close to 0.95 instead of numbers in the range of 0.6 to 0.8 that were common in the past. SPAWAR ISEAs and others with access to equipment in laboratory conditions to be installed are responsible for using a power analyzer to measure the current draw and power factor of equipment under their cognizance during typical operating conditions and under maximum load.

14.2.4 Power Factor Definition

The true power factor is equal to the real power consumed by the device (watts) divided by the apparent power (volt-amperes). (Volt-amperes are calculated in single-phase circuits simply by multiplying the voltage by the current. Volt-amperes are determined in balanced three-phase circuits by multiplying the line voltage by 1.732 times the line current). The power factor is the fraction of the volt-amperes that is consumed by the device and, in most cases, transformed into heat.

14.2.5 Meaning of Leading and Lagging Power Factors

Until recently, almost all electrical loads had a lagging power factor meaning that their loads were more inductive than capacitive. However, modern electronics including computers can have either a leading or a lagging power factor. It is important to realize that the terms leading and lagging can only be used for one component of the true power factor. This component is the displacement power factor (DPF). The DPF is the power factor caused by the voltage being out of phase with the current **at the fundamental frequency** (usually 60 Hz). However, the true power factor is also influenced by the harmonic distortion in the load current -- especially for loads like computer power supplies. These loads often have a DPF very close to unity (one), but a much larger true power factor. **This means that for these loads the term leading or lagging has little value. It is often omitted from contractor's data sheets.** The true power factor is based on the apparent power that includes all harmonic components. This is of importance in practical power systems which contain non-linear loads such as rectifiers,

some forms of electric lighting, electric arc furnaces, welding equipment, **switched-mode power supplies** (like the ones common in communications and computer equipment) and other devices. These have very high ratios of peak to average input current, leading to high harmonics and serious phase and neutral loading concerns. European agencies have set harmonic limits as a method of improving power factors. For example, EU standard EN61000-3-2 (2001) has forced manufacturers to greatly improve the power factors of computers to meet these standards.

15. Use of Manufacturer's Data

PEs are responsible for researching equipment manufacturer's data to ensure that technical data provided on their drawings are correct. When manufacturer's data is known to be unavailable or unreliable, PEs shall arrange to take the measurements needed to obtain accurate data.

16. Electrical Safety in the Workplace and on IDP Drawings

The governing document is UFC 3-560-01, which was discussed previously in the above section on UFC and UFGS documents. PEs shall receive electrical safety training. Installing activities shall develop and maintain an electrical safety program using the references discussed in this section. Whenever possible, work shall be planned to avoid requiring any work to be performed that will expose workers to live circuits. When IDPs are prepared for installations that might require work to be performed on live electrical circuits (e.g. connecting new circuits to a live power panel supplying wartime coverage), the IDPs shall include a large warning telling installers to read the notes carefully before proceeding. The notes shall identify:

a. The required training for the personnel involved or the specific individuals who have received the required training.
b. The tools (e.g. special insulated screwdrivers), test equipment, and safety gear (e.g. rubber and leather gloves, hardhat, face-shield, insulated mat) required
c. The paperwork that must be completed/submitted/received to perform the task.

16.1 NFPA 70E: Electrical Safety in the Workplace

NFPA 70E: Electrical Safety in the Workplace covers the full range of electrical safety issues, from work practices to maintenance, special equipment requirements, and installation. According to the NFPA, "OSHA evaluates compliance with its electrical safety mandates — OSHA 1910 Subpart S and OSHA 1926 Subpart K— using the comprehensive information in this important standard." Energized work is the most dangerous job any electrician performs. The 2004 standard emphasized working on live parts as the last alternative work practice, and introduced a new provision that requires signed authorization for all such work. The 2009 standard increases electrical worker protection and contains new recordkeeping requirements for training and safety program audits to answer OSHA's need for records. The standard is designed to ensure that energized work will be performed only when no safer alternative is possible and that it will be done by qualified electrical workers who have determined that the job can be done safely based on hazard analyses and identification of safe work practices. A sample energized electrical work permit is included.

16.2 NFPA Electrical Safety Program Book

According to the NFPA Catalog/Vol.112, "the book explores the issues involved in developing an electrical safety program and provides guidance and resources to resolve them." Topics include:

a. Regulations, codes, and standards
b. Hazard and task analysis
c. Lockout/tagout
d. Personal protective equipment
e. Training
f. Auditing
g. Recordkeeping
h. Budgeting
i. Implementation

16.2.1 NFPA Electrical Safety Program Book CD

The book comes with a CD with all of the checklists and forms from the book as well as a PowerPoint training presentation on electrical safety.

16.3 NFPA 70E: Electrical Safety in the Workplace Video Seminar - DVD/VHS

This video is available from the NFPA. It is designed to "Teach employees about the hazards of electricity…the importance of establishing a safe work environment and work condition…and the common errors and misconceptions that lead to devastating electrical accidents.""NFPA's proven training video fulfills your requirement to satisfy OSHA 1910.331-335. Footage shot in a variety of locations demonstrates proper procedures around electrical equipment up to 600 volts. Workers will learn how to use correct protective clothing, implement lockout/tagout procedures, and create an electrically safe work environment. (DVD format, 17 minutes, Presenter's Guide; VHS format, 17 minutes, Presenter's Guide)" (See http://www.nfpa.org/catalog/product.asp?title=&category%5Fname=NFPA+70E+Resources&pid=VC95VH&target%5Fpid=VC95VH&src%5Fpid=&link%5Ftype=category&src=catalog)

16.4 SPAWARINST 5100.9D, "Navy Shore Electronics Safety Precautions"

This instruction is old (dated 15 June 1992) but still contains useful safety information. This includes flowcharts for locking out/tagging out circuits and for going aloft into spaces with radiating antennas. (See https://cne.spawar.navy.mil/portal/page/portal/Headquarters/HQ_80/HQ_83_Command_Operations/HQ_834_Admin_Support/HQ_834_Instructions.)

17. Construction Safety and General Environmental Controls

17.1 EM 385-1-1 (dated 15 September 2008)

This 1050 page document has been updated to reflect current standards and requirements. The effective date of this EM 385-1-1 is 12 January 2009. U.S. Army Corps of Engineers Safety and Health Requirements Manual governs safety on construction sites. (A copy of this manual can be obtained from http://www.usace.army.mil/CESO/Pages/EM385-1-1,2008NEW!.aspx or

http://www.usace.army.mil/CESO/Pages/Home.aspx. So can a Power Point presentation that discusses changes to the document.) All interim changes (changes made between publication of new editions) to this manual, and the effective date of change, will be posted on the Safety and Occupational Health Office website: http://www.usace.army.mil/CESO/Pages/Home.aspx. All construction contracts on military bases require an approved Safety Plan with Activity Hazard Analysis (AHA's) for each definable area of work. This plan is required to be on the job site. Further, a qualified on site Safety Manager must be present. Safety Manager must be approved by the government. Violations of this standard in the past have occurred on trenching work for outside plant cable installations and caused major problems.

17.1.1 RF Radiation Exposure

Section 06.F.02.d states "Whenever personnel are potentially exposed to RF (radio frequency) fields exceeding PELs (OSHA Permissible Exposure Limits (PELs)), the fields will be measured and evaluated using Institute of Electrical and Electronics Engineers (IEEE) guidance. District and/or project safety personnel will use this information and document RF environments. Where multiple RF electromagnetic radiation emitters are located in fixed arrangements, RF evaluation data will include a determination of weighted contributions from expected simultaneously operated emitters.

Note: (OSHA) 29CFR 1926.54(l) states that "Employees shall not be exposed to microwave power densities in excess of 10 milliwatts per square centimeter."

17.1.2 Fall Protection

Section 21 addresses fall protection. It states that "The fall protection threshold height requirement is 6 ft (1.8 m) for ALL WORK covered by this manual, unless specified differently below, whether performed by Government or Contractor work forces …" Part 21.H.05 addresses personal fall arrest systems. It warns that "PFAS are generally only certified for users within the capacity range of 130 to 310 lbs (59 to 140.6 kg) including the weight of the worker, equipment and tools. Workers shall not be permitted to exceed the 310 lbs (140.6 kg) limit unless permitted in writing by the manufacturer. For workers with body weight less than 130 lbs (59 kg), a specially designed harness and also a specially designed energy absorbing lanyard shall be utilized which will properly deploy if this person were to fall." It also states, "Only full body harnesses meeting the requirements of ANSI/ASSE Z359.1 are acceptable. Full body harnesses labeled to meet the requirements of the ANSI A10.14 shall not be used… The use of body belts is not acceptable."

Notes:
1. OSHA Standard 1910.268(n)(7) states that "Unless adequate railings are provided, safety straps and body belts shall be used while working on elevated work platforms such as aerial splicing platforms, pole platforms, ladder platforms and terminal balconies."

2. OSHA Standard 1910.268(n)(8) states that "Safety straps and body belts shall be worn when working at elevated positions on poles, towers or similar structures, which do not have adequately guarded work areas."

17.2 Navy Safety and Occupational Health Program Manual, OPNAVINST 5100.23G (dtd 30 Dec 05)

All shore project engineers need to have a copy of this standard and to be aware of its vast contents (444 pages). The following subsections address just some areas of this instruction that could apply to shore installations.

17.2.1 Confined Space Entry

Chapter 27 of OPNAVINST 5100.23G defines the Confined Space Entry program and is required reading for SPAWAR PEs planning work that may require personnel to enter manholes, underground cable vaults and similar spaces. It states that "The Occupational Safety and Health Administration (OSHA) estimates that 85 percent of confined space-related incidents could have been prevented if proper precautions had been followed. Moreover, the overwhelming majority of all confined space fatalities could have been prevented if spaces had simply been tested for atmospheric hazards or ventilated prior to entry. For this reason, Navy policy is to consider all confined spaces to contain the most unfavorable and unsafe conditions. Entry into, or work in or on, such spaces is prohibited until qualified personnel have performed the tests, evaluations and prescribed procedures of this chapter to ensure that safe conditions exist and are maintained. Each installation shall develop a written, program that explains the processes, means and methods used for recognizing, evaluating and controlling potential confined space hazards, and for communicating information concerning those hazards to employees." It also states that "**The written program shall incorporate a provision that the installation's cognizant environmental representative shall be notified to evaluate any space that is to be drained, flushed, or rinsed.** (emphasis added). This evaluation must identify any specific Federal, State, and/or local environmental codes, standards, rules, regulations, or statutes that apply to the draining, flushing rinsing, and waste disposal processes." (See Section 17.7 of this appendix for more information on Hazardous Material.) These spaces can contain hazardous gasses that can cause death. SECNAVINST 5100.16B, dated 11 April 2008, governs the *Navy Gas Free Engineer Certification/Recertification Process.* (SECNAVINST 5100.16B is not referenced in OPNAVINST 5100.23G.) OSHA 1910.268(o)(2)(i) requires that "Before an employee enters a manhole, the following steps shall be taken:

1910.268(o)(2)(i)(A)
The internal atmosphere shall be tested for combustible gas and, except when continuous forced ventilation is provided, the atmosphere shall also be tested for oxygen deficiency."

17.2.1.1 Precautions for Specific Operations

Section 2734 of OPNAVINST 5100.23G addresses Precautions for Specific Operations. It states in part 2734.f that "This section applies to operation conducted in manholes, un-vented vaults or any other confined space covered under 29 CFR 1910.268 and 269." Here is a sample from 29 CFR 1910.268:

"1910.268(o)(3)
Joint power and telecommunication manholes. While work is being performed in a manhole occupied jointly by an electric utility and a telecommunication utility, an employee with basic first aid training shall be available in the immediate vicinity to render emergency assistance as may be required. The employee whose presence is required in the immediate vicinity for the purposes of rendering emergency assistance is not to be precluded from occasionally entering a manhole to provide assistance other than in an emergency. The requirement of this paragraph (o)(3) does not preclude a qualified employee, working alone, from entering for brief periods of time, a manhole where energized cables or equipment are in service, for the purpose of inspection, housekeeping, taking readings, or similar work if such work can be performed safely.
1910.268(o)(4)
Ladders. Ladders shall be used to enter and exit manholes exceeding 4 feet in depth."

17.2.2 Safety Shoes

Section 2008.b(2) states that "Employees shall wear the following special-purpose safety footwear, furnished for special hazards:
… (c) Electrical hazard safety shoes, with a built-in protective toe box, to guard against electrical shock hazards when performing electrical work on live circuits not exceeding 600 volts. Employees should note, however, that these shoes only provide partial protection and should not ignore additional protective measures normally employed in these environments, (i.e., all personnel working on energized circuits shall insulate themselves from the ground (MIL-S-43860 Shoes, Electrical Hazards Protective)."

17.2.3 Asbestos

Chapter 17 of OPNAVINST 5100.23G discusses the control of Asbestos. Installation planners need to be aware that many older buildings contain asbestos and that it is important that areas containing asbestos be identified and that installers working in areas containing asbestos receive proper training in the techniques used to minimize asbestos related risks.

17.2.4 RF Safety Certification

Section 2218 of Chapter 22 OPNAVINST 5100.23G, Safety Certification, requires that:
"a. Activities identified in paragraph 2218(c) (All shore facilities having RF emitters) shall obtain a survey certification from the technical activities listed in appendix 22-B (See next subsection.) to ensure all RF sources have been evaluated, safe separation distances have been determined, warning signs posted and any other safety measures, such as protective fences, have been defined.
b**. To maintain certification, the site shall forward information on new RF sources that are installed to the technical activity listed in appendix 22-B (See next subsection) to obtain a theoretical or calculated safety evaluation.** The activity with the original site certification shall maintain this provisional certification.
c. All shore facilities having RF emitters must obtain baseline certification. For most facilities, certifications/re-certifications will require an instrumented site survey or desktop analysis. Some activities with only a few low power RF systems may require

neither. The certifying agency will determine certification survey/re-certification requirements of the facility. Re-certifications will be scheduled as follows:
(1) Three-Year Resurvey Re-certification. Major NAVNETSPAOPSCOM transmitter facilities are included within this group.
(2) Five-Year Resurvey Re-certification. Sites with large numbers or frequent additions/changes of RF emitters or a site located in populated areas where public exposure to RF emissions may be an environmental concern.
(3) Ten-Year Resurvey Re-certification. Sites having a moderate and stable number of RF microwave emitters."

17.2.4.1 Technical Activities Listed in Appendix 22-B

Appendix 22-B of OPNAVINST 5100.23G needs to be updated. It states:

"For site certification and measurement surveys for shore-based RF emitting systems, contact Space and Naval Warfare Systems Center (SPAWARSYSCEN) Charleston (Attn: Code 323), P.O. Box 190022, North Charleston, SC 29419-9022, DSN 588-4228, or commercial (843) 218-4228. For shore facilities within PACNAVFACENGCOM geographical region, contact Space and Naval Warfare Systems Activity Pacific (SPAWARSYSACT PAC) (Attn: Code 2915), 675 Lehua Avenue, Pearl City, HI 96782-3356, DSN 315-474-7330, commercial (808) 474-7330, fax (808) 474-5511."

Note: The following updated Point of Contact (POC) information is provided for the SPAWAR activities in Charleston and Hawaii. They are now referred to as SPAWAR Systems Center Atlantic (Code 56170) and SPAWAR Systems Center Pacific PAC C4ISR Department (Code H42B0). They perform a wide variety of Electromagnetic Environmental Effects (E^3) work including RF Safety certifications and HERF and HERF analysis.

SPAWARSYSCEN ATLANTIC
ATTN: CODE 56170
P.O. BOX 190022
NORTH CHARLESTON, SC 29414-9022
(843)218-4228(V), DSN 588-4363

SPAWARSYSCEN PAC, PAC C4ISR DEPT
ATTN: H42B0
2293 VICTOR WHARF ACCESS RD
PEARL CITY, HI 96782-3356
(808)471-1967(V), DSN (315)

17.2.5 RF Warning Signs, Labels and Devices

Section 2219 OPNAVINST 5100.23G provides guidance on the use of warning signs, labels and devices. RF hazard warning signs, labels, devices, exposure incident procedures and technical assistance points of contact are shown in OPNAVINST 5100.23G, Appendix 22-B. The appendix also provides national stock numbers for a variety of warning signs.

17.2.6 Fall-Hazard Prevention and Control Measures

Section 1308 of this instruction provides Fall-Hazard Prevention and Control Measures that project engineers working on projects with fall hazards (e.g., placing antennas on towers) need to be aware of. In most cases, body harnesses are required for personnel working in areas with a significant fall hazard. Section 1310.a states 'Navy civilians and military personnel should be trained to recognize fall hazards. Navy civilians and military

personnel who use fall protection equipment shall be trained in accordance with appendix A. Other Navy civilians and military personnel involved in the fall protection program should also be trained in accordance with appendix A." SPAWAR policy is that all SPAWAR contractors subject to fall hazards receive training in accordance with the requirements.

Note: OSHA Standard Number 1910.268(n)(8) states that "Safety straps and body belts shall be worn when working at elevated positions on poles, towers or similar structures, which do not have adequately guarded work areas."

17.3 OSHA Regulations

OSHA Regulations are available from www.OSHA.gov. OSHA 1910 Subpart S and OSHA 1926 Subpart K cover electrical safety and were discussed previously in the section on NFPA 70E.

17.3.1 (Standards -29 CFR), Part 1926, Subpart P (Excavations)

OSHA Regulations (Standards -29 CFR), Part 1926, Subpart P (Excavations) provides safety requirements related to excavations required for trenching to install underground conduits and for excavations required to install manholes. This type of work is among the most dangerous performed by SPAWAR contractors, and PEs responsible for monitoring this work need to be aware of the standards governing it.

17.3.2 (Standards -29 CFR), Part 1910, Subpart R (Telecommunications)

Section 1910.268(a)(1) of this standard states: "This section sets forth safety and health standards that apply to the work conditions, practices, means, methods, operations, installations and processes performed at telecommunications centers and at telecommunications field installations, which are located outdoors or in building spaces used for such field installations. Center work includes the installation, operation, maintenance, rearrangement, and removal of communications equipment and other associated equipment in telecommunications switching centers. Field work includes the installation, operation, maintenance, rearrangement, and removal of conductors and other equipment used for signal or communication service, and of their supporting or containing structures, overhead or underground, on public or private rights of way, including buildings or other structures." Standard Number 1910.146 address confined space entry (applies to manholes). Specific clauses from 1910.268 are quoted in the previous Section 17.2 of this appendix.

17.4 Safety Information Required On Drawings

Drawings for installation construction efforts that are unusually hazardous (e.g. manhole installations, antenna tower construction, etc.) should reference the appropriate regulations and shall identify significant hazards that installers need to be aware of and the means to avoid them. For example, when shoring is required for excavations, the drawings shall indicate the material required to provide shoring and instructions for its use. Details for work presenting an impalement hazard from the ends of exposed reinforcing bar shall include covers designed to prevent impalement until the concrete is poured and include the covering material on the parts list.

17.5 Fall Protection Systems — ANSI/ASSE A10.32-2004

ANSI/ASSE A10.32-2004 is the *Fall Protection Systems—American National Standard for Construction and Demolition Operations*. This standard establishes performance criteria for personal fall protection equipment and systems and provides guidance for their use and inspection. Section 2.31 of this standard defines a "Personal Fall Arrest System" as "Any combination of an anchorage, connectors, body harness, lanyard, deceleration device or lifeline used to arrest a fall from any working level. Section 2.32 defines a "Positioning Device System" as "A combination of equipment that permits the user to use both hands freely while being supported on an elevated vertical surface." It goes on to explain that full "body harnesses with built-in or modular positioning belts are acceptable as well as body belts constructed for this purpose. When using the body belt for positioning, the free fall distance must be limited to 2 feet or less. Note: Waist belts do not comply with this standard for fall arrest." Section 5.2.6 also states that **waist belts (body belts) s**hall not be used for fall arrest, but that they may be used for positioning and climbing only. This reinforces guidance in EM 385-1-1 and in OPNAVINST 5100.23G. This document is referenced in UFGS-01 35 26 (August 2008), *Governmental Safety Requirements*, which states "Fall protection must comply with 29 CFR 1926.500, Subpart M, USACE EM 385-1-1 and ASSE/SAFE A10.32."

17.6 ANSI/ASSE Z359.1-2007, Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

Section 1309 of OPNAVINST 5100.23G states "Navy activities shall only use fall arrest equipment where the manufacturer can substantiate through third party certification that the equipment meets the requirements addressed in reference 13-5, and/or fall arrest equipment is designed, selected, and approved by a Qualified Person for fall protection. Any equipment that has previously met ANSI A10.14 Standards, and is in proper working condition, will be deemed to be usable until January 1, 2007. After January 1, 2007, requirements of reference 13-5 are recommended." Reference 13-5 is American National Standard Institute (ANSI) Z359.1.

17.6.1 Training Requirements

While much of Z359.1 is dedicated to testing and other requirements manufacturers must meet, the standard also requires that users of personal fall arrest systems receive specific training and requires that training records be kept for ten years by the trainer. Section 7.3.9 states "Training shall be provided by practical demonstration on how to properly use the equipment before authorized persons are exposed to fall hazards." It then goes on to list all of the topics that the training must cover including what to do after a fall and emergency rescue planning.

17.6.2 Variance Clause

Section 1.3.3 of this standard states that "Variance from the requirements of this standard are permissible in isolated instances of practical difficulties when applying it at the user level, but only when it is clearly evident that an equivalent degree of protection is thereby secured."

17.6.3 Knots

Section 7.2.12.1 forbids the use of knots in lanyards, lifelines, or anchorage connectors because knots reduce the capacity of the personal fall arrest system by as much as 50 to 70 percent.

17.7 Environmental Protection During Outside Plant (OSP) Work

Note: This section of Appendix AC is designed to provide awareness of a few common potential hazards and to facilitate further research. It is not a comprehensive treatment of the subject.

Construction activities on military facilities may encounter a variety of hazards. These include contaminated soils or water and RF radiation hazards. These hazards can significantly impact construction schedules and project costs. Failure to adequately address such situations and adhere to local environmental requirements can endanger workers, surrounding populations, and the local environment. Project engineers responsible for projects need to contact local authorities to determine if planned construction activities will occur in areas known or suspected to contain hazardous materials and to determine the local environment regulations that apply. (See previous discussion on OPNAVINST 5100.23G and confined space entry.) Project engineers working on OSP projects requiring trenching or soil excavation need to be aware that in some locations soil testing for hazardous material may be required and special precautions may be required for the handling of excavated material. There are also often local requirements for the handling of water that accumulates in manholes, handholes, and underground conduits. The National Service Center for Environmental Publications (NSCEP) (http://www.epa.gov/nscep/) "is EPA's premier site for accessing EPA publications, with more than 7,000 in stock and 30,000 digital titles, free of charge!" These titles include:

a. EPA530-R-03-001, *Guide for Industrial Waste Management*
b. EPA 520/1-85-014, *The Radiofrequency Radiation Environment, Environmental Exposure Levels and RF Radiation Emitting Sources*
c. EPA832-R-92-005, *Storm Water Management For Construction Activities, Developing Pollution Prevention Plans and Best Management Practices*

18. MIL-STD-1472F, Human Engineering, With Change Notice 1 dated 5 December 2003

This standard establishes general human engineering design criteria for military systems, subsystems, equipment and facilities. The change notice provided guidance for the handling of heavy objects. Rev F was published 23 August 1999. Rev F discusses console heights, pedestrian ramp design, the use of non-skid material or open grating on outdoor platforms, and various other subjects. The following paragraphs are applicable to most SPAWAR hardware installations

"5.9.13.2 Cable clamps. Unless wiring ducts or conduits are used, mechanically (not adhesively) mounted cable clamps shall be provided to ensure correct routing of electrical cables within and between equipment items to ensure that cables do not hinder or obstruct equipment maintenance and to facilitate the mating of cables with their associated

equipment items, and to prevent chafing due to contact with adjacent structure. All clamps shall be visible when equipment is installed.
5.9.13.3 Length. Cables shall be long enough so that required checking of any functioning item can be accomplished in a convenient place. Extension cables shall be provided where this is not feasible. Cables shall permit checkout of each functioning item located in drawers or pullout racks without having to remove the item from its installed location.
5.9.13.4 Cable routing. Cable routing shall not obstruct visual or physical access to equipment for operation or maintenance.
5.9.13.5 Access. Cables shall be routed so as to be accessible for inspection and maintenance.
5.9.13.6 Susceptibility to abuse. Cables shall be routed or protected to preclude mechanical damage and abuse, including damage by doors, lids, use as steps or hand holds, or being bent or twisted sharply or repeatedly.
5.9.13.7 Identification. Cables shall be labeled to indicate the equipment to which they belong and the connectors with which they mate." Note: Cable labeling shall also be in accordance with the Shore Installation Process Handbook.

18.1 MIL-HDBK-759C, Handbook for Human Engineering Design Guidelines

The cover of this document states that "This handbook is for guidance only. Do not cite this document as a requirement." All PEs should be aware of its general content. Much of its content can be considered common sense, but the handbook contains a lot of data on human dimensions and ranges of motion that is hard to find elsewhere. It should be consulted when installation designers are deciding on questions such as "What is the best height for placing keyboard and displays in cabinets?" and "Where should displays be mounted?"

(Section 5.4.3.1.3.2.1 states "The keyboard should be mounted so that it is directly in front of the operator when it is in use. The first row of keys should be between 230 mm and 300 mm above the seat level and the tiers of keys should slope upward toward the back at an angle between 10° and 30° from the horizontal with 17° preferred (see Table 11)." Section 5.7.5.1.3 states: "The preferred distance to displays is 635 mm.
The viewing distance to displays should not be less than 250-300 mm for short viewing periods, and preferably not less than 400 mm.")

19. SPAWARINST 3084.1, Policy and Procedures for Development and Execution of SOVT Documentation

"This instruction applies to all Team SPAWAR, including Space and Naval Warfare Systems Command. SPAWAR associated PEOs and proqram offices, and SPAWAR System Centers. For National Security Space Systems, this instruction will be applied to the maximum extent practicable. In the event that a non Team SPAWAR activity or contractor is tasked by a Team SPAWAR activity to develop solutions or services that require a SOVT (e.g. PEO EIS tasks NAVAIR as their developer and installation activity for an ERP effort), the SPEG shall be used in any Memorandum of Agreement, task statement, or contract … as a requirement for said developer." This instruction requires that the SPAWAR 4.2 installation competency to ensure that approved and certified SOVT documents are executed and discrepancies tracked to resolution in accordance

with the SOVT Preparation and Execution Guide (SPEG) discussed in the following subsection. It also requires all Team SPAWAR activities that procure and/or develop systems/equipment intended to be installed on Navy platforms {ashore or afloat} and their Program/Project Managers, Test and Evaluation (T&E) competency Subject Matter Experts, SOVT developers, In-Service Engineering Agents, Installation Activities, and SOVT Execution Activities or agents to utilize the SPEG processes for all SOVT development, approval, planning, execution, and post-execution discrepancy tracking.

19.1 SPAWAR SOVT Preparation and Execution Guide (SPEG)

This document is the result of a Lean Six Sigma study undertaken to improve the Team SPAWAR System Operational Verification Test (SOVT) process. The requirements in this document apply to all SOVT documents prepared for Team SPAWAR regardless of system, platform, or tests that must be performed.

20. Miscellaneous Helpful Documents

The following documents are not needed by experienced project engineers and other installation professionals with many years of experience. However, they can be very useful to any personnel who want to acquire more depth of understanding of the subjects that they cover.

20.1 2008 Soares Book on Grounding and Bonding

SPAWAR Code 4.2 is not aware of a better book on the subject for Project Engineers who need to improve their knowledge of commercial (National Electrical Code) grounding requirements and the theory and philosophy behind them. It contains many useful illustrations and is much easier to read than the NEC. Once again, PEs need to be aware that military requirements for grounding are more strict than the NEC requirements.

20.2 NEC 2008 Handbook

This handbook is a useful guide that contains illustrations, diagrams, and explanatory text that augments the contents of the NEC. Some of the explanatory text is almost as dense as that of the code, but some is very helpful.

20.3 Stallcup's Electrical Regulations Simplified (2004 Edition)

This document is based on the 2004 NFPA 70E. It ties together OSHA regulations with NFPA 70E (Electrical Safety in the Workplace) and NFPA 70 (NEC) requirements with many illustrations. At the time of this writing, an updated version to reflect the new requirements in the 2009 NFPA 70E was not available.

20.4 Department of Defense Joint Technical Architecture, Version 6.0

The updated JTA, version 6.0, was approved and distributed in January 2004. The JTA is a document that mandates the minimum set of standards and guidelines for the acquisition of all U.S. Department of Defense (DoD) systems that produce, use or exchange information. It is designed to be used by anyone involved in the management, development or acquisition of new or improved systems within DoD.

"Abstract: For U.S. Forces to counter current and future threats successfully, they must operate worldwide with speed, agility, and flexibility. Key to achieving this required level of responsiveness is providing the quality, shared situation awareness, and understanding necessary to make sound judgments. This goal requires widespread access to secure, accurate, and timely information and the capability to share this information securely among U.S., coalition and allied forces, as well as with nonmilitary and nongovernmental organizations. Achieving this information end-state will result in U.S. forces attaining Information Superiority (IS) over potential adversaries. IS, as stipulated in Joint Vision 2020, will be achieved by robustly networking the Force in a manner that allows information to be readily shared among people, sensors, and weapon platforms throughout the battle space, as well as between the communities of interest representing enterprise business activities. The Global Information Grid (GIG) -- a seamless, common-user, information infrastructure -- will be the foundation for IS by providing the enterprise-wide information services for the DoD's Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) and e-Business systems. Volume I consists of two main parts: (1) core standards characterized as those applicable to all DoD systems, and (2) domain-specific standards. The current version of the JTA includes domains for C4ISR, Combat Support, Modeling and Simulation, and Weapon Systems. Where subsets of an application domain have special requirements, the JTA includes subdomains containing standards and guidelines applicable to systems within that subdomain. The subdomains include C4ISR Cryptology and Space Reconnaissance; Combat Support Automatic Test Systems, Defense Transportation, Human Resources, and Medical Services; and Weapon Systems Aviation, Ground Vehicles, Missile Systems, Munitions, and Soldier Systems."

20.5 DISA Circular 310-130-1, Submission of Telecommunications Service Request

When a command requires additions, deletions, or changes in existing Defense Communications System (DCS) circuits, it must initiate a Telecommunications Service Request (TSR). The submission of a TSR requires research and planning. DISA CIRCULAR 310-130-1 provides instructions for preparing and submitting TSRs. New, increased, or updated services are expensive and require substantial justification.

20.6 SECNAVINST 5720.47B, Department of the Navy Policy for Content of Public Accessible World Wide Web Sites (dated 28 Dec 2005)

This document contains the DON policy for publicly accessible web sites.

20.7 NAVCOMTELCOMINST 2066.1B, Navy Base Communications Manual, dated November 1998

Paragraph 2 of the Executive Summary of this manual states that, "This manual is the principal document providing Department of the Navy (DON) policy and procedures at shore installations for base communications project planning, contracting, management, and the operations and maintenance of base communications services, systems, and equipment. The manual is organized to provide guidance as it applies to each organizational level including responsibilities of other commands and organizations involved with base communications services. If provisions of this manual are in conflict

with existing DON instructions pertaining to base communications, the policy in this manual shall take precedence."

20.8 OPNAVINST 2400.20F, Electromagnetic Environmental Effects (E3) and Spectrum Supportability Policy and Procedures, dated 19 July 2007

"This instruction specifies mandatory actions that are prerequisite to obligating or expending funds for C-E equipment, systems, subsystems, and the specific requirements and procedures for obtaining spectrum certification and frequency assignments." It requires that "C-E (Communications-Electronic) transmitting equipment shall not be activated for any purpose without obtaining both spectrum certification and an approved frequency assignment."

20.8.1 Spectrum Certification Process[13]

A diagram depicting the Spectrum Certification Process is presented below in Figure 3. The Spectrum Certification Process is also called "Frequency Allocation" or the "JF-12 Process." The Program Manager submits DD Form 1494, "Application for Equipment Frequency Allocation," to obtain spectrum certification. The DD Form 1494 documents the spectrum-related technical and performance characteristics of an acquisition item to ensure compliance with the applicable DoD, individual national, both U.S. and foreign, and international spectrum management policies and regulations. The DD Form 1494 is routed through command channels to the sponsoring Military Department Frequency Management Office: the U.S. Army Spectrum Management Office, the Navy-Marine Corps Spectrum Center, or the Air Force Frequency Management Agency. The Military Department Frequency Management Office then submits the form simultaneously or as required to the Spectrum Planning Subcommittee of the Interdepartmental Radio Advisory Committee under the National Telecommunications and Information Administration and to the Equipment Spectrum Guidance Permanent Working Group under the Frequency Panel of the Joint Staff Military Communications-Electronics Board.

20.8.1.1 Spectrum Certification within the United States and Its Possessions

The National Telecommunications and Information Administration Spectrum Planning Subcommittee provides a national level review and approval for the DD Form 1494.

20.8.1.2 Spectrum Certification outside the United States and Its Possessions

Any information intended to be released to a foreign nation must be approved for release by the appropriate DoD Component authority. Once a J/F-12 is approved for release to foreign nations and forums, it is then coordinated through the appropriate Combatant Command (COCOM) or other appropriate military offices, such as a Defense Attaché Office or Military Assistance Group office, with the foreign countries (also called "Host Nations") that have been identified as projected operating locations for the particular equipment. Since Host Nation coordination can be a lengthy and difficult process, the Program Manager should only list those nations on the DD Form 1494 in which permanent deployment is planned.

[13] https://akss.dau.mil/dag/Guidebook/IG_c7.6.4.1.1.asp

20.8.1.3 Department of Defense Internal Review

Within the Department of Defense, the Equipment Spectrum Guidance Permanent Working Group is responsible for the overall review, coordination and processing of all DoD frequency allocation applications. Within the Equipment Spectrum Guidance Permanent Working Group (formerly called the J-12 Permanent Working Group) the DD Form 1494 receives a tracking number (e.g., J/F-12/XXXX) and is reviewed by the other Military Department Frequency Management Office representatives. The Equipment Spectrum Guidance Permanent Working Group then sends the DD Form 1494 to other entities throughout the Department of Defense for review and comment. The Equipment Spectrum Guidance Permanent Working Group prepares the final J/F-12/XXXX for Military Communications-Electronics Board approval after all internal and external (e.g., National Telecommunications and Information Administration and/or Host Nation(s)) review and coordination has occurred.

20.8.1.4 Program Manager Responsibility

Per Office of Management and Budget Circular A-11, Part 2, program managers must heed the advice provided by National Telecommunications and Information Administration. In addition, program managers should follow guidance provided by foreign governments (i.e., host nation comments provided in response to the request to coordinate on a J/F-12) and implement suggested changes even if testing and/or operation is intended to occur within the United States but eventual deployment and operation is intended or desired for that host nation.

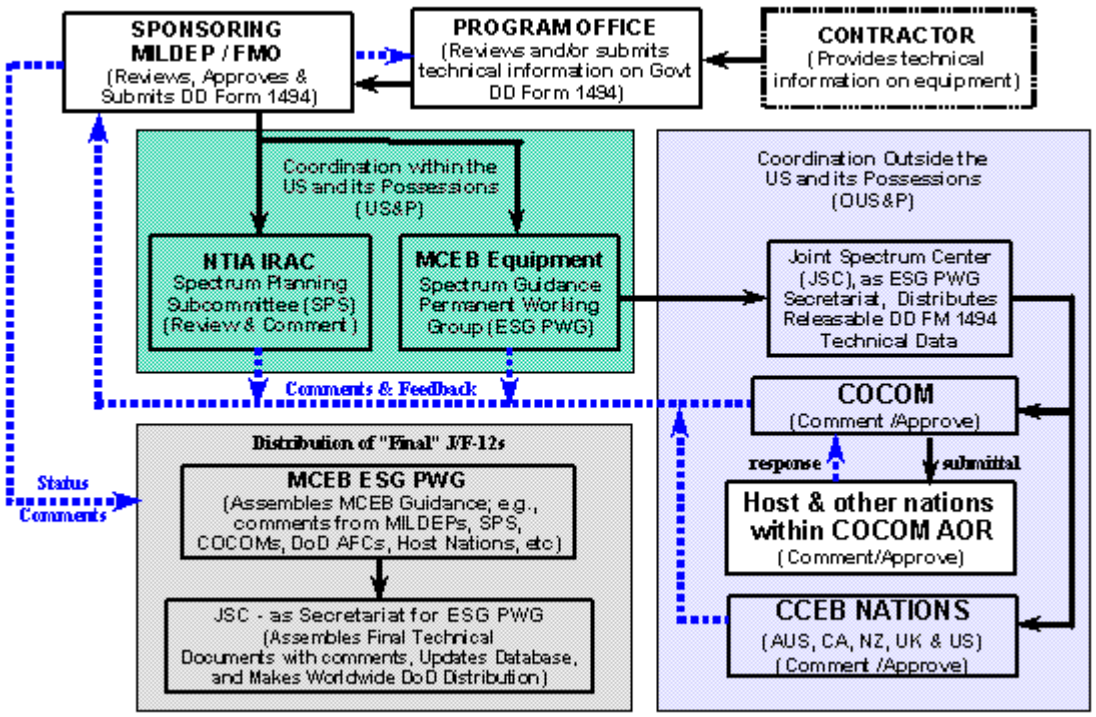

Figure 5 - DoD Equipment Spectrum Certification Process[14]

[14] https://akss.dau.mil/dag/Guidebook/IG_c7.6.4.1.1.asp

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Attachment A— Common Checklist Items for Inside Plant (ISP) Infrastructure

SECTION I
Introduction

This document is designed to list the standards and important requirements that should be checked when examining the adherence to Industry Standards of installations of Inside Plant (ISP) Infrastructure. It does not list required standards that are not expected to be used directly by the installation activity for Quality Assurance purposes. For example, ANSI/TIA/EIA-569-B states, in A.3.4 that "The Fact that a material is non-combustible does not qualify that material as a firestop unless it has passed performance testing as a through penetration firestop following ASTM E 814 or UL 1479." Since we do not expect the installing activity to perform this firestop testing, ASTM E 814 and UL 1479 are not listed in the following Section II. This checklist has been expanded to include an important new requirement from UFC 3-600-01.

SECTION II
List of Major Standards

The following is a list of the documents needed to ensure that the Inside Plant (ISP) infrastructure will meet industry standards and best commercial practices.

a. ANSI/TIA/EIA-568-C.0, “Generic Telecommunications Cabling for Customer Premises” dated February 2009
b. , "Commercial Building Telecommunications Cabling Standards – Part 1General Requirements", dated February 2009
c. TIA-569-B, "Commercial Building Standard for Telecommunications Pathways and Spaces", dated October 2004
d. ANSI/TIA/EIA-606-A-2002, "Administration Standard for Commercial Telecommunications Infrastructure", Approved 16 May 2002, dated May 2002
e. ANSI/NFPA-70, "National Electrical Code" (2008 Version)
f. BiCSi Telecommunications Distribution Methods Manual, Eleventh Edition, dated 2006
g. ANSI/TIA-598-C-2005, "Color Coding of Optical Fiber Cables", approved 13 January 2005, dated January 2005
h. BISCI Telecommunications Distribution Methods Manual (TDMM), Eleventh Edition
i. NEMA Standards Publication VE 2-2006
j. UFC 3-600-01, Fire Protection Engineering for Facilities, dated 26 September 2006

SECTION III
List of Suggested Checklist Items

1. Is appropriate slack provided? At one time there was requirement for a minimum of 200 mm (8 in) of excess cable stored at each outlet. (TIA/EIA-570-A, Section 8.2.3 and TIA/EIA-568-A, Section 10.4.5) This requirement was removed from TIA-568-B.1. However this is still the recommendation of Chapter 4, Section 2, page 4-71 of the TDMM (11th Edition). The installing activity should have a rational and consistent policy for the amount of slack required. The eleventh edition of the BICSI TDMM states that:

"Although the exact amount of required cable slack depends on the size and layout of the connecting hardware at the TR (Telecommunications Room (the place where the Ethernet hub or switch is)) or TE (Telecommunications Enclosure (e.g. a wall mounted cabinet)) and the work area, the recommended minimum amount of cable slack:

- At the TR or TE is 3 m (10 ft).
- In the suspended ceiling for the telecommunications outlet is 1 m (3.28 ft).

Note: If a horizontal distribution method other than ceiling distribution is used, the length of recommended minimum amount of cable slack should be adjusted accordingly.

This cable slack may be used for terminating balanced twisted-pair and optical fiber cables in a telecommunications outlet/connector.

The minimum slack for termination of:

- Balanced twisted-pair cable is 203 mm (8 in).
- Optical fiber cable is 1 m (3.28 ft).

Additional slack may be considered at the telecommunications outlet/connector location to facilitate moving a telecommunications outlet/connector from one wall to another. Slack should be included in all length calculations to ensure that the horizontal cable does not exceed 90 m (295 ft).

NOTE: Slack should not be stored in bundled loops. Cable slack should be stored in an extended loop or in a figure-eight configuration to alleviate stress."

2. For Category 5e and higher cables, is the amount of pair untwisting no greater than 13 mm (0.5 in)? (TIA/EIA-568-C.01, Table 1)

Note: Section 5.3.2.1 of ANSI/TIA-568-C.0 states that "The minimum bend radius, under no-load or load, for multipair cable shall follow the manufacturer's guidelines."

3. In spaces with ScTP or UTP terminations, are the cable bend radii under no-load or load conditions not less than four times the cable diameter for horizontal cable? (TIA/EIA-568-C.0, Section 5.3.2.1)
4. Is the minimum inside bend radius, under no-load or load conditions, for 4-pair ScTP or UTP patch cable one-times the cord cable diameter (ANSI/TIA-568-C.0 Section 5.3.2.2)
5. Is cable stress, such as that caused by tension in suspended cable runs and tightly cinched bundles minimized? (ANSI/TIA-568-C.0 Section 5.1)
6. Are cable bindings, if used to tie multiple cables together, irregularly spaced and loosely fitted (easily movable). (ANSI/TIA-568-C.0 Section 5.1)

(Note: The minimum bend radii requirements were different for screened and unscreened twisted pair cable and for these cables under load or no-load conditions before ANSI/TIA-568-C.0 was published.)

7. Is the minimum bend radius for intrabuilding 2 and 4-fiber horizontal cables not less than 25mm (1 in) under no-load conditions? (ANSI/TIA-568-C.0 Section 5.4.1, Table 2)
8. Is the minimum bend radius for inside plant cable with more than four fibers, indoor/outdoor cable, and outside plant cable not less than 10-times the cable outside diameter? (ANSI/TIA-568-C.0 Section 5.4.1, Table 2)
9. Is cabling installed to provide color coding, labeling, and documentation consistent with the provisions of ANSI/TIA/EIA-606-A?

a. Are all labels "printed or generated by a mechanical device"? (TIA/EIA-606-A, Section 10.2)
b. Are all labels easily read and visible during the installation of and normal maintenance of the infrastructure? (TIA/EIA-606-A, Section 10.2)
c. In the work areas (LAN drop locations), is each individual telecommunications outlet/connector labeled with the horizontal link identifier (TIA/EIA-606-A Section 5.1.2, top of page 15)
d. Is each end of a horizontal cable labeled within 300 mm (12 in) of the end of the cable jacket? (TIA/EIA-606-A Section 5.1.2 at bottom of page 14.)

10. Are communications cables installed in ducts, plenums, and other spaces used for environmental air type CMP? (NEC Article 800.154(A))
11. Is power and communication (data) cabling installed in spaces above ceilings or below raised floors plenum rated or installed in metallic conduit? (UFC 3-600-01, Section 6-8.1.3)
12. Are abandoned cables removed? (Section 800.25(C) of the National Electrical Code requires the removal of accessible abandoned communications cable. Section 800.154 (A) specifically forbids leaving abandoned cable in ducts, plenums and other spaces used for environmental air.)
13. Are areas under floors and above ceilings that are used to distribute environmental air not used to install electrical outlets for plugging in equipment? (NEC Article 300.22(C) (1) states that the wiring methods for such spaces "shall be limited to totally enclosed, nonventilated, insulated busway having no provisions for plug-in connections, …")
14. Is backbone optical fiber cabling color coded and terminated in the order shown in ANSI/TIA-598-C (See attached table of Fiber Color Codes.)
15. Are 62.5 (multimode) SC connectors beige? Are single mode connectors blue? (TIA/EIA-568-B.3, Section 5.2.3)
16. If SC connectors are used, are the two positions of the 568SC connector and adapter identified as Position A and Position B as specified in ANSI/TIA-568-C.3 or, if alternative connectors are used (connectors other than SC), do the alternative connector designs employ similar labeling and identification schemes to that required for SC connectors. (ANSI/TIA-568-C.0 Annex B, Section B.3.1)
17. Are optical fiber patchcords of an orientation such that Position A goes to Position B on one fiber, and Position B goes to Position A on the other? .(Cross-over orientation) (ANSI/TIA-568-C.0 Annex B, Section B.3.1) (also required by TIA/EIA-568-B.3 Section 6.4 and TIA/EIA-568-B.1 Section 10.3.3 and TIA-758A Section 5.3.5)
18. Are fibers grouped in pairs following the color-coding or numbering sequence specified in ANSI/TIA-598-C and shown in **Attachment G** of SIPH Appendix AC with the pairs forming 2-fiber transmission paths that are associated with Position A and Position B of a duplex adapter at each end of the cable? (ANSI/TIA-568-C.0 Annex B, Section B.3.1)
19. Is each installed backbone and horizontal premises cable properly polarized? In other words, is each cable segment installed in a pair-wise cross-over orientation as illustrated by TIA-758 Figure 13; TIA-758-A Annex C Figures 15, 16, and 17; TIA/EIA-568-B.1 Figures 10-1, 10-2, and 10-3; and ANSI/TIA-568-C.0 Annex B, Section B.3.1 Figure 7?
20. Is each installed horizontal fiber link tested IAW the following from TIA/EIA-568-C.0 Section 6.4..3.2:

"Cabling Subsystem 1 link segments (the horizontal optical fiber cabling link segments) need to be tested in one direction at one wavelength either 850 nm or 1300 nm for multimode, and either 1310 nm or 1550 nm for single-mode." (Because of the short length of cabling (90m [295 ft] or less), attenuation deltas due to wavelength are insignificant.)

21. The horizontal link should be tested at 850 nm or 1300 nm in one direction and in accordance with ANSI/EIA/TIA-526-14-A, Method B, One Reference Jumper. Do the attenuation test results show the link attenuation to be less than the link attenuation allowance calculated as shown in ANSI/TIA-568-C.0 Section 6.4.3.4:

Link attenuation allowance (dB) = Cable Attenuation Allowance (dB) + Connector Insertion Loss Allowance (dB) + Splice Insertion Loss Allowance (dB)

Where:

Cable Attenuation Allowance = Maximum Cable Attenuation Coefficient (dB/km) x Length (km)
Connector Insertion Loss Allowance = Number of Connector Pairs x Splice Loss Allowance
Splice Insertion Loss Allowance = Number of Splices x Splice Loss Allowance (dB)

Note: Component Loss Allowances are provided in ANSI/TIA-568-C.3

22. Is each installed Cabling Subsystem 2 and Cabling Subsystem 3 (backbone) fiber link tested in at least one direction at both operating wavelengths IAW the following from TIA/EIA-568-C.0 Section 6.4.3.3: "Cabling Subsystem 2 and Cabling Subsystem 3 multimode link segments shall be tested at 850 nm and 1300 nm … single-mode link segments shall be tested at 1310 nm and 1550 nm."
23. Is the overall fill ratio of all trays and wireways less than or equal to 50%? (ANSI/TIA/EIA-569-B, Section 8.6.1.1) Note: At this fill ratio, the trays and wireways will appear full because of air gaps between cables. See TIA-569-B, Figure 16.
24. Is the depth of all cables on runways or trays 150 mm (6 inches) or less? (TIA-569-B Sections 8.6.1.1 and 8.6.1.2)
25. For cable pathways, is a support placed within 600 mm (24 in) on each side of any connection to a bend, tee, or cross? (TIA-569-B Sections 8.6.2)
26. Unless otherwise recommended by the manufacturer, are support locations for cable tray fittings – **this does not apply to single rail and wire mesh cable trays** - in accordance with the following guidance from NEMA VE 2-2006.
    a. Supports for horizontal cable tray elbows should be placed within 600 mm (2 ft) of each end of the fitting and at the center point of the arc except that the center support is not required for 12" radius 30 & 45 degree fittings. (See NEMA VE 2-2006, Figure 4.22.)
    b. Supports for horizontal tees should be placed within 600 mm (2 ft) of each of the three openings connected to other cable tray items if the radii are 12 inches. On all other radii, at least one additional support should be placed under each side rail at the horizontal tee, preferably as shown in NEMA VE 2-2006 Figure 4.23.
    c. Supports for Horizontal Wyes should be placed within 600 mm (2 ft) of each of the three openings connected to other cable tray systems, and at the 22-1/2° point of the arc adjacent to the side branch, preferably as shown in NEMA VE 2-2006 Figure 4.24, for all but 12-inch radius fittings.
    d. Supports for Horizontal Crosses should be placed within 600 mm (2 ft) of each of the four openings connected to other cable tray items for 300 mm (12 in) radius fittings. For fittings with radii other than 12 inches, at least one additional support should be placed under each side rail of the horizontal, preferably as shown in NEMA VE 2-2006 Figure 4.25.
    e. Supports for reducers should be placed within 600 mm (2 ft) of each fitting extremity as shown in NEMA VE 2-2006 Figure 4.26.
    f. Supports for vertical cable tray elbows at the top of runs should be placed at each end of the elbow, and at the bottom of runs, they should be supported at the top of the elbow and within 600 mm (2 ft) of the lower extremity of the elbows as shown in NEMA VE 2-2006 Figure 4.27.
    g. Supports for vertical cable tray tees should be placed within 600 mm (2 ft) of each fitting extremity as shown in NEMA VE 2-2006 Figure 4.28.
    h. Cable support fittings should be placed at the top of long vertical runs of heavy cables to support the cables during installation as shown in NEMA VE-2006 Figures 4.29 and 4.30.
27. Is the fastening of cables on vertical runs done every 18 inches in accordance with the guidance from NEMA VE 2-2006, Section 5.6.a?
28. Are cable clamps and cable ties only tightened enough to secure the cable without indenting the jacket? (NEMA VE 2-2006, Section 5.6.a and TIA/EIA-568-C.0 Section 5.1 – See previous Checklist Questions 5 and 6.) Note: Some indentation may be unavoidable, but designers, as well as installers, should be making a conscious effort to limit the indentation of cable jackets by choosing appropriate hardware and tools (e.g. use of broad Velcro type ties and/or pressure limiting tools).

29. Is the inside of the cable tray free of burrs, sharp edges, and any projections that could damage cable insulation? Do abrasive supports (e.g. threaded rod) have the portion within the tray protected with a smooth non-scratching covering so that cable can be pulled without physical damage? (TIA-569-B, Section 8.6.3)
30. Is a minimum of 300 mm (12 inches) of access headroom provided and maintained above the cable tray. (TIA-569-B, Section 8.6.3)
31. Are non-continuous cable tray supports located at intervals that do not exceed 1.5 m (5 feet)? (TIA-569-B, Section 8.7)
32. Is the length of all flexible metal conduit runs less than 6 m (20 feet)? (TIA-569-B, Section 8.8.1)
33. Is no section of conduit longer than 30 m (100 ft) between pull points? (TIA-569-B, Section 8.8.2.1)
34. Is all metallic conduit terminated with an insulated bushing? (TIA-569-B, Section 8.8.3.1)
35. Is a pull string or rope placed in installed conduits? (TIA-569-B, Section 8.8.3.2)
36. Is no cable laid directly on ceiling tiles or rails? (TIA-569-B, Section 8.4.2.1)
37. When a wireway passes through a partition or wall, is it an unbroken length? (ANSI/TIA/EIA-569-A, Section 4.5.6.1) (Note: This common sense requirement was not found in 569-B.)
38. Are openings in fire-rated walls, floors, and ceilings, properly firestopped? (TIA-569-B, Section 8.1) (NECA/BICSI 568-2006, Section 3.2.1) (NFPA 5000, 2006 Edition, Section 8.8.2) (2008 NEC Article 300.21)
39. Are any J-hooks used as cable pathways spaced not more than 5 feet apart? (NECA/BICSI 568-2006, Section 3.5.1.1(8))
40. Does no section of conduit contain more than two 90 degree bends, or equivalent, between pull points (e.g. outlet boxes, telecommunications closets, or pull boxes)? (TIA-569-B, Section 8.8.2.2)
41. Is the inside radius of a bend in conduit at least 6 times the internal diameter for conduits with an internal diameter of 50 mm (2 in) or less? (TIA-569-B, Section 8.8.2.2)
42. Is the inside radius of a bend in conduit at least 10 times the internal diameter for conduits with an internal diameter of more than 50 mm (2 in)? (TIA-569-B, Section 8.8.2.2)
43. Are bends in conduit free of any kinks or other discontinuities that may have a detrimental effect on the cable sheath during cable pulling operations? (TIA-569-B, Section 8.8.2.2)
44. Are conduits reamed to eliminate sharp edges? (TIA-569-B, Section 8.8.2.2)
45. Is the following requirement from the NEC being met? (A common violation of this requirement is tie-wrapping Cat-5 cable to electrical conduit for support.) "Raceways shall be used for their intended purpose. Communications wires or cables shall not be strapped, taped, or attached by any means to the exterior of any conduit or raceway as a means of support. *Exception: Overhead (aerial) spans of communications cables or wires shall be permitted to be attached to the exterior of a raceway-type mast intended for the attachment and support of such conductors*." (2008 NEC Article 800.133(B))
46. Is the following requirement from the NEC being met? "Communications wires and cables shall be separated by at least 50 mm (2 in.) from conductors of any electric light, power, Class 1, non-power-limited fire alarm, or medium power network-powered broadband communications circuits.

Exception No. 1: Where either (1) all of the conductors of any electric light, power, Class 1, non-power-limited fire alarm, or medium power network-powered broadband communications circuits are in a raceway or in metal-sheathed, metal-clad, non-metallic-sheathed, Type AC or Type UF cables, or (2) all of the conductors of communications circuits are encased in a raceway.
Exception No. 2: Where the communications wires or cables are permanently separated from the conductors of any electric light, power, Class 1, non-power-limited fire alarm, or medium power network-powered broadband communications circuits by a continuous and firmly fixed non-conductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the wire."
(2008 NEC Article 800.133(A)(2))
Note: A raceway is an enclosed channel designed for holding wire, cables and busbars.

47. Are communications cables installed in ducts, plenums, and other spaces used for environmental air Type CMP or in EMT, flexible metallic tubing, IMC, or rigid metal conduit without an overall nonmetallic covering? This includes abandoned cable and replaced cable.

Note: **The permission to use liquidtight conduit in spaces used for environmental air was removed from (two places in) Article 300.22 the 2005 edition of the NEC.**

48. Are communications cables installed in risers type CMP or CMR or encased in a metal raceway or located in a fireproof shaft with firestops at every floor? (2008 NEC 800.154(B)(2))
49. Is the area above and below power panels free of any drops, communications cables, communications pull boxes, etc. The 2008 NEC states in 110.26(F)(1)(a) that "The space equal to the width and depth of the equipment and extending from the floor to a height of **1.8 m (6 ft)** above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this zone."(Suspended ceilings with removable panels are allowed by exception.)
50. Are all horizontal cables - including fiber optic cables - less than 90 meters long? ANSI/TIA/EIA-568-B.1 states in Section 4.3 that "The maximum horizontal distance shall be 90 m (295 ft), independent of media type (Figure 4-1)" Note: The ANSI/TIA-568-C.0 standard allows some flexibility, but the ANSI/TIA-568-C.1 standard continues to specify a maximum horizontal cable length of 100 m, independent of media type.

Attachment B — Common Checklist Items for Underground Outside Plant Infrastructure

SECTION I
Introduction

This document is designed to list the standards and important requirements that should be checked when examining the adherence to Industry Standards of installations of Outside Plant (OSP) Infrastructure. It does not list standards that are not expected to be used directly by the installation activity for Quality Assurance purposes. Primary standard are the bare minimum standards that activities responsible for the quality assurance of OSP infrastructure must have on site. Secondary standards are standards that should be held by these activities, but that are not critical to the installation quality assurance at most sites.

SECTION II
List of Primary Standards

The following is a list of the documents needed to ensure that the Outside Plant (OSP) infrastructure will meet industry standards and best commercial practices.

a. TIA-758-A, “Customer-Owned Outside Plant Telecommunications Infrastructure Standard”, dated 5 May 2004
b. National Electrical Safety Code C2-2007
c. National Electrical Manufacturer’s Association Bulletin No. TCB 2-2000, “NEMA Guidelines for the Selection and Installation of Underground Nonmetallic Duct”
d. TIA-590-A, “Standard for Physical Location and Protection of Below-Ground Fiber Optic Cable Plant, dated January 1997
e. OSHA Regulations (Standards -29 CFR), Part 1926, Subpart P (Excavations), Standard 1926.651 and 1926.652
f. TIA-569-B, "Commercial Building Standard for Telecommunications Pathways and Spaces", dated October 2004
g. Unified Facilities Guide Specifications, UFGS-33 71 02.00 20 (August 2008), Underground Electrical Distribution
h. Unified Facilities Guide Specifications, SECTION 33 82 00 (April 2006), TELECOMMUNICATIONS OUTSIDE PLANT (OSP)
i. USDA RUS Bulletin 1751F-644, Underground Plant Construction, dated August 28, 2002
j. USDA RUS Bulletin 1753F-201 (PC-4), RUS Standard for Acceptance Tests and Measurements of Telecommunications Plant, dated June 2, 1997.

SECTION III
List of Secondary Standards

The following is a list of the documents that should be on-hand to ensure that the Outside Plant (OSP) infrastructure will meet industry standards and best commercial practices. However, they are not as important to have on hand as the standards listed in the above Section II.

a. NEMA standard TC-2
b. ANSI/EIA-TIA-455-8
c. TDMM, 11th Edition
d. ASTM F402, Standard Recommended Practice for Safe Handling of Solvent Cements Used for Joining Thermoplastic Pipe and Fittings
e. USDA RUS BULLETIN 1751F-644
f. BICSI Customer-Owned Outside Plant Design Manual, Third Edition, Published 2004 (See note below.)

Note: The BICSI Outside Plant Design Manual, Fourth Edition, Released Feb 2007 2004 replaced the BICSI Customer-Owned Outside Plant Design Manual, Third Edition, Published 2004. This checklist will be updated when the new standard arrives in the SPAWAR 4.2 library.

SECTION IV
List of Common OSP Cable Installation Checklist Items

1. Do optical fiber cables, connecting hardware, and patch cords maintain the correct polarity throughout the cabling system to support two fiber transmit and receive applications? (Reference TIA/EIA-758-A, Section 5.3.5) (ANSI/TIA/EIA-568-B.1 Section 10.3.2 also required this as did the previous version of the standard and the current standard ANSI/TIA-568-C.0.)
2. Are the two fiber connection positions (or polarities) labeled using the letters "A" and "B"? (Reference TIA/EIA-758-A Section 5.3.5. See also ANSI/TIA-568-C.0 Annex B Section B.3.1.)
3. Is a stairway, ladder, ramp or other safe means of egress located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees? (OSHA 1926.651(c)(2))
4. Do employees exposed to public vehicular traffic wear warning vests or other suitable garments marked with or made of reflectorized or high-visibility material? (OSHA 1926.651(d))
5. Are excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations placed and kept at least 2 feet (.61 m) from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary? (OSHA 1926.651(j)(2))
6. Is each employee in an excavation protected from cave-ins by an adequate protective system designed in accordance with paragraph (b) or (c) of OSHA 1926.652(a)(1) except when:
    a. Excavations are made entirely in stable rock (OSHA 1926.652(a)(1)(i)); or
    b. Excavations are less than 5 feet (1.52 m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in. (OSHA 1926.652(a)(1)(ii))
7. Is the radial separation of electrical supply and communications cables or conductors from steam lines, gas, and other lines that transport flammable material not less than 300 mm (12 in)? (2007 NESC Rule 354.A.2)
8. Does communications conduit not enter any the same manhole, handhole, or vault with gas or other lines that transport flammable material? (2007 NESC Rule 320.B.5)

9. Are conduit systems to be occupied by communications conductors separated from conduit systems used to supply electrical power by not less than the following (2007 NESC Rule 320.B.2)
    a. 75 mm (3 in) of concrete
    b. 100 mm (4 in) of masonry
    c. 300 mm (12 in) of well-tamped earth
10. Is the minimum depth of buried cables or conduit in accordance with the following table from TIA/EIA-590-A? In conditions where this depth is not feasible or permitted, is additional physical protection (e.g., concrete encasement) provided?

Facility	Minimum cover mm (in)
Toll, trunk cable	750 (30)
Feeder, distribution cable	600 (24)
Service/drop lines	450 mm (18 in)
Multiple - Duct underground conduit, with manhole access	750 (30)

11. Is detectable (recommended) warning tape (should be orange) installed a minimum of 12 inches above the cable? (See TIA/EIA-590A Section 4.2.4) (Note: Chapter 19 of the 11th edition of the TDMM calls for the tape to be a min of 12 inches below grade, which makes less sense.)
12. Are all bends long sweeping bends with a radius not less than ten times the internal diameter of the conduit when conduits are larger than 50 mm (2 in). ANSI/TIA/EIA-569-B, Section 8.8.2.2)
13. Is conduit not terminated in a joint use Maintenance Hole (Manhole) with electrical cables. See also TIA-758-A, top of page 23, Part of Section 4.2.1.1 which states that "Telecommunications maintenance holes shall not be shared with electrical installations other than those needed for telecommunications equipment."
14. Are manhole and handhole frames and covers used in roads or driveways rated to withstand vehicular traffic?
15. Is a plastic or nylon line with a minimum test rating of 90kg (200 lb) pulling tension provided in all entrance conduits. (TIA-569-B Section 8.8.3.2 states that “Pull string or rope shall be placed in installed conduits.” The test rating is from the TDMM, 11th Edition, Chapter 19, under “Choosing a Pull Cord”.)
16. Does Schedule 40 and Schedule 80 rigid non-metallic conduit meet NEMA standard TC-2? (TIA/EIA-758-A, Section 4.1.1.2.2)
17. Are nonmetallic conduits encased in concrete of minimum 17225 kPa (2500 lb/in^2) compressive strength where vehicular traffic is above the pathway, or where a bend or sweep is placed? (TIA/EIA-758-A, Section 4.1.1.2.2) Note that the NESC defines a roadway as "The portion of highway, including shoulders, for vehicular use." The NESC defines a shoulder as "The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles for emergency use and for lateral support of base and surface course.” If the curvature radius is 80 feet or greater, encasement is not required per the BICSI CO-OSP Design manual, Chapter 3, under "Designing Curved Conduit Sections."
18. Does any section length of conduit exceed 183m (600 ft) between pulling points? (TIA-758-A, Section 4.1.1.2.3)
19. Where bends are required, are manufactured bends used whenever possible? "Bends made manually shall not reduce the inner diameter of the conduit" (TIA-758-A, Section 4.1.1.2.4)
20. Is there no more than the equivalent of two (2) 90-degree bends (180-degrees total) between pull points, including offsets and kicks? Are back-to back (closer than ten feet) 90-degree bends avoided? (TIA-758-A, Section 4.1.1.2.5)

21. Is underground conduit installed so that a drain slope exists at all points of the run to allow drainage and prevent the accumulation of water? (TIA-758-A, Section 4.1.1.2.6)
22. Is conduit installed so that it will drain properly? "A drain slope of no less than 10 mm per meter (0.125 in per foot) is desirable when extending conduit away from building structures. Where conduit extends between maintenance holes, a slope of 10 mm per meter (0.125 in per foot) should extend from the middle of the span to each maintenance hole." (TIA/EIA-758-A, Section 4.1.1.2.6)
23. Are ducts sealed to resist liquid and gas infiltration at all maintenance holes and building entrance point locations? (TIA-758-A, Section 4.1.1.2.8) Do conduits installed through building walls have internal and external seals to limit the likelihood of gas entering the building? (NESC Rule 322B.4)
24. Is conduit suitably restrained to maintain its design position? If you can see the conduit, manholes, or handholes move during installation procedures, the conduit is not suitable restrained. (2007 NESC rule 322.B.1)
25. Are ducts joined in a manner to limit solid matter from entering the conduit line? (2007 NESC rule 322.B.2)
26. Do conduit joints form a sufficiently continuous smooth interior surface between joining duct sections so that cable will not be damaged when pulled past the joint? (2007 NESC Rule 322.B.2)
27. Are maintenance holes equipped with corrosion resistant pulling irons and cable racks, that are grounded, and a sump for drainage? (TIA/EIA-758-A, Section 4.2.1.1)
    a. Pulling eyes should be at least 22mm (7/8 in) in diameter (TDMM, 11th Edition, Chapter 19, Under "Maintenance Hole Interior Hardware")
    b. Sumps should be at least 200 mm (8 in) in diameter (TDMM, 11th Edition, Chapter 19, Under "Maintenance Hole Interior Hardware")
28. Is the strength of concrete used for manholes at least 24000 kPa (3480 psi) (TDMM, 11th Edition, Chapter 19, Under "Concrete Strength and Reinforcement")
29. Do manholes meet the following requirements? "A clear working space sufficient for performing the necessary work shall be maintained. The horizontal dimensions of the clear working space shall not be less than 900 mm (3 ft). The vertical dimensions shall be not less than 1.83 m (6 ft) except in manholes where the opening is within 300 mm (1 ft) horizontally, of the adjacent interior side wall of the manhole." (2007 NESC Rule 323.B)
    a. Exception 1 to NESC Rule 323.B is: "Where one boundary of the working space is an unoccupied wall and the opposite boundary consists of cables only, the horizontal working space between these boundaries may be reduced to 750 mm (30 in)."
    b. Exception 2 to NESC Rule 323.B is: "In manholes containing only communications cables, equipment, or both, one horizontal dimension of the working space may be reduced to not less than 600 mm (2 ft) provided the other horizontal dimension is increased so that the sum of the two dimensions is at least 1.83 m (6 ft)."
30. Are round access openings to communications manholes at least 600 mm (24 inches) in diameter? (2007 NESC Rule 323.C.1)
31. Are fixed ladders corrosion resistant? (NESC Rule 323F)
32. Do manhole and handhole covers have an identifying mark that indicates ownership or the type of utility? (2007 NESC Rule 323.J)

33. Is the cable used outside designed for outdoor use? In other words:
    a. Does OSP Optical Fiber meet the performance requirements of ANSI/ICEA S-83-640 or ICEA S-104-896 and ANSI/TIA/EIA-568-B.3? (TIA-758-A Section 5.3.2)
    b. Does OSP optical fiber cable meet the physical requirements of ANSI/ICEA S-83-640 or ICEA-104-696? (TIA-758-A Section 5.3.3)
    c. Do copper twisted pair cables filled OSP cables meet one of the following requirements (TIA-758-A Section 5.1.1.2):
        i. Filled OSP cables shall meet the requirements of ANSI/ICEA S-84-608.
        ii. Air core OSP cables shall meet the requirements of ANSI/ICEA S-85-625
        iii. Enhanced performance filled OSP cables, referred to as Broadband Outside Plant (BBOSP), shall meet the requirements of ANSI/ICEA S-99-689.
        iv. Enhanced performance air core OSP cables shall meet the requirements of ANSI/ICEA S-98-688.
34. Is the following requirement met? "The splice insertion loss shall not exceed 0.1 dB mean (0.3 dB maximum) when measured in accordance with ANSI/EIA-TIA-455-8 (OTDR testing). (TIA-758 Section 5.3.4.1.2) If not, is the alternative requirement from RUS Bulletin 1753F-201(PC-4) being met? Section 4.2.4.3 states that “When no limit is specified in the applicable construction contract, the splice loss of each field splice shall not exceed 0.2 dB at 1310 and/or 1550 nanometers. Section 4.2.4.1 requires that “The splice loss for each single mode field splice shall be the bi-directional average of the two OTDR readings.”
35. Is the following requirement being met? Splices shall have a return loss greater than or equal to 45.0 dB mean (40.0 dB minimum) when measured in accordance with ANSI/EIA-TIA-455-8 (OTDR testing). (TIA-758-A Section 5.3.4.1.3)
36. Whenever an armored fiber optic cable is spliced, is a cable shield continuity test set used to measure armor continuity within splices? (RUS Bulletin 1753F-201 (PC-4) Section 4.1.4)
37. Is buried warning tape at least 50 mm (2 inches) wide and colored orange. Does the tape identify that fiber optic cable is buried below, and will the tape stretch significantly before breaking? (TIA/EIA-590-A Section 4.2.4. TDMM 11th Edition, Chapter 19)
38. Do fiber optic cables on riser poles have mechanical protection extending approximately 2.5 meters (8 feet) from the ground?
39. Is the minimum bend radius for OSP optical fiber cable during installation (under load) not less than 20 times the cable diameter, and after installation not less than fifteen times the cable diameter. (TIA-758-A, Section 5.3.7) This requirement is more stringent than that required by TIA/EIA-568-C.0, Section 5.4.1. (See ISP checklist, Item 8.)
40. Are all metallic components of the cable, except for metallic transmission media, bonded to each other and to ground? (TIA-758-A Section 5.3.6)
41. Is testing of Optical Fiber Cabling conducted according to ANSI/TIA/EIA-568-B.1? (TIA -758-A Section 5.3.8) This requires testing at two wavelengths (1310 nm and 1550 nm) for each (single mode) fiber.
42. Do concrete encasement procedures and other procedures meet the requirements of the authority having jurisdiction (AHJ)? (TIAEIA-758-A Section 3.1)
43. Under roads, paved areas, and railroad tracks, does concrete encasement “of rectangular cross-section providing a minimum of 75 mm (3 inch) concrete cover around ducts” exist? Does concrete encasement extend at least 1525 mm (5 feet) beyond the edges of paved areas and roads, and 3660 mm (12 feet) beyond the rails on each side of railroad tracks? (Note: This is a requirement of USFG Section 33 71 02.00 20, UNDERGROUND ELECTRICAL DISTRIBUTION, Paragraph 3.7.8.1. Section 33 71 02.00 20 is called out in SECTION 33 82 00, TELECOMMUNICATIONS OUTSIDE PLANT (OSP), Paragraph 3.1.5.
44. Did the designer determine the number of conduits to be placed in a proposed system installation based on the Initial requirements **plus one maintenance conduit and** the estimated growth over the life cycle of the system? (BiCSi Customer Owned Outside Plant Design Manual 3rd Edition, page Under “Conduit System Requirements”)

45. Were all newly installed conduits mandreled and cleaned of loose materials? RUS, Telecommunications Engineering and Standards Division 644 Issue #3, Design and Construction of Underground Cable is referenced in TIA-758-A Paragraph 4.1.1.2.5 under "Number of Bends" as a sample pull planning tool. (It is listed as a reference on page 7 of TIA-758-A as a document that contains provisions which form part of the TIA/EIA-758 standard.) USDA RUS BULLETIN 1751F-644 replaces this (Issue #3). USDA RUS BULLETIN 1751F-644 states "Test mandrels which are 0.25 in (6 mm) smaller in diameters than the inside diameters of conduits should be pulled through all single conduits and through two diagonally opposite conduits in multi-conduit configurations to ensure proper alignments. The pulling of the test mandrels through the conduits should be performed after backfilling but prior to the replacement of any grass, sod, repaving, etc. In addition, all conduits should be cleaned of loose materials such as concrete, mud, dirt, stones, etc."
46. Were all newly installed conduit joint surfaces cleaned prior to joining with a clean dry cloth? (NEMA TCB 2-2000)
47. Is there at least three inches of space on each side of duct banks in trenches? (NEMA TCB 2-2000)
48. Are the bottoms of trenches undisturbed, tamped, or relatively smooth earth? Where the excavation is in rock, the conduit should be laid on a protective layer of clean tamped backfill. (NESC Rule 321.A)
49. Are all solvent cements examined prior to usage to ensure that no sign of gelation is present? (NEMA TCB 2-2000)
50. Are solvents handled in a safe manner? (See ASTM F402, Standard Recommended Practice for Safe Handling of Solvent Cements Used for Joining Thermoplastic Pipe and Fittings)
51. Are thinners NOT used to return cement to its original viscosity? (NEMA TCB 2-2000)
52. Are burrs and ridges removed prior to joining? (NEMA TCB 2-2000)
53. Are cables permanently identified by tags or otherwise at each manhole or other access opening of the conduit system? (NESC Rule 341.b.3.a.(1)) (Also a TIA-606-A requirement.)
54. Are labels resistant to the environmental conditions at the point of installation (such as moisture, heat, or ultraviolet light), and do they have a design life equal to or greater than the labeled component (TIA/EIA-606-A Section 10.1.1)

Attachment C — Common Checklist Items for Above Ground OSP Infrastructure

SECTION I
Introduction

This document is designed to list the standards and important requirements that are unique to pathways installed above ground. Requirements that are common to both underground and above ground pathways are covered by Attachment B — Common Checklist Items for Underground Outside Plant (OSP) Infrastructure.

SECTION II
List of Standards

The following is a list of additional documents, to the documents already listed in the "**SSC San Diego Underground OSP Infrastructure Standard Requirements",** needed to ensure that the BLII OCONUS above ground OSP infrastructure will meet the requirements of the the Statement of Work and Best Industry Practices. When ANSI O5.1 is obtained, this list can be completed.

a. TIA-758-A, "Customer-Owned Outside Plant Telecommunications Infrastructure Standard", dated 5 May 2004
b. National Electrical Safety Code C2-2007
c. BICSI Telecommunications Distribution Methods Manual, 11th Edition, dated 2006
d. NFPA 70, National Electrical Code 2008
e. 2005 National Electrical Code Handbook (for protector block requirements clarification)

SECTION III
List of Common Checklist Items

1. Are the following minimum separations for communications cables met?

   NOTE: Below separation requirements are for typical situations for which the electrical supply conductors operate at less than 8.7 kilovolts. See the NESC for exceptions and applications at higher voltages.

:

Required Separation From ….	**Is…**
Power at a pole	1000 mm (40 in) below power supply services. (See 2007 NESC, Table 235-5.)
Power at mid-span (under conditions of maximum sag on power conductors)	750 mm (16 in) below power supply services. (See 2007 NESC, Rule 235.C.2.b(1).)

a. Required Clearances:

Required Clearance From …	**Is…**
Street and Driveway Surface …	4.7 m (15.5 ft) vertically. (See 2007 NESC, Table 232-1.)
Pedestrian Traffic	2.9 m (9.5 ft) vertically. (See 2007 NESC, Table 232-1.)
Rooftops	2.4 m (8 ft) vertically. (See 2008 NEC, Article 800.44(B).)

Railroad Tracks	7.2 m (23.5 ft) vertically from top of tracks. (See 2007 NESC, Table 232-1.)
Signs, chimneys, billboards, radio and television antennas, tanks, and other installations not classified as buildings or bridges.	0.9 m (3ft), except 1.4 m (4.5 feet) is required horizontally for the part of structure accessible to pedestrians. (See 2007 NESC, Table 234-1.)

2. Is the horizontal clearance between crossing or adjacent wires, conductors, or cables carried on different supporting structures not less than 1.50 m (5 ft)? (Exception: The horizontal clearance between anchor guys of different supporting structures may be reduced to 150 mm (6 in) and may be reduced to 600 mm (2 ft) between other guys, span wires, and neutral conductors meeting Rule 230E1.) (NESC Rule 233C2B1)
3. Where practicable, are communications wires and cable located below the electric light and power conductors? (NEC 800.44(A)(1))
4. Are communications wires and cables not attached to a cross-arm that carries electric light or power conductors? (NEC 800.44(A)(2))
5. Are electrical power supply wires of 0-750 volts running above and parallel to communications service drops at least 300 mm (12 in.) away from the communications cable at any point in the span, including the point of their attachment to the building, and are the live wires (nongrounded conductors) insulated, and is a clearance of not less than 1.0 m (40 in) maintained between the two services at the pole? (Based on NEC 800.44(A)(4))
6. Are primary protectors installed on interbuilding cables where cables are exposed to lightning? Interbuilding circuits are not considered to have a lightning exposure if one or more of the following conditions exist:
    a. Circuits in large metropolitan areas where buildings are close together and high enough to intercept lightning.
    b. Interbuilding cable runs of 42 m (140 ft) or less, directly buried or in underground conduit, where a continuous metallic cable shield or a continuous metallic conduit containing the cable is bonded to each building grounding electrode system.
    c. Areas having an average of five or fewer thunderstorm days per year and earth resistivity of less than 100 ohm-meters. Such areas are found along the Pacific coast of the United States. (Based on NEC 800.90(A) FPN No. 2.)
7. Where practicable, is a separation of at least 1.8 m (6 ft) maintained between communications wires and cables on buildings and lightning conductors? (NEC 800.53)
8. Is messenger wire (conductive) used to support aerial optical fiber cables grounded at four connections in each 1.6 km (1 mi)? NESC Section 9, Rule 92C1. The actual rule from the NESC is as follows:
"Messenger wires required to be grounded shall be connected to grounding conductors at poles or structures at maximum intervals as listed below:
    a. Where messenger wires are adequate for system grounding conductors (Rules 093C1, 093C2, and 093C5), four connections in each 1.6 km (1 mi).
    b. Where messenger wires are not adequate for system grounding conductors, eight connections in each 1.6 km (1 mi) exclusive of service grounds."
9. Is the spacing between messengers supporting communications cables not less than 30 mm (12 in) except by agreement between the parties involved? (2007 NESC Rule 235H.1) Note: "Normal spacing between communications cables is 300 mm (12 in) to allow a lashing machine to be pulled along one messenger without damaging the lashing wire on another messenger. Where space is at a premium, communications utilities can, by agreement, install cables closer than a 300 mm (12 in) spacing. This often requires moving a cable out on a temporary attachment arm to work on it."[15]
10. Are the clearances between the conductors, cables, and equipment of one communications utility to those of another, anywhere in the span, less than 100 mm (4 in), except by agreement between the parties involved? (NESC Rule 235H.1)

[15] NESC Handbook 5th Edition

11. Do dead-ends and corners in pole lines have guying to support the cable or wire facility? (Old TDMM requirement, still a requirement of sound engineering.)
12. Are all exposed guy wires either grounded or insulated as required? (See 2007 NESC, Rule 215.C.2)
13. When aerial entrances are used, is the span from the last pole to the building less than or equal to 30m (100 ft)? (TDMM requirement, Figure 6.12 of 11th Edition). Allows the use of a slack span. With no guying at either end. Helps to keep messenger from pulling part of the wall off or the vertical mast down. See TDMM, 11th Edition, Figures 6.10 and 6.11)
14. Does aerial cable enter the building through a conduit with an approved service head when raceway (includes a vertical mast) is used? (2008 NEC, Article 800.50(C))
15. When a cable entrance sleeve is placed through a building wall, does the raceway slope downward so that the outward end of the sleeve is 13 mm (0.5 in) below the inside end? (TDMM 11th Edition, Figure 6.13.) (Note: A downward slope is is required by the NEC (Article 800.50(C)) for raceways entering a building. When this cannot be done, drip loops are required in the cables immediately before the cables enter the building.)
16. Is conductive conduit used for a vertical mast, or any conduit or other metal raceway located ahead of the primary protector, grounded? (TDMM requirement for a vertical mast, Figure 6.12 of 11th Edition - and many other places. The TDMM has a nice picture. NEC Article 800.50(C) requires conduits or other metal raceways located ahead of the primary protector to be grounded,)

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Attachment D — Common Checklist Items for SPAWAR Electrical Power Installations

SECTION I
Introduction

This document is designed to list the standards and important requirements that are related to typical electrical power installations need to support SPAWAR C4ISR installations. This document only lists standards that might be used directly by the installation activity (or other activity) for Quality Assurance purposes.

SECTION II
List of Standards

The following is a list of the documents needed to ensure that the Electrical Power Installation for a project will meet the requirements of applicable standards and best industry practices.

a. ANSI/TIA/EIA-569-B, "Commercial Building Standard for Telecommunications"
b. ANSI/TIA/EIA-606-A, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings"
c. NFPA-70, "National Electrical Code" (2008 Version)

SECTION III
List of Common Checklist Items

1. Are electrical branch circuit line, neutral, and grounding conductors maintained close together (e.g. twisted, sheathed, taped, or bundled together) for minimizing inductive coupling into telecommunications cabling? (ANSI/TIA/EIA-569-B, Section 8.3.2.b) (NEC Article 300.20 (A) also requires this where conductors are installed in **ferrous** metal enclosures or raceways.)
2. Are the following NEC Article 240.4 overcurrent protection (fuse or circuit breaker size) requirements met?
   a. Circuits shall be protected against overcurrent in accordance with their ampacities specified in NEC Article 310.15, unless otherwise permitted or required in 240.4(A) through (G). Note: The ampacity of any given wire depends on the ambient air temperature, the wire's insulation, and the nature of the material (if any) surrounding the wire. The latest **software** edition of the Shore Installation Process handbook contains a spreadsheet that can be used to determine the ampacities of the most commonly used wire for SPAWAR Installations. The effect of higher temperatures on ampacity can be seen by clicking on the different tabs in the Excel spreadsheet. If you have higher temperatures the ampacity goes down. If you have a lot of wires in a conduit (which causes heat build-up) the ampacity goes down. The effect of many wires in a conduit can be seen by determining the appropriate adjustment factor by looking at the provided chart on the spreadsheet and then changing the value shown in red on the sheet with the tab labeled "30 Deg C". The Excel file has columns for wire with 60 degree C, 75 degree C, and 90 degree C insulation. The higher the temperature rating, the more current the wire can carry. (Conduit runs shorter than 2 feet don't require the derating of the ampacity. See NEC Article 310.15(B)(2)(a) Exception #3 on page 70-146. Sheet metal duct can carry up to 30 wires without a need for derating or an adjustment factor.)

b. "Unless specifically permitted in 240.4(E) or (G), (overcurrent protection (circuit breaker size)) shall not exceed 15 amperes for 14 AWG copper, 20 amperes for 12 AWG copper, and 30 Amperes for 10AWG copper." (The minimum size of conductors for general wiring, according to NEC Table 310.5 is #14 AWG.)

3. Does the percent of cross sectional area of any conduit/raceway filled by more than two conductors not exceed 40 percent? See NEC Chapter 9, Table 1 and Annex C. Pages 70-704 & 705 show that up to sixteen #12 AWG THHN wires may be placed in a 3/4" conduit where only 11 TW wires of the same AWG can go.
4. For sheet metal wireways, does the sum of the cross-sectional areas of all contained conductors at any cross section not exceed 20%? (NEC Article 376.22(A))
5. Do circuit breakers open all ungrounded conductors of the circuit unless otherwise permitted in NEC article 240.15(B)(1), (B)(2), and (B)(3)? (NEC article 240.15(B)) (Applies to two and three phase circuits like 208 VAC 2-phase circuits.)
6. Is the measured continuous load (According to NEC Article 100, a continuous load is a load where the maximum current is expected to continue for 3 hours or more.) on any circuit not greater than 80% of the circuit breaker rating unless the circuit breaker is listed for continuous use at that rating? (This is 16 amps for a 20 amp circuit breaker and 24 amps for a 30 amp breaker.) (See NEC Article 210.20(A) for details.)
7. Does the ampere rating of any cord-and-plug connected utilization equipment (like an UPS) not exceed 80% of the branch circuit ampere rating for 15, 20, and 30-ampere circuits? (NEC 210.23 (A) and (B))
8. When a single receptacle is installed at the end of a branch circuit, does it have an ampere rating not less than that of the branch circuit? (NEC 210.21(B)(1))
9. Are receptacles installed on 15 and 20 ampere circuits grounding type receptacles (NEC 406.3) properly installed so that all three wires are connected to the proper terminals? (Recommend use of pocket tester.)
10. Are the receptacle ratings for branch circuits in accordance with table 210.21(B)(3) of the NEC, Receptacle Ratings for Various Size Circuits?

Circuit Rating (Amperes)	Receptacle Rating (Amperes)
15	Not over 15
20	15 or 20
30	30
40	40 or 50
50	50

11. Is EMT conduit securely fastened in place at least every 3 m (10 ft). (NEC Article 358.30(A))
12. Is EMT conduit run between termination points securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other tubing termination?

Exception # 1: Fastening of unbroken lengths shall be permitted to be increased to a distance of 1.5m (5 ft) where structural members do not readily permit fastening within 900 mm (3 ft).

Exception #2; For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of EMT shall be permitted to be fished.

13. Is there no more than the equivalent of four quarter bends (360 degrees) in EMT conduit between pull points? (NEC Article 358.26)
14. Are bends in EMT made so that the tubing is not damaged and the internal diameter of the tubing is not effectively reduced. (NEC Article 358.24)
15. Are all Circuit Breakers legibly and durably marked to indicate their purpose. (NEC Article 110.22).
16. Are no cabinets placed so as to reduce the clearance in front of a circuit breaker panelboard to less than 900 mm (3 feet)? If the nominal voltage to ground is 151-600 volts (not very common for C4I Installations) and then the clearance must be at least 1 m (3 1/2 ft). (NEC Article 110.26(A)(1))

17. Are no cabinets placed so as to reduce the width of the working space in front of panelboards to less than the width of the panelboard or 750 MM (30 in.), whichever is greater? (NEC Article 110.26(A)(2))
18. Does the work space in front of all power panels and other electrical equipment enclosures at least a 90 degree opening of equipment doors or hinged panels. (NEC Article 110.26(A)(2))
19. Is each grounded conductor terminated within a panelboard terminated in an individual terminal that is not also used for another conductor? (NEC Article 408.41) (Don't attach two white wires to the same terminal. Exception – Grounded conductors of circuits with parallel conductors shall be permitted to terminate in a single terminal if the terminal is identified for connection of more than one conductor.)
20. Is each outlet box provided with a cover? (NEC Article 410.12)
21. Is "at least 150 mm (6 inches) of free conductor, measured at the point in the box where it emerges from its raceway or cable sheath, left at each outlet, junction, and switch point for splices or the connection of luminaires (fixtures) or devices." (NEC Article 300.14) (Does not apply to conductors that are not spliced or terminated. Where the opening to an outlet, junction or switch point is less than 200 mm (8 inches) in any dimension, each conductor shall be long enough to extend at least 75 mm (3 inches) outside the opening.)
22. Is liquidtight flexible metal conduit NOT used in spaces used for environmental air, including such spaces beneath computer decks? (NEC Article 300.22(C)(1) no longer permits this.) (NEC Article 300.22(C)(1) does not apply to spaces that meet the strict requirements for Information Technology Room as described in Article 645 per 300.22(D).)
23. Are all openings around electrical penetrations through fire-resistant-rated walls, partitions, floors, or ceilings firestopped using approved methods to maintain the fire resistance rating? (NEC Article 300.21)

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Attachment E — Common Checklist Items for Commercial Building Telecommunications Grounding

(FOR INSTALLATIONS WHERE MIL-STD GROUNDING REQUIREMENTS ARE NOT IMPOSED)

SECTION I
Introduction

This document is designed to list the standards and important requirements that are related to typical SPAWAR C4ISR indoor installations in buildings for which MIL-STD-188-124 grounding does not apply. MIL-STD-188-124B (with Notice 3) is the main governing document for grounding at Naval C4ISR facilities. MIL-STD-188-124B states in Section 1.3 that:

"It does not apply to general construction such as barracks, administration buildings, dining facilities, warehouses, and non-communications facilities, nor does it apply to mobile units such as tanks, trucks, jeeps, etc."

SECTION II
List of Standards

This document is based on the following standards:

a. ANSI/TIA/EIA-606-A-2002, "Administration Standard for Commercial Telecommunications Infrastructure", approved 16 May 2002, dated May 2002
b. ANSI-J-STD-607-A-2002, "Commercial Building Grounding (Earthing) and Bonding Requirements For Telecommunications dated October 2002

SECTION III
List of Common Checklist Items

1. In all buildings where the contractor installed telecommunications equipment, did the contractor procure and install a:
   a. Bonding Conductor for Telecommunications as defined in Section 5.3 of J-STD-607-A, unless this conductor already existed and was installed in accordance with J-STD-607-A. (This conductor connects the telecommunications main grounding busbar to the equipment grounding busbar at the electrical service entrance.)
   b. Telecommunications Main Grounding Busbar (TMGB) as defined in Section 5.2 of J-STD-607-A, unless this TMGB already existed and was installed in accordance with J-STD--607-A.
2. When the size of the building and the location of the equipment to be installed require it to meet the requirements of J-STD-607-A, did the installing activity install:
   a. A Telecommunications Bonding Backbone (TBB) -- unless the TBB already exists and has been installed in accordance with J-STD-607 or unless no TGBs are needed.
   b. As many new Telecommunications Grounding Busbars (TGBs) as needed to meet the requirements of J-STD-607-A. Each room where equipment was installed by the contractor should have either the TMGB or a TBB.

3. Is the TMGB labeled with a labeled in the format of fs-TMGB where fs is the identifier for the telecommunications space containing the TMGB (f identifies the floor and s uniquely identifies the space on that floor.)? (TIA/EIA-606-A, Section 5.1.3 & Figure 7)
4. Are TGBs labeled with the TGB identifier in the format fs-TGB? (TIA/EIA-606-A Section 5.1.4 & Figure 7)
5. Is the TMGB listed by a nationally recognized testing laboratory? (Obviously must be manufactured and tested by a professional organization. "Home-made" TMGBs are not allowed.) (J-STD-607-A, Section 5.2.5.1.d)
6. In a metal frame (structural steel) building, where the steel framework is readily accessible within (or external) to the room, is each TGB and TMGB bonded to the vertical steel frame using at least a #6 AWG conductor? (J-STD-607-A, Section 5.6.2 & 3))
7. Is the TMGB placed to best meet the following goals of J-STD-607-A Section 6.2? The TMGB should be located:
    a. In the telecommunications entrance facility
    b. To provide for the shortest and straightest path for the primary protector grounding conductor (for outside plant cables)
    c. As close as practicable to the panelboard (power panel) for telecommunications equipment
    d. So that the bonding conductor for telecommunications is as short and straight as possible.
8. Is the primary protector grounding conductor connected to the TMGB? (J-STD-606-A, Section 6.3.1)
9. Is a minimum of 300 mm (1 ft) separation maintained between the primary protector grounding conductor and any DC power cables, switchboard cable, or high frequency cables even when placed in rigid metal conduit or EMT? (J-STD-606-A, Section 6.3.1)
10. Is each telecommunications grounding and bonding conductor labeled with a request to notify the telecommunications manager if the cable is removed. (J-STD-607-A, Section 5.1.5.1)
11. Is each telecommunications grounding and bonding conductor green or marked with a distinctive green color? (J-STD-607-A, Section 5.1.5.2)
12. Is the TBB copper and does the size of the TBB meet the requirements in the following table from Figure 5.4.4.1 of J-STD-607A?

Sizing of the TBB

TBB Length Linear Meters (Feet)	TBB Size (AWG)
Less than 4 (13)	6
4 - 6 (14-20)	4
6 - 8 (21 - 26)	3
8 - 10 (27 - 33)	2
10 - 13 (34 - 41)	1
13 - 16 (42 - 52)	1/0
16 - 20 (53 - 66)	2/0
Greater than 20 (66)	3/0

13. Is the size of the bonding conductor for telecommunications at least as large as the TBB? (J-STD-607-A Section 5.3.2.
14. Did the contractor bond equipment to the nearest TGB or TMGB in accordance with the manufacturer's installation instructions. (The use of #6 AWG wire is often called for.)
15. Are all metallic raceways for telecommunications cabling located within the same room or space as the TGB or TMGB bonded to the TGB or TMGB? (J-STD-607-A, Sections 5.5.2.7 & 5.2.7.3)
16. Are TMGBs and TGBs insulated from their supports? (TIA/EIA-607, Sections 5.5.4.1 and 5.2.8.1)
17. When bonding conductors are placed in ferrous metallic conduit longer than 1 m (3 ft) is the conduit bonded to each end of the conduit with a minimum #6 AWG wire or a grounding bushing? (J-STD-607-A, Section 5.1.4)

NOTE: Grounding and bonding conductors should not be placed in ferrous metallic conduit.
18. Is the potential difference between the electrical safety and telecommunications grounds less than 1 volt? According to Section D.1.1 of Annex D of J-STD-607-A, “ANSI/TIA/EIA 568-B.1 - B.3 limits the potential difference between power and telecommunications ground references to a maximum of 1 volt for shielded/screened cable applications.”

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Attachment F— Common Checklist Items for Commercial Building Antenna Grounding

(FOR INSTALLATIONS WHERE MIL-STD GROUNDING REQUIREMENTS ARE NOT IMPOSED)

SECTION I
Introduction

This document is designed to list the standards and important requirements that are related to typical SPAWAR C4ISR outdoor antenna installations in buildings for which MIL-STD-188-124 grounding does not apply. MIL-STD-188-124B (with Notice 3) is the main governing document for grounding at Naval C4ISR facilities. MIL-STD-188-124B states in section 1.3 that:

"It does not apply to general construction such as barracks, administration buildings, dining facilities, warehouses, and non-communications facilities, nor does it apply to mobile units such as tanks, trucks, jeeps, etc."

SECTION II
List of Standards

This document is based on the following standards:

a. ANSI/NFPA-70, "National Electrical Code" (2008 Version)
b. NFPA 780, "Standard for the Installation of Lightning Protection Systems (2008 Edition)

SECTION III
List of Common Checklist Items

1. Are there at least two paths to ground (and more if practical) from the antenna tower lightning rod(s) (also called an air terminal or strike termination device). (NFPA 780 Annex B, Article B.4.2)
2. For structures exceeding 18 m (60 feet) in height, is the interconnection of the lightning protection system ground terminals and other grounded media in the form of a ground loop conductor? (NFPA 780 Article 4.20.1.2)
3. Are all grounding media and buried metallic conductors that can assist in providing a path for lightning currents in or on a structure interconnected to provide a common ground potential? (This interconnection shall include lightning protection, electric service, telephone, and antenna system grounds as well as underground metallic piping systems.) (NFPA 780-16 Article 4.14.1/4.14.1.1.)
4. Are main size grounding conductors utilized for interconnecting other grounding systems to the lightning protection system. (NFPA 780, Article 4.14.1.4) Note: Minimum Class I material (for ordinary structures under 75 feet) requirements for copper cable are minimum strand size of 17

AWG and a cross sectional area of 57,400 circular mils. (For practical purposes, in the USA this means #2 AWG which is 66,360 circular mils.)

5. Are Surge Protection Devices (SPDs) provided for all signal, data, and communications lines (not counting all-dielectric fiber) at facility entrances. (NFPA 780-16, Article 4.18.6.1)
6. Are SPD components:
    1. Not grounded through a down conductor of the lightning protection system (NFPA 780 Article 4.18.6.3.4)
    2. Accessible for inspection and maintenance? (NFPA 780 Article 4.18.7.4)
    3. Providing common mode protection (NFPA 780 Article 4.18.6.3.5)
    4. Located and installed so as to minimize lead length (NFPA 780 Article 4.18.7.2)
    5. Protected with consideration for the operational environment and according to the manufacturer's instructions (NFPA 780 Article 4.18.9.1)
    6. Bonded to the point of grounding of the electrical service and, if this point is greater than six meters (20 feet) away, is a supplementary earth electrode or electrode system installed at the SPD location? (NFPA 780 Article 7.18.6.3.1 and 2)
7. Are new lightning down conductors not just terminated at the electrical power ground rod?

DISCUSSION

If you install lightning rods on a building with AC Power, you can't use the ground rod for the electrical power or the one for telecommunications in lieu of putting in a dedicated ground rod for the lightning system.

NFPA 780 (the 2004 edition) states in Section 4.13.1.1 that "Each down conductor (these are the conductors coming down from the lightning rods (air terminals) pointed to the sky) shall terminate at a grounding electrode (this is the ground rod driven into the earth) dedicated to the lightning protection system."

Section 4.13.1.3 of NFPA-780 states that "Underground metallic piping, electrical System and telecommunications grounding electrodes shall not be used in lieu of lightning ground electrodes; this provision shall not prohibit the required bonding together of these items … .

Article 250.60 of the National Electrical Code states that "Air terminal conductors and driven pipes, rods, or plate electrodes used for grounding air terminals (lightning rods) shall not be used in lieu of the grounding electrodes required by 250.50 for grounding wiring systems and equipment. This provision shall not prohibit the required bonding together of grounding electrodes of different systems.

8. Are metal antenna masts or supports located on a protected structure (one with lightning rods) connected to the lightning protections system using main-size conductors and listed fittings unless they are in a zone of protection? (NFPA 780, Section 4.17)
9. Are receiving antenna discharge units grounded at (See NEC 810.20(C).) the building or structure Intersystem Bonding Termination provided external to enclosures at the (electrical) service equipment in accordance with NEC Article 250.94 when the building has an Intersystem bonding Termination? If the building does not have an Intersystem Bonding Termination, is the grounding conductor connected to the nearest accessible location on the following: .
    a. The building or structure grounding electrode system as covered in NEC Article 250.50 (Typically the electrical system's ground rod.)
    b. Other Ground locations listed in NEC Article 810.21(F)(1) and NOT INCLUDING LIGHTNING ROD DOWN CONDUCTORS.
10. Is the grounding conductor for antenna discharge units not smaller than #10AWG copper? (NEC Article 810.21(H))
11. Is a bonding jumper not smaller than 6 AWG copper or equivalent connected between the radio or Television equipment grounding electrode and the power grounding electrode system where separate electrodes are used? (NEC Article 810.21(J))

12. Is the outer conductive shield of coaxial cable grounded at the building premises as close to the point of cable entrance as practicable (NEC Article 820.93(A)) with a 14 AWG grounding conductor or larger if needed to make the current carrying capacity of the conductor approximately equal to the cable? (NEC Article 820.100(A)(3))

Note: NEC Article 820.93(A) of the 2005 NEC stated that "Where the outer conductive shield of a coaxial cable is grounded, no other protective devices shall be required." This was removed from the 2008 version of the NEC. The IDP or manufacturer's recommendation should require surge suppression in accordance with NFPA 780.

13. Is the following requirement of NEC Article 820.44(F) met for coaxial antenna cables outside of buildings:

"Where attached to buildings, cables shall be securely fastened in such a manner that they will be separated from other conductors in accordance with 820.44(F)(1), (F)(2), and (F)(3).

a. Electric Light or Power. The coaxial cable shall have a separation of at least 100 mm (4 in.) from electric light, power, Class 1, or non-power limited fire alarm circuit conductors not in a raceway or cable, or shall be permanently separated from conductors of the other system by a continuous and firmly fixed nonconductor in addition to the insulation on the wires.

b. Other Communications Systems. Coaxial cable shall be installed so that there will be no unnecessary interference in the maintenance of the separate systems. In no case shall the conductors, cables, messenger strand, or equipment of one system cause abrasion to the conductors, cable, messenger strand, or equipment of any other system.

c. Lightning Conductors. Where practicable, a separation of at least 1.8 m (6 ft.) shall be maintained between any coaxial cable and lightning conductors."

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Attachment G— Fiber Optic Cable Color Code Chart

Position Number	Fiber strand Color Per TIA-598-C	TIA-598-C Color Abbreviation	SPAWAR Classic Color Abbreviation
1	Blue	BL	BLU
2	Orange	OR	ORN
3	Green	GN	GRN
4	Brown	BR	BRN
5	Slate	SL	SLT
6	White	WH	WHT
7	Red	RD	RED
8	Black	BK	BLK
9	Yellow	YL	YEL
10	Violet	VI	VIO
11	Rose	RS	ROS or PNK
12	Aqua	AQ	AQU or TUR
13	Blue with Black Tracer	D/BL	BLU/BLK
14	Orange with Black Tracer	D/OR	ORN/BLK
15	Green with Black Tracer	D/GR	GRN/BLK
16	Brown with Black Tracer	D/BR	BRN/BLK
17	Slate with Black Tracer	D/SL	SLT/BLK
18	White with Black Tracer	D/WH	WHT/BLK
19	Red with Black Tracer	D/RD	RED/BLK
20	Black with White Tracer	D/BK	BLK/WHT
21	Yellow with Black Tracer	D/YL	YEL/BLK
22	Violet with Black Tracer	D/VI	VIO/BLK
23	Rose with Black Tracer	D/RS	ROS/BLK
24	Aqua with Black Tracer	D/AQ	AQU/BLK
25	Blue with Double Black Tracer	DD/BL	-
26	Orange with Double Black Tracer	DD/OR	-
27	Green with Double Black Tracer	DD/GR	-
28	Brown with Double Black Tracer	DD/BR	-
29	Slate with Double Black Tracer	DD/SL	-
30	White with Double Black Tracer	DD/WH	-
31	Red with Double Black Tracer	DD/RD	-
32	Black with Double White Tracer	DD/BK	-
33	Yellow with Double Black Tracer	DD/YL	-
34	Violet with Double Black Tracer	DD/VI	-
35	Rose with Double Black Tracer	DD/RS	-
36	Aqua with Double Black Tracer	DD/AQ	-

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Attachment H — Common Data Rate Information

OPTICAL CARRIER DATA RATE INFORMATION				
Optical Level	Electrical Level	Data Transmission Rate (Mbps)	Payload Transmission Rate (Mbps)	Overhead Transmission Rate (Mbps)
OC-1	STS-1	51.84	50.112	1.728
OC-3	STS-3/STM-1	155.52	148.608	6.912
OC-3c		155.52	149.76	5.76
OC-12	STS-12/STM-4	622.08	601.344	20.736
OC-48	STS-48/STM-16	2,488.32	2,405.376	82.944
OC-96	STS-96/STM-32	4,976.64	4,810.752	165.888
OC-192	STS-192/STM-64	9,953.28	9,621.504	331.776
OC-768	STS-768/STM-256	39,813.12	38,486.016	1,327.104

Go to http://www.iec.org/online/tutorials/sonet/topic01.html for a SONET tutorial.

T-CARRIER DATA RATE INFORMATION				
Signal Level	Number of 64 kbps Channels	Data Transmission Rate (Mbps)	Max Channelized Payload Transmission Rate (Mbps)	Overhead Transmission Rate (Mbps)
DS-1	24	1.544	1.536	0.008
DS-3	672	44.736	43.008	1.728
DS-4	4032	274.176	258.048	16.128

ISDN DATA RATES			
Type of Interface	Channel Grouping Type	Number of Combined 64 kbps Channels	Maximum Data Transmission Rate (Mbps)
BRI	Bonded	2 B channels	0.128
PRI	H0	6 B channels	0.384
PRI	H10	23 B channels	1.472
PRI	H11	23 plus one D channel	1.536

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Attachment I — Index

This index covers the text of the main document more thoroughly than the attachments. This reduces the index size and helps to allow NMCI machines to cope with the file.

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Attachment J — RED/BLACK Installation Physical Separation Recommendations

1. *Purpose*

The purpose of this attachment is to provide practical guidance to installation designers trying to develop installation designs that meet the guidance of **Section 3** of NSTISSAM TEMPEST /2-95 with NSTISSAM TEMPEST/2-95A Amendment of 3 February 2000, which will be referred to in the remainder of this document as NSTISSAM TEMPEST 2-95A. This attachment provides guidance in addition to NSTISSAM TEMPEST 2-95A to ensure compliance with current PDS guidance and SPAWAR policy, provides guidance on how to find the information that NSTISSAM TEMPEST 2-95A requires to determine physical separation requirements, and points out when the NSTISSAM guidance refers to equipment zones or levels that equipment has not been assigned to. This attachment also presents the NSTISSAM TEMPEST/2-95A recommendations A through I in a condensed format. This attachment is also designed to facilitate a more consistent implementation of RED/BLACK installation guidance across the SPAWAR installation competency.

2. *Relationship to OPNAVINST C5510.93F*

Installation designers planning to install RED equipment should be familiar with the both the classified and unclassified guidance provided in OPNAVINST C5510.93F. OPNAVINST C5510.93F states in Encl (1), section 4.d that:

"Personnel involved with the design, development or procurement of communication, encryption or radio frequency transmitters systems which will process National Security Information (i.e., secure voice, secure telemetry, secure data transmission) shall request a review by a DON Certified TEMPEST Technical Authority (CTTA) to determine if and what TEMPEST requirements must be implemented. This includes systems which will be operated in ships, shore stations, manned or unmanned aircraft, missiles and mobile platforms. **As a minimum, systems of these types will require RED/BLACK installation in accordance with reference (k).**"

(Reference (k) is NSTISSAM TEMPEST/2-95.) (We realize that the “as a minimum” part of the above statement seems to conflict with the part of the statement that indicates that the CTTA review will determine “if and what” TEMPEST requirements will be implemented. The CTTA does have broad discretionary authority.)

3. *Drawing Requirements*

In order for an Installation Design Plan (IDP) to be approved by SPAWAR, an IDP shall completely conform to the applicable NSTISSAM TEMPEST 2-95A recommendation (per its Table 3-1) unless a letter is provided from the CTTA indicating that total conformance to the recommendations in NSTISSAM TEMPEST 2-95A is not required. In these cases, the date of the letter, the name of the CTTA, and the RED/BLACK criteria required by the CTTA should be identified in notes on the appropriate drawings (typically floor plans and elevations). See SIPH Appendix AC for more guidance.

4. *Determining RED/BLACK Separation Recommendation Applicability*

NSTISSAM TEMPEST 2-95A contains nine sets of RED/BLACK separation requirements, Recommendations A through I. (**Note: Recommendations B and C are the same except for typos.**) The set that applies depends upon:

a. Whether the facility has a TEMPEST zone rating
b. If the facility does not have a TEMPEST zone rating, the radius of the inspectable space surrounding the installation location
c. The TEMPEST zone rating (or TEMPEST certification/profile) of the equipment to be installed

4.1 Determining Facility TEMPEST Zone Ratings

TEMPEST zone information for facilities should be available from the Information System Security Managers assigned to them. According to OPNAVINST C5510.93F, enclosure (1), Information System Security Managers (ISSMs) are responsible for "Maintaining TEMPEST zone maps of facilities under their cognizance when applicable."

Note: According to CJCSM 6510.01 of 25 March 2003 (A-A-4 Appendix A Enclosure A) Section 3, the term "information assurance manager (IAM)" is replacing the term "information system security manager (ISSM)" within the Department of Defense.

4.2 Determining Inspectable Space

Determining the extent of inspectable space is required for installation sites that have not been TEMPEST zoned. Inspectable space is defined in NSTISSAM TEMPEST/2-95 as "The three dimensional space surrounding equipment that processes classified and/or sensitive information within which TEMPEST exploitation is not considered practical or legal authority to identity and/or remove a potential exploitation exists." According to OPNAVINST C5510.93F, "The inspectable space for facilities is determined by a Certified TEMPEST Technical authority." See OPNAVINST C5510.93F for additional guidance in this area.

4.3 Determining Equipment TEMPEST Zone Rating or Equivalent

Note: This only needs to be done for the RED equipment that requires the most stringent equipment zone recommendations (the weakest link(s) in the system) because NSTISSAM TEMPEST/2-95A states that "When installing a system that contains equipment with multiple zone ratings, the system should be installed in compliance with the most stringent equipment zone recommendations."

NSTISSAM TEMPEST/2-95A often refers to equipment TEMPEST zone rating, but there are no zoned equipment products at this time, according to the NSA web site. (last checked, 5 January 2009 at http://www.nsa.gov/ia/industry/tempest/zonedEquipment.cfm?MenuID=10.3.1.1.4).
NSTISSAM TEMPEST/2-95A states, "Equipment TEMPEST zone ratings should be used if available. … If an equipment has not been TEMPEST zoned and no TEMPEST profile data is available, the "All Other RED Equipment" category should be used." The "other TEMPEST profile data" referred to in the previous quote is data that shows that the product complies with the requirements of the National TEMPEST Standard (NSTISSAM TEMPEST/1-92, Compromising Emanations Laboratory Test Standard, Electromagnetics, dated 15 December 1992).

4.3.1 NSA TEMPEST Data Research

TEMPEST profile data can sometimes be obtained from the National Security Agency (NSA) Certified TEMPEST Products List (CTPL) for Level I or II. These two lists are lists of commercially developed and produced TEMPEST telecommunications equipment which NSA has certified, under the auspices of the NSA Certified TEMPEST Products Program (CTPP), for use by Government entities and their contractors to process classified U.S. Government information. These lists are available from http://www.nsa.gov/ia/industry/tempest/Level1Endorsed.cfm?MenuID=10.3.1.1.1 and from http://www.nsa.gov/ia/industry/tempest/Level2Endorsed.cfm?MenuID=10.3.1.1.2.
According to the NSA website, these are lists of commercially developed and produced TEMPEST telecommunications equipment which NSA has certified, under the auspices of the NSA Certified TEMPEST Products Program (CTPP), for use by Government entities and their contractors to process classified U.S. Government information. NSA certification is a statement that the company has successfully demonstrated to NSA that its product complies with the requirements of the National TEMPEST Standard, NSTISSAM TEMPEST/1-92, Compromising Emanations Laboratory Test Standard, Electromagnetics, dated 15 December 1992.

4.3.2 Researching Manufacturers' TEMPEST Claims

Manufacturer's data sheets can also be used to provide evidence that equipment meets NSTISSAM 1/92 level I or II requirements. The National Security Agency (NSA) Certified TEMPEST Products List (CTPL) Level I list did not include cryptos such as the TACLANE™-Micro (KG-175D) which the

manufacturer claims to be "In accordance with NSTISSAM TEMPEST/1-92 Level 1" at http://www.gdc4s.com/documents/TACLANE_Micro_PIB.pdf. It also did not list the TEMPEST Large Group system version of the Polycom VSX 8000 Videoconferencing system, the DTD-8400-T (See http://www.cissecure.com/tempest/data%20sheets/Tempest%20Large%20Group%20Videoconferencing%20DTD-8400-T%20data%20sheet.pdf.) Designers should not blindly accept claims at face value when equipment does not appear on the NSA's lists. Manufacturers should be asked to provide evidence that the testing was conducted by an NSA certified test services facility. According to its web site, "NSA provides a listing of commercial TEMPEST test services facilities that NSA has certified under the auspices of the Certified TEMPEST Test Services Program. The listing is for use by U.S. Government departments and agencies, U.S. Government contractors, and eligible TEMPEST product manufacturers to conduct TEMPEST testing related to the development and production of TEMPEST products."

4.3.3 Installation Requirements Drawing (IRD) Package Information

If an IRD has been developed for a system, RED/BLACK requirements should be identified in the System Elevation Drawings provided in the IRD package as required in Section 3.3.6 of the SPAWAR IRD standard. Since site unique attributes cannot be identified in an IRD that will apply to many sites, the IRD should identify the TEMPEST certifications or zone ratings of the system/equipment.

4.4 Determining the Appropriate NSTISSAM TEMPEST/2-95 Recommendation

As previously mentioned, NSTISSAM TEMPEST/2-95A states that "When installing a system that contains equipment with multiple zone ratings, the system should be installed in compliance with the most stringent equipment zone recommendations." The NSTISSAM document goes on to state, "For example, if a system containing equipment rated Zone A, Zone B and Zone C is to be installed in a Facility Zone C space, the entire system should be installed to meet equipment Zone C recommendations." For many, if not most, systems currently being installed by SPAWAR, this means that the entire system should be installed to meet the recommendations for Zone C equipment. Once the Zone Rating (or equivalent NSTISSAM TEMPEST /1-92) and the Facility TEMPEST Zone Rating (or the radius of the inspectable space) have been determined, Table 3-1 of NSTISSAM TEMPEST/2-95A can be used to easily determine the appropriate RED/BLACK installation recommendation. Table 1 is a copy of NSTISSAM TEMPEST 2/95A Table 3-1 basically modified to eliminate grammatical errors and provide a little more clarity.

5. Effect of NSTISSAM TEMPEST/2-95 Recommendation Letter on Requirements

Table 2 shows the separation distances contained in each of the nine recommendations. The most stringent recommendations are highlighted in yellow. Table 3 shows the distribution vehicle requirements contained in each of the nine recommendations. The table shows that the distribution vehicle requirements are identical for each recommendation. Table 4 provides Shielded Cable and Power Line Requirement Applicability for different RED/BLACK Installation Recommendations in NSTISSAM TEMPEST/2-95A. A "YES" indicates that the requirement listed to the right applies to the recommendation letter shown above, and a "No" indicates the opposite.

6. NSTISSAM TEMPEST/2-95 Guidance not Affected by Recommendation Letter Assignment

NSTISSAM TEMPEST/2-95 contains some guidance that is not covered or affected by the recommendation letter that applies to the installation. The following paragraphs discuss some of this guidance, but installation designers planning to install RED equipment need to be aware of the entire contents of the standard. The following examples are provided as examples of significant guidance in NSTISSAM TEMPEST/2-95 is not affected by the TEMPEST Zoning of either the equipment being installed or of the installation location.

6.1 Patch Panel Jack Fields

According to NSTISSAMTEMPEST/2-95A, section 4.5.2, "Jack fields should have incompatible connectors to prevent inadvertent RED to BLACK patching."

6.2 Grounding Pigtails for Connector Shields

According to NSTISSAMTEMPEST/2-95A, section 4.4.1.2, “If pigtail termination is required, the pigtail should be as short as possible and should be bonded to a low impedance radio frequency ground such as ground, plate, chassis or wide ground bus. A long slender ground wire is not an effective RF ground and can instead be an effective antenna. “

6.3 Power Distribution

According to NSTISSAMTEMPEST/2-95A, section 4.7.1, “Adequate internal filtering permits use of BLACK power for Level I 'TEMPEST compliant equipment and systems.” This section also states, “RED power distribution must be designed such that neither BLACK equipment nor utility equipment is connected to it. The design and installation of power systems require Judicious selection of the primary and auxiliary power sources, uninterruptible power supplies (UPS) or other power conditioning equipment, secondary substations, protective measures, and the distribution system to attain the maximum overall system performance with the most cost-effective design” and “When the facility transformer is located within the inspectable space and draws an average load of 100 kilovolt-amperes (kva) or more, filtering the ac power is not required.”

6.4 Paging, Intercom, and Public Address Systems.

According to NSTISSAMTEMPEST/2-95A, section 4.7.1, “In addition to being a possible fortuitous conductor of TEMPEST emanations, the speakers in paging, intercom and public address systems can act as microphones and retransmit classified audio discussions out of the controlled area via the signal line distribution. This microphonic problem could also allow audio from higher classified areas to be heard from speakers in lesser classified areas. Ideally, such systems should not be used. Where deemed vital, the following precautions should be taken in full or in part to lessen the risk of the system becoming an escape medium for NSI.

- Systems should be totally contained within the inspectable space.
- Voice frequency, lowpass filters should be installed on all cables if they are not totally contained within the inspectable space. This protects against TEMPEST signals on the cables but does not protect against voice modulation of the speakers.
- Equipment should meet the separation recommendations of Section 3.
- Amplifiers should be considered for speakers in higher classified areas to provide reverse isolation to prevent audio from being heard in lesser classified areas.”

FACILITY RATING → / EQUIP. RATING ↓	**FACILITY ZONE A** OR INSPECTABLE SPACE LESS THAN 20 METERS SEE NOTE 1 BELOW.	**FACILITY ZONE B** OR INSPECTABLE SPACE GREATER THAN 20 METERS BUT LESS THAN 100 METERS	**FACILITY ZONE C** OR INSPECTABLE SPACE GREATER THAN 100 METERS
EQUIPMENT MEETS NSTISSAM 1/92 LEVEL I OR ZONE A	RECOMMENDATION A	RECOMMENDATION D	RECOMMENDATION G
EQUIPMENT MEETS NSTISSAM 1/92 LEVEL II ZONE B	RECOMMENDATION B SEE NOTE 2 BELOW.	RECOMMENDATION E	RECOMMENDATION H
ALL RED EQUIPMENT THAT DOES NOT FIT INTO THE ABOVE CATEGORIES	RECOMMENDATION C SEE NOTE 2 BELOW.	RECOMMENDATION F SEE NOTE 2 BELOW.	RECOMMENDATION I

NOTE 1: *Additional precautions may be necessary if inspectable space is less than 8 meters or common wall situations exist.*

NOTE 2: *This installation may create TEMPEST hazards.*

IMPORTANT!

The CTTA has responsibility for conducting or validating TEMPEST reviews and recommending TEMPEST countermeasures, including RED/BLACK installation measures. There should be no commitment of funds without CTTA concurrence. Failure to consult the CTTA could result in installation of unnecessary and/or expensive countermeasures or the omission of needed countermeasures.

Table 1: Clarified NSTISSAM TEMPEST/2-95A Table 3-1, *RED/BLACK Installation Recommendations*

Table 2 - Required Separation Distances For Different RED/BLACK Installation Recommendations in NSTISSAM TEMPEST/2-95A

	Installation Recommendation Letter								
Installation Requirement	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Required Separation in centimeters between RED Processors and:									
BLACK Equipment	50	100	100	None	50	100	None	None	50
BLACK wire lines that exit the Inspectable Space	50	100	100	50	100	100	50	50	100
BLACK wire lines that are connected to an RF transmitter	50	100	100	50	100	100	50	50	100
BLACK power lines	50	100	100	50	100	100	None	None	None
BLACK power lines connected to an RF Transmitter	Included as a subset of black power lines above.						50	50	100
Fortuitous Conductors that Exit the Inspectable Space	50	100	100	None	None	100	None	None	None
Required Separation in centimeters between any RED lines and:									
BLACK Wire Lines that Exit the Inspectable Space or are connected to an RF transmitter but are not parallel to them for More than 30 Meters	5	5	5	5	5	5	5	5	5
BLACK Power Lines not Parallel for More than 30 Meters	5	5	5	5	5	5			
BLACK Power lines connected to an RF transmitter and not parallel for more than 30 meters.							5	5	5
BLACK Wire Lines with a minimum separation distance shown above that are Parallel for More than 30 Meters	15	15	15	15	15	15	15	15	15
BLACK Power Lines with a minimum separation distance stated above that are Parallel for More than 30 Meters	15	15	15	15	15	15	15	15	15

Table 3 - Distribution Vehicle Requirement Applicability For Different RED/BLACK Installation Recommendations In NSTISSAM TEMPEST/2-95A (A "YES" indicates that the Requirement Listed to the Right Applies)

Installation Requirement	Installation Recommendation Letter								
	A	B	C	D	E	F	G	H	I
Distribution Vehicle Requirements. Does the NSTISSAM TEMPEST document require that:									
RED and BLACK wire lines should not use a common distribution vehicle.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RED and BLACK optical fiber lines may use a common distribution vehicle provided that: RED and BLACK optical fiber lines are not mixed within a multifiber cable; when a BLACK optical fiber cable is used in a RED distribution vehicle, there should be an opaque dielectric sheath covering each fiber and there should be no metallic stiffeners or metallic sheath in the BLACK optical fiber cable. When a RED optical fiber cable is used in a BLACK distribution vehicle, in addition to the above, the RED optical fiber cable must be separated from the BLACK distribution vehicle at the point where the BLACK distribution vehicle exits the inspectable space. If the RED optical fiber cable exits the inspectable space, it must be provided appropriate protection (encryption, protected distribution systems [PDS]). (See note in box over columns on the right showing that this is not consistent with the PDS standard, IA PUB-5239-22/October 2003.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The PDS Requirement from IA PUB-5239-22/October 2003 is more stringent than what is required by NSTISSAM/TEMPEST/2-95. IA PUB-5239-22/October 2003 states:

"3.3.1. A PDS for shore facilities shall be installed in compliance with Section 6. The PDS shall originate in a SR or CAA and terminate in a SR, CAA, or RAA. The PDS shall not traverse an UAA. The PDS terminal equipment shall be installed in a SR, CAA or RAA. The physical security manager for the PDS shall determine which areas constitute a SR in accordance with reference (d). In addition, the physical security manager will identify which areas, through which the PDS will run, are considered CAAs, RAAs or LAAs. The PDS Certification Authority shall validate these determinations." (See definitions for SR, CAA, RAA, UAA in IA PUB-5239-22/October 2003.)

An LAA could fit the definition of "inspectable space", but according to IA PUB-5239-22, Section 2.3, a Limited Access Area (LAA) is defined as:

"A physical area (e.g., a military base in the U.S.) that is under direct U. S. physical control and to which only authorized personnel are admitted. Access is not usually based on clearance level but rather on the presentation of an approved credential (e.g., picture badge with or without other technologies such as magnetic strip, bar code, etc.; visitor pass issued after verification of picture identification, etc.). Verification can be via guard inspection or electronic processing. Within the LAA a PDS is always required. The PDS will not terminate within a LAA."

Table 4 - Shielded Cable and Power Line Requirement Applicability For Different RED/BLACK Installation Recommendations in NSTISSAM TEMPEST/2-95A (A "YES" indicates that the Requirement Listed to the Right Applies to the Recommendation Letter Shown Above)

Installation Requirement	Installation Recommendation Letter								
	A	B	C	D	E	F	G	H	I
Shielded Cable Requirements.									
Red Processors meeting the requirements of NSTISSAM TEMPEST/ 1-92 (Levels 1, 11(sic) or III) must use optical or shielded wire cables if specified as part of the manufacturer's installation specification, or if specified for compliance with TEMPEST certification.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RED wire cables should be shielded and insulated overall.	Yes	Yes	Yes	No	No	No	No	No	No
Power Line Requirements.									
Power Lines should be contained within the inspectable space whenever the average power load is less than 100 KVA. If this is not possible, the CTTA must conduct a review to determine whether power line filters should be recommended. For existing facilities, the CTTA may request a TEMPEST test be performed to assist in arriving at the recommendations.	No	Yes	Yes	No	Yes	Yes	No	No	Yes
RED processors should not be powered from the same circuits as RF transmitters or BLACK equipment with signal lines that exit the inspectable space, except when either the the RED equipment or the RF transmitters and BLACK equipment with signal lines that exit the inspectable space are equipped with powerline filters.	No	Yes	Yes	No	Yes	Yes	No	No	Yes
RED Processors should be separated from RF transmitters by a minimum of 3 meters.	No	Yes	Yes	No	Yes	Yes	**No***	Yes	Yes

*** See Table 2 showing that equipment should be separated from power lines to these transmitters by 50 centimeters. SPAWAR recommends maintaining a 3 meter separation, or as much separation as practical, from RF transmitters in this situation.**

Appendix AD – SPAWAR Regional Divisions

1. Regional Divisions:

SPAWAR has two engineering field activities; SPAWAR Systems Center (SSC) Atlantic and SSC Pacific. Correspondingly, two Installation Management Offices (IMO), one for Atlantic and one for Pacific were established to oversee and manage installations performed by SPAWAR employees or a SPAWAR contractor. The division of responsibility is principally based upon a geographical allocation. The western part of the United States, and all U.S. territories and foreign countries throughout the Pacific, Australia, and Asia are assigned to SSC Pacific for installation management. The eastern part of the United States, and all U.S. territories and foreign countries throughout the Atlantic, South America, Europe, Middle East, and Africa are assigned to SSC Atlantic for installation management.

For SPAWAR purposes the world is further divided into regions. Each region is assigned a Regional Shore Installation Manager (RSIMs) who is responsible for the quality, schedule, and cost of shore installations within that region. SPAWAR assigns RSIMs to be the single point of customer contact for installations within specific regions. Some RSIMs may have multiple regions and some regions may have more than one RSIM. The decision on how many RSIMs and where they are located is based upon regional work load. The SPAWAR regional divisions are illustrated in Figure AD-1 and are defined as follows:

- Pacific Far East (PFE)
- Pacific Mid Pac (PMP)
- Pacific West Pac (PWP)
- Pacific North West (PNW)
- Pacific South West (PSW)
- Atlantic North East (LNE)
- Atlantic Mid Atlantic (LMA)
- Atlantic South East (LSE)
- Atlantic National Capitol (LNC)
- Atlantic Southern Command (LSC)
- Europe North (EUN)
- Europe Mediterranean (EMD)
- Central Command (CEN)
- Africa Command (AFR)

The Shore Installation Process is designed so that other “non-SPAWAR” activities can also use it to execute and manage their shore installations. Non-SPAWAR activities may choose different regional divisions, but the intent is to establish single points of contact

within each region that customers can trust to quickly resolve installation issues and the IA can use to implement and manage common process and consistent quality across all installations.

2. Treatment of Classified Locations:

Installations involving systems that process information considered Secret, Top Secret, or even SCI when used in the operational environment, can still be identified in the Work Plan and assigned to PEs holding the required clearances. If a project, system name, or even a location is classified, then only sanitized information can be entered into the Work Plan. For example, a project/system may be identified by an unclassified name or program title, and a classified location may be assigned to a generic region, e.g. LXX, PXX, and EXX and the site name listed as “classified”.

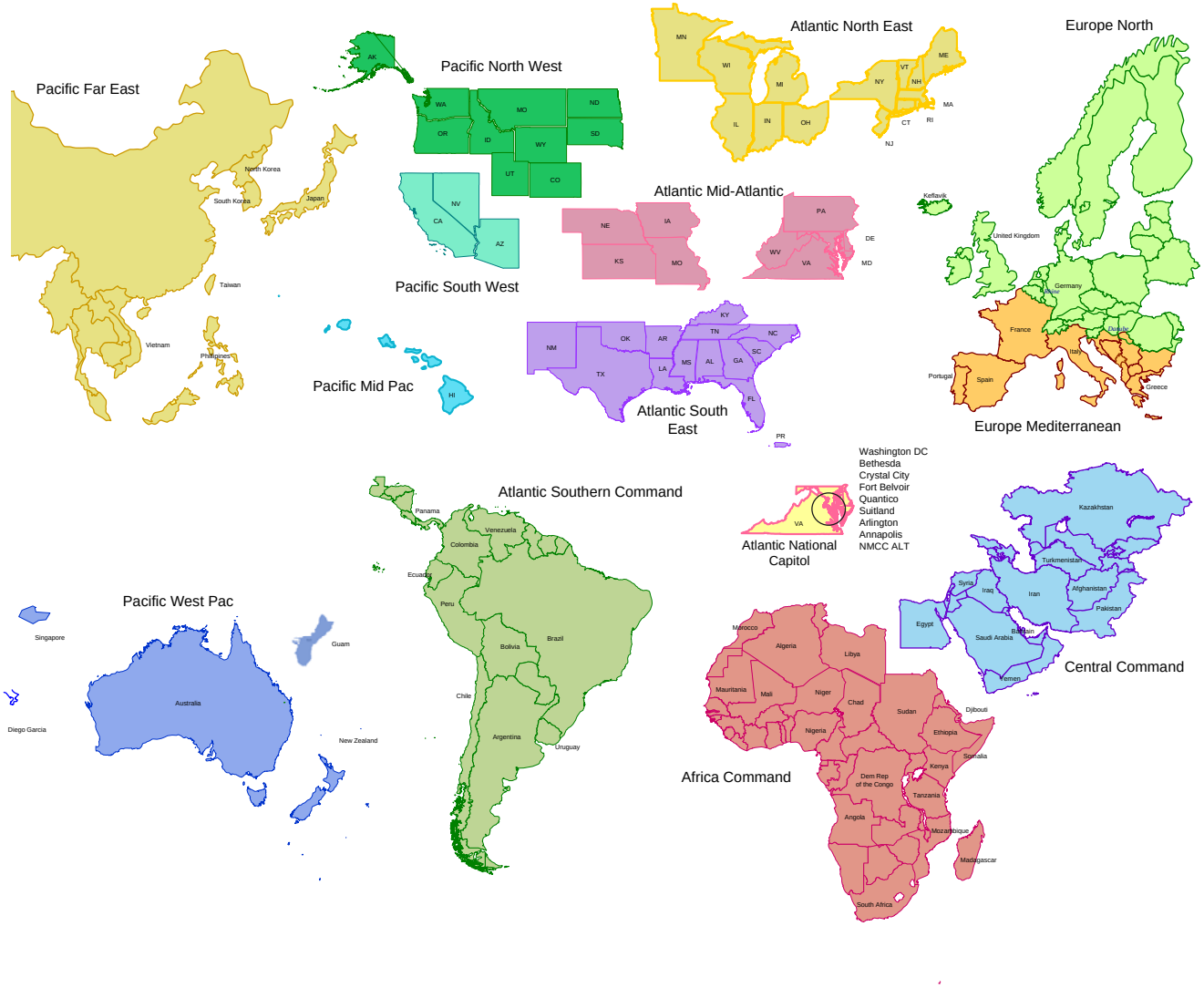

Figure AD-1. SPAWAR Regional Divisions