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UNIFIED FACILITIES CRITERIA (UFC)

NAVY AIR TRAFFIC CONTROL FACILITIES

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UNIFIED FACILITIES CRITERIA (UFC)

DESIGN: NAVY AIR TRAFFIC CONTROL FACILITIES

U.S. ARMY CORPS OF ENGINEERS

NAVAL FACILITIES ENGINEERING COMMAND (Preparing Activity)

AIR FORCE CIVIL ENGINEER SUPPORT AGENCY

Record of Changes (changes are indicated by **1**\ ... /**1**/)

Change No.	Date	Location
1	7 March 2007	Figure 1, page 38
2	7 March 2007	Paragraph 2.5, page 15
3	20 June 2007	Editorial corrections throughout.
4	30 July 2007	Paragraph 2-5.3.11 and 2-5.3.12, page 18
5	30 July 2007	Paragraph 2-5.1, page 15

This UFC supersedes MIL-HDBK-1024/1, in part, dated February 1994.

FOREWORD

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD(AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA.) Therefore, the acquisition team must ensure compliance with the more stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Civil Engineer Support Agency (AFCESA) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale should be sent to the respective service proponent office by the following electronic form: Criteria Change Request (CCR). The form is also accessible from the Internet sites listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

- Whole Building Design Guide web site http://dod.wbdg.org/.

Hard copies of UFC printed from electronic media should be checked against the current electronic version prior to use to ensure that they are current.

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CHAPTER 1 INTRODUCTION

1-1 SCOPE.

This Unified Facilities Criteria (UFC), UFC 4-133-01, contains guidance for (Navy and contract) planners, engineers, and architects on the planning, engineering, and design of Department of the Navy (DoN) air traffic control facilities. This is supplementary guidance to be used in conjunction with Facility Requirements Documents (FRD), Facility Requirements Supplements (FRS), Intrusion Detection Systems Engineering Plans (IDSEP), Base Exterior Architecture Plans (BEAP), and other DoD and Department of Transportation (DOT) material for the planning and construction of Naval air traffic control faculties facilities and the preparation of DD 1391 MILCON and Step II Special Project Submissions. It is assumed that general architectural and engineering standards are known or available to the planner. Navy criteria concerning basic and detailed construction and engineering criteria are not addressed in this UFC and are a prerequisite for facility planning.

1-1.1 Other Aviation Operational and Support Facilities.

Criteria for the design of other aviation operational and support facilities are not contained in this UFC, but will be included in future UFCs. Until these documents are published, continue to use the criteria in Military Handbook (MIL-HDBK) 1024/1 for these facilities.

1-1.2 Other Design Considerations.

Closely consult ATC and Air Operations (OPS) officers of shore activities from project definition through the entire design effort of any project.

1-1.3 Facility Plates.

Facility plates show conceptual data that shows key features of Aviation Operational and Support Facilities, functional layouts, design data and similar pertinent data. Plates are furnished as a design guide to assist in planning a new facility. Plates are representative of a generic type of air traffic control facilities. Variations to the plans are to be determined by the using activity, the design activity, and the designer of record during the development of the design. The responsibility of the design rests with the designer of record.

UFC 4-133-01 provides design criteria for air traffic control towers. The design criteria assigns space and provides a conceptual design layout for equipment and personnel supporting the control of aircraft movement around the airfield. The updated control tower design criteria provides guidance and methods for establishing the tower height resulting in the air traffic controller’s unobstructed line of sight to the airfield approach areas, runways, taxiways, aircraft parking areas, and all other operational areas over which aircraft movements must be

controlled. The design criteria discusses the functional requirements for the cab design including the glass strength and color consistent with FAA practices, provides the Navy/Marine Corps policy for handicap accessibility and sustainability in air traffic control facilities, and clarifies the Navy/Marine Corps position on seismic design of control towers as an essential facility. The newly updated design criteria provides for enhanced air traffic controller safety responsible for diverting aircraft during fires or other natural disasters

1-2 **PURPOSE OF CRITERIA**.

This UFC will be used for planning individual projects, preparing engineering documentation, and preparing contractual documents for construction. It is intended to present the basis for standardization of practices and identify a common baseline to be used as a guide during the planning of new facilities or the modification of existing facilities.

1-3 **PREDESIGN PROGRAMMING**.

Naval aviation is a highly dynamic field that depends on state-of-the-art computer technology. The design of Navy air traffic control facilities requires close coordination between the designer and other parties. Consider a pre-design programming session at the host activity to establish specific requirements for the proposed facility. Responsibilities involved in pre-design stages are as follows:

1-3.1 **Chief of Naval Operations (CNO)**.

The CNO, as the user, states the needs of the ATC Facility for research and development, improved equipment, new equipment, spare and repair parts, consumables, training, maintenance, personnel facilities, and any other requirements of the user.

Code N785F is the governing body or Operations Navy (OPNAV) sponsor for all Naval Air Traffic Control (ATC), Air Navigational Aids and Landing Systems (NAALS) programs, operations and funding. CNO is responsible for formulating policies, directives, procedures and guidelines that govern planning, programming and implementation of the NAALS ATC program and associated equipment for use at naval aviation shore facilities. CNO is responsible for validating Operational Requirements, approving Operational Capability Improvement Requests (OCIR), representing the Navy in interagency agreements with the Federal Aviation Administration (FAA) and other DoD components and appropriating funds for NAALS acquisition, research, development, testing, evaluation, operations, and maintenance.

1-3.2 **Naval Facilities Engineering Command (NAVFAC)**.

NAVFAC is responsible for design, development and construction of the facilities ancillary to and/or required for the support or housing of electronic equipment and operating personnel. NAVFAC provides technical guidance and direction in shore facility engineering from project inception to completion. To support ATC electronic facilities construction, NAVFAC works closely with Space and Naval Warfare Systems Center Charleston (SSCC) to ensure that. .

1-3.3 **Naval Air Systems Command (NAVAIR)**.

Naval aviation facility requirements are driven by a multitude of Navy and Marine Corps aircraft, weapons systems, airborne electronics systems and related ground-based aeronautical equipment, training and material support. NAVAIR works with the respective program entities to identify unique aviation and operational support facilities requirements. As the Navy Lead Field Activity (LFA) for National Airspace System Modernization (NAS

1-3.4 **Maintenance Authority.**

SPAWAR exercises technical control through regional and district offices, whose responsibilities include installation and maintenance engineering of electronic equipment that is beyond the capacity of station forces. Regional and district offices represent SPAWAR for electronic engineering control during facility design development. SSCC represents NAVAIR for electronic engineering control and development of ATC electronic facilities design.

1-3.5 **Facility Requirements Document (FRD) and Facility Requirements Supplement (FRS)**.

The Air Traffic Control Tower (ATCT) Facility Requirements Document (FRD) provides construction requirements and recommendations in support of Military Construction (MILCON) Projects and Renovation/Repair Projects. The FRD provides amplifying and current information not contained in the various ATC related construction references. Information pertaining to site-specific details of construction and design are covered in the Facility Requirements Supplement (FRS). Stated requirements are in support of the Air Traffic Control (ATC) electronic equipment to be installed once the construction has been completed, and are restricted to those items in direct support of ATC operations. Requirements not pertaining to ATC systems support must be obtained from station personnel. Stated recommendations are in support of ATC and Ground Electronics Maintenance Division (GEMD) or Air Traffic Control Maintenance Branch (ATCMB) operations.

1-3.6 **Designer**.

The designer (planner, engineer, and architect) enters design development at the pre-design programming stage, after the operational requirements have been established. The designer plans the facility to satisfy the operational

requirements set forth in this UFC and in the to FRD/FRS, IDSEP, and BEAP, and prepares project drawings and specifications under the control of NAVFAC and the guidance of SSCC. While maintaining close liaison with the NAVFAC command responsible for the project, the designer is responsible for coordinating all technical matters with the sponsors and users of the project.

1-3.7 **Intrusion Detection Systems Engineering Plan (IDSEP)**.

SSCC Code 70 is directed by Commander Naval Investigative Service Command (COMNISCOM), OP-09, to prepare IDSEPs for Electronic Sensor System (ESS)/Intrusion Detection System (IDS) installations when a MILCON is required. The reference document for the IDSEP is Section 6.0 of SPAWARINST 2804.1, *Policy and Procedures Concerning Base Electronic Systems Engineering Plan* and is equivalent to a MILCON base electronic system engineering plan (BESEP.) The scope of the IDSEP is specific only to detailed requirements for the design of the facility in order to accommodate ESS/IDS systems and related electronic equipment.

1-4 **POLICY STATEMENT**.

Base the design of air traffic control facilities on operational requirements and the guidance contained in this UFC. Operational facilities should incorporate the user's requirements, provide the most effective support possible, and accommodate the best safety, habitability, energy conservation, maintenance, and training characteristics. Operational requirements should take precedence over other criteria such as convenience or cost should compromises be required. Documents such as the FRD/FRS applicable NAVFAC publications and other pertinent Navy and DoD documents will be the governing sources for establishment of requirements.

CHAPTER 2 AIR TRAFFIC CONTROL FACILITIES

2-1 GENERAL.

Per the Naval Air Training and Operating Procedures Standardization (NATOPS) Air Traffic Control Manual (NAVAIR 00-80T-114), shore air traffic control facilities (ATCFs) are divided into 7 major classes that encompass common elements of air traffic control:

a. Class I Flight Planning Facility,

b. Class II Control Tower Facility,

c. Class IIIA/IIB combined Control Tower and GCA Facility,

d. Class IVA/IVB Approach Control Facility,

e. Class VA/Class VB Joint Control Facility, and

f. Class VI Fleet Area Control and Surveillance Facility

g. Class VII Combined Center

The class facility is then equipped in accordance with the matrixes set forth in the Baseline Planning Criteria for the Naval Air Traffic Control Facility Resources Ashore (OPNAV 3722.35 series.) The buildings that enable safe air traffic control services in these classes can similarly be grouped into four types.

a. Radar air traffic control facility (RATCF) buildings, which are required for Class III, IV, V, and VII ATCFs.

b. Fleet Area Control and Surveillance Facilities (FACSFAC) buildings, which are required for Class VI ATCFs.

c. Air Traffic Control Tower (ATCT) buildings, which are required for Class II, III, IV, V, and VII

d. Flight planning facilities, which are required for Class I, II, III, IV, V, and VII. Flight planning facilities are not covered in this UFC.

This chapter contains information on four facility types:

- ATC para 2-5

2-2 RADAR AIR TRAFFIC CONTROL FACILITY (RATCF).

2-2.1 Function.

Radar air traffic control facilities (RATCF) enable the radar branch to provide air traffic control services using installed radar. The function of the radar branch is to provide radar ATC services to instrument flight rules (IFR) and visual flight rules (VFR) air traffic within assigned airspace. The scope of radar services provided will vary according to equipment installed and the delegated airspace. The scope and complexity of the services are the significant design drivers. Local agreements may dictate that an FAA air traffic representative be provided office space in the air traffic control facility The RATCF building contains equipment used for controlling air traffic and is staffed by air traffic controllers and air OPS, administrative and maintenance support personnel. The ASR, PAR, Precision Approach Landing System (PALS), Transmitting and Receiving Sites, and Navigation Aids Systems (NAVAIDS), all of which are remotely located, are monitored and controlled in the RATCF. The RATCF contains an IFR control room that includes the radar display consoles and communications control equipment. An adjacent terminal equipment room houses all automation central (or terminal) equipment, maintenance positions and audio/video tape recorders. An office for the FAA liaison officer is required at joint operated Navy/FAA terminal radar approach control (TRACON) facilities.

2-2.2 Location.

Locate the RATCF building adjacent to the ATCT where siting requirements permit.

2-2.3 Architectural and Structural Requirements.

See Figures 1 through 5 and Table 1. Provide:

a. Removable, modular, access flooring in the IFR and IFR equipment rooms with 457.2 mm (18 in.) of clearance provided between the floor panels and sub floor to accommodate wiring and insulated piping. See Paragraph 3-3.5.1.

b. A 2.9 m (9 ft.) clear ceiling height above accessible flooring.

c. Built-in Electrostatic Dissipating (ESD) workbenches and shelving in the IFR equipment room.

d. Facility and restroom areas must conform to the *Uniform Federal Accessibility Standards* (UFAS).

e. Interior and exterior acoustical treatment to attain the room criteria described in Paragraph 3-3.1. Use soft textured acoustical wall panels in the IFR room.

f. Cable trays or conduits between the ATCT and the RATCF for intra-facility cabling. The exact dimensions of the cable trough or size and number of conduits are specified in the FRS.

2-2.3.1 **Windows**.

Do not provide windows in IFR or IFR equipment rooms. Provide insulated glazing for noise reduction in administrative areas. See Paragraph 3-6.3.6.

2-2.4 **Electrical Requirements**.

2-2.4.1 **Uninterrupted Power Supply (UPS)**.

Provide non-redundant UPS with maintenance bypass switch in accordance with Paragraph 3-5.2.3. Use the anticipated load to determine the size of the UPS. ATC electronic equipment loads will be provided in the FRS

2-2.4.2 **Emergency Electrical Power**.

Provide an emergency generator with automatic starting and switching capability as described in Paragraph 3-5.2. Provide emergency power to:

a. All loads as required by NFPA-101, *Life Safety Code*.

b. Electronic equipment in the IFR and IFR equipment rooms.

c. Mechanical systems supporting electronic equipment.

d. Exterior security lighting and security systems.

2-2.4.3 **400-Hz Power**.

Provide 400-Hz (Hz) power in accordance with Paragraph 3-5.2.4 when required by the FRS.

2-2.4.4 **Lighting**.

Design lighting in accordance with HB-9-00, *Lighting Handbook*. Provide dimmer adjustable red or blue lights in the IFR room. See SSCC FRD for additional information.

2-2.5 **Security**.

The RATCF is normally located within restricted areas that typically meet the minimum-security measures for external security. If the facility is located within a restricted area of a lower level of security or is remotely located and outside of an established restricted area, provide additional measures to meet the minimum-security requirements for the level of security assigned to the facility. Security at the main building entrance usually requires a single entry point with visitor control. Remote locks, video cameras, card readers, and/or keypads may be required by NISCOM as components of the IDS. The level of security and the designer's responsibility for particular security elements will be designated in the IDSEP. See Paragraph 3-6. Provide:

a. Electronic cipher door locks at interior entrance doors to IFR and terminal equipment rooms.

b. Exterior doors in emergency generator/electrical and terminal equipment rooms with no access hardware on the outside.

2-2.6 **Additional Design Criteria**.

Refer to Chapter 3, "General Design Criteria" for facility design requirements not addressed above.

2-3 **FLEET AREA CONTROL AND SURVEILLANCE FACILITY (FACSFAC)**.

2-3.1 **Function**.

The FACSFAC building houses the Navy Tactical Data System/Advanced Combat Direction System (NTDS/ACDS) equipment and personnel to provide a variety of services to air, surface and subsurface units. These services are provided to both military and civilian users and include radar surveillance and various forms of air traffic control in warning and other special airspace areas. Other services include surface operating area management, ground controlled intercept (GCI), operating area scheduling and range control. The FACSFAC normally operates continuously.

2-3.2 **Location**.

Locate the FACSFAC building as a stand-alone facility.

2-3.3 **Architectural and Structural Requirements**.

See Figures 9, 10 and 11. Provide:

a. Removable, modular, access flooring in the operations, and electronic equipment/maintenance rooms with 457.2 mm (18 in.) of clearance provided between the floor panels and sub floor to accommodate wiring and insulated piping. See Paragraph 3-3.5.1.

b. Interior and exterior acoustical treatment to attain the room criteria described in Paragraph 3-3.1. Use soft textured acoustical wall panels and movable sound absorbent partitions in the operations room.

c. A clear ceiling height of 4.3 m (14 ft.) (finished floor to ceiling) in the operations area.

d. A tiered seating area in projection auditorium.

e. Radio Frequency (RF) shielding throughout the crypto room. See MIL-HDBK-1195, *Radio Frequency Shielded Enclosures and Shielding*; requirements must be confirmed by Naval Electronics Systems Security Engineering Center (NESSEC).

f. Facility and restroom must conform to the UFAS.

2-3.3.1 **Windows**.

Do not provide windows in operations, NTDS/ACDS system, and electronic equipment/maintenance rooms. Provide insulated glazing for noise reduction in administrative areas. See Paragraph 3-6.3.6.

2-3.4 **Mechanical Requirements**.

Design the mechanical system to meet the criteria in Paragraphs 3-4, UFC 3-420-01 *Design: Plumbing Systems*, and MIL-HDBK 1003/3 *Heating, Air Conditioning, and Dehumidification Systems*. Provide:

a. Automatic thermostatic control.

b. A four-pipe chilled/hot water distribution system with separate air handlers for each zone or dehumidifying system to work in conjunction with the air conditioning system.

c. Capability for future expansion of the heating, ventilation, and air conditioning (HVAC) system. Use piping designed for low friction and velocity losses at the maximum flows expected.

2-3.4.1 **Air Conditioning**.

Provide:

a. Two parallel piped air-cooled chillers, each designed for 60 percent of the total building-cooling load. Alternate operation of chillers automatically, on a regular basis, when load is less than 60 percent. Consider cold storage to minimize power peaks.

b. One chilled water circulation pump for each chiller plus a manifold spare pump. Design chiller circuitry so that the pump must operate and water flow before the chiller is energized. The spare pump may be manually operated. Provide secondary chilled water loops with three-way valves at coils in each circuit to result in constant flow through chiller.

c. Divide the building into three cooling zones: administrative areas, operations areas, and the equipment areas. Provide separate air handlers and ducting systems for each zone. Provide sound attenuators for all supply ductwork. Consider more than one air handler for large zones.

d. Provide two air handlers for the operations and electronic equipment rooms. Design the air handler controls to regulate the units as primary and secondary with each unit alternating as the primary. Provide air handlers capable of controlling humidity, equipped with electric heat, and specifically designed for computer room applications. See MIL-HDBK-1012/1, *Electronic Facilities Engineering*.

2-3.4.2 **Heating**

Provide fuel oil or gas operated boiler heating system designed to accommodate the largest heating load anticipated. Provide two circulation pumps, each designed for 100 percent of the total building-heating load. Design the pump controls to regulate the pumps as primary and secondary with each pump alternating as the primary.

2-3.5 **Electrical Requirements**.

2-3.5.1 **Uninterrupted Power Supply (UPS)**.

Provide non-redundant UPS with maintenance bypass switchin accordance with Paragraph 3-5.2.3. Use anticipated load to determine the size of UPS. Use a separate plumbing and electrical chase that extends from the ground floor to the cable access level.

2-3.5.2 **Emergency Electrical Power**.

Provide an emergency generator with automatic starting and switching capability as described in Paragraph 3-5.2. Provide emergency power to:

a. All loads as required by NFPA-101.

b. Electronic equipment in operations and with maintenance bypass switch.

c. Building mechanical systems supporting electronic equipment.

d. Exterior security lighting and security systems.

2-3.5.3 **400-Hz Power**.

Provide 400-Hz (Hz) power in accordance with Paragraph 3-5.2.4, when required by the FRS.

2-3.6 **Security**.

The RATCF is normally located within restricted areas that meet the minimum-security measures for external security. When the facility is located within a restricted area of a lower level of security or is located remote and outside of an established restricted area. Provide additional measures to meet the minimum security requirements for the level of security assigned to the facility. Security at the main entrance usually requires a single entry point with visitor control. Remote locks, video cameras, card readers, and/or keypads may be required by NISCOM as components of the IDS. The level of security and the designer's responsibility for particular security elements will be designated in the IDSEP. See Paragraph 3-6. Provide:

a. Electronic cipher door locks at all access points to the IFR room and electronic equipment rooms.

b. Exterior doors in the IFR room and electronic equipment rooms with no access hardware on the outside.

c. Closed circuit TV (CCTV).

d. Security fencing and guard post for facilities located outside the secure area of the Naval installation.

e. Personnel identification, visitor check-in, and control system to control ingress and egress.

2-3.7 **Additional Design Criteria**.

Refer to Chapter 3, "General Design Criteria" for facility design requirements not addressed above.

2-4 **JOINT CONTROL FACILITY (JCF)**.

2-4.1 **Function**.

A combined ATCF and ROC/FACSFAC that may provide airport traffic control, low approach and landing, terminal area control, and special use airspace control services.

2-4.2 **Location**.

Locate the JCF building adjacent to the ATCT where siting requirements permit.

2-4.3 **Architectural and Structural Requirements**.

See Figures 12 through 18. Provide:

a. Removable, modular, access flooring in the operations, and the electronic equipment/maintenance rooms with 457.2 mm (18 in.) of clearance provided between the floor panels and sub floor to accommodate wiring and insulated piping. See Paragraph 3-3.5.1.

b. Interior and exterior acoustical treatment to attain the Room Criteria described in Paragraph 3-3.1. Soft textured acoustical wall panels and movable sound absorbent partitioning in the operations room.

c. A clear ceiling height of 4.2674 m (14 ft) (finished floor to ceiling) in the operations area.

d. A tiered seating area in projection auditorium.

e. Radio Frequency (RF) shielding throughout the crypto room. See MIL-HDBK-1195, requirements must be confirmed by Naval Electronics Systems Security Engineering Center (NESSEC).

f. Facility and restroom areas must conform to the UFAS.

g. Cable trays or conduits between the ATCT and the JCF for intra-facility cabling. The exact dimensions of the cable trough or size and number of conduits are specified in the BESEP.

2-4.3.1 **Windows**.

Do not use windows in operations, NTDS/ACDS system, and equipment/maintenance rooms. Provide insulated glazing for noise reduction in administrative areas. See Paragraph 3-6.3.6.

2-4.4 **Mechanical Requirements**.

Design the mechanical system to meet the criteria in Paragraphs 2-2 (RATCF,) UFC 3-420-01 *Design: Plumbing*, and MIL-HDBK 1003/3 *Heating, Air Conditioning, and Dehumidification Systems.* Provide

a. Automatic thermostatic control.

b. A four-pipe chilled/hot water distribution system with separate air handlers for each zone or dehumidifying system to work in conjunction with the air conditioning system.

c. Capability for future expansion of the HVAC system. Use piping designed for low friction and velocity losses at the maximum flows expected.

d. Chilled water requirements will be provided in the SSCC FRS.

2-4.4.1 **Air Conditioning**.

Provide:

a. Two parallel piped air-cooled chillers, each designed for 60 percent of the total building-cooling load. Alternate operation of chillers automatically, on a regular basis, when load is less than 60 percent. Consider cold storage to minimize power peaks.

b. One chilled water circulation pump for each chiller plus a manifold spare pump. Design chiller circuitry so that the pump must operate and water flow before the chiller is energized. The spare pump may be manually operated. Provide secondary chilled water loops with three-way valves at coils in each circuit to result in constant flow through chiller.

c. Divide the building into three cooling zones: administrative areas, operations areas, and the equipment areas. Provide separate air handlers and ducting systems for each zone. Provide sound attenuators for all supply ductwork. Consider more than one air handler for large zones.

d. Provide two air handlers for the operations, and electronic equipment/maintenance rooms. Design the air handler controls to regulate the units as primary and secondary with each unit alternating as the primary. Provide air handlers capable of controlling humidity, equipped with electric heat, and specifically designed for computer room applications. See MIL-HDBK-1012/1.

2-4.4.2 **Heating**.

Provide fuel oil or gas operated boiler heating system designed to accommodate the largest heating load anticipated. Provide two circulation pumps, each designed for 100 percent of the total building-heating load. Design the pump controls to regulate the pumps as primary and secondary with each pump alternating as the primary.

2-4.5 **Electrical Requirements**.

2-4.5.1 **Uninterrupted Power Supply (UPS)**.

Provide non-redundant UPS with maintenance bypass switch in accordance with Paragraph 3-5.2.3. Use anticipated load to determine the size of UPS.

2-4.5.2 **Emergency Electrical Power**.

Provide an emergency generator with automatic starting and switching capability as described in Paragraph 3-5.2. Provide emergency power to:

a. All loads as required by NFPA-101.

b. Electronic equipment in operations, NTDS/ACDS, and equipment rooms.

c. Building mechanical systems supporting electronic equipment.

d. Exterior security lighting and security systems.

2-4.5.3 **400-Hz Power**.

Provide 400-Hz (Hz) power in accordance with Paragraph 3-5.2.4, when required by the FRS

2-4.6 **Lighting**.

Design lighting in accordance with HB-9-00. Provide dimmer adjustable red or blue lights in the IFR room. See SSCC FRD for additional information.

2-4.7 **Security**

The JCF is normally located within restricted areas that meet the minimum-security measures for external security. If the facility is located within a restricted area of a lower level of security or is located remote and outside of an established restricted area, provide additional measures to meet the minimum-security requirements for the level of security assigned to the facility. Security at the main building entrance usually requires a single entry point with visitor control. Remote locks, video cameras, card readers, and/or keypads may be required by NISCOM as components of the IDS. The level of security and the designer's responsibility for particular security elements will be designated in the IDSEP. See Paragraph 3-6. Provide:

a. Electronic cipher door locks at all access points to operations room.

b. Exterior doors in operations, NTDS/ACDS system, equipment/maintenance, and mechanical/electrical rooms with no access hardware on the outside.

c. Closed circuit TV (CCTV).

d. Security fencing and guard post for facilities located outside of the secure area of the Naval installation.

e. Personnel identification, visitor check-in, and control system to control ingress and egress.

2-4.8 **Additional Design Criteria**.

Refer to Chapter 3, "General Design Criteria" for facility design requirements not addressed above.

2-5 AIR TRAFFIC CONTROL TOWER (ATCT).

\2\ Design the Navy-Marine Corps Air Traffic Control Tower to be generally consistent with FAA Order 6480.7, *Airport Traffic Control and Terminal Radar Approach Control Facility Design Guidelines*. If a conflict exists between this UFC and FAA Order 6480.7, this UFC governs. Sizing of cab window mullions, cab glazing and electrical grounding are examples of where most recent FAA criteria should be considered. /2/

2-5.1 Function.

The ATCT building houses equipment and personnel for control of aircraft approaching and departing the terminal area or airport and aircraft and vehicular movement on the runways, taxiways and all other movement areas.

\5\ Navy ATCT buildings shall be designed consistent with F.A.A. Order 64807, except for cab glazing, due to the normally high wind and structural loads associated with typical Navy ATCT locations. /5/

2-5.2 Tower Location and Height.

2-5.2.1 The ATCT building houses equipment and air traffic control personnel who provide air traffic control services to aircraft, and vehicles operating in the vicinity of an airport or on the movement areas.

2-5.2.2 An ATCT Siting Report that recommends the optimum location, relative orientation, and the optimum size and height of the ATCT must be completed. The ATCT must be sited and physically oriented relative to the primary runways first, so as to obtain the best unobstructed view of the airport and aircraft primary movement areas (i.e., runways and taxiways), their associated VFR and IFR approach paths, traffic pattern entry points, traffic patterns, ground routes, parking areas, and VFR and IFR departure paths. Consider planned runway and taxiway construction when siting the ATCT, as well as expected vegetation growth that cannot be cultivated due to various factors.

2-5.2.3 The ATCT itself should not be an obstruction (see paragraph 3-2.2) or affect IFR operations. Care must be taken not to site the ATCT close to and/or under a flight path.

2-5.2.4 Lights and rotating beacons should not impair the visibility of the air traffic controllers. See NAVAIR 51-50AAA-2 (01 May 03) *Airfield Lighting & Marking*.

2-5.2.5 Other considerations for final siting include utility availability (water, sewer, storm, power, and gas), site access, security, and relationship to existing ATC Facilities and existing ATCTs. Provide a tower location and height that results from a tower cab eye-level line of site (care should be taken in determining eye level to accommodate a variety of controllers height) intersecting (furthest) airport traffic surfaces at a vertical angle of 35 minutes or greater. If an area directly below the ATCT requires controlling, consideration for relocating the ATCT to allow proper visual access to that area should be of prime importance. Refer to FAA Order 6480.4, *Airport Traffic Control Tower Siting Criteria* and paragraphs 3-1 and 3-2.

2-5.2.6 The control tower facility design shall provide for efficient layout to operate and maintain all utilities required in support of mission. See Table 1 for normal facility building footprint square footage allowance.

2-5.3 **Architectural and Structural Requirements**.

See Figures 1 through 5. The ATCT is categorized as low, normal or high density based upon air traffic volume, as defined by FAA Order 6480.7. See Table 1 for space allocation based on operator density level. In addition, the following criteria should be included:

Note: All reference to ATCT heights is to the tower cab finished floor.

2-5.3.1 **Access Flooring**.

Bonded modular static resistance access flooring and carpet in the tower cab with 457 to 610 mm (18 to 24 in.) of clearance provided between the floor panels and sub floor to accommodate cable trays, mechanical ducts, and insulated piping. Bond access floor to copper grid tied to the building grounding system. Refer to paragraph 3-3.5.1.

2-5.3.2 **Acoustical Treatment**.

Design interior and exterior acoustical treatment to attain the room criteria described in paragraph 3-3.1.

2-5.3.3 **Roof Structure**.

Use a clear span roof structure (no interior columns) in tower cab.

2-5.3.4 **Stairway and Hatches**.

Provide folding ceiling stairway to a roof hatch for access to the roof from the tower cab floor. 2-hr. rated floor hatch (1.066 m^2 [3 ft. 6 $in.^2$] minimum) flush with top of access floor level and all other levels required to allow for moving of equipment between the cab and top elevator landing.

2-5.3.5 **Outside Access**.

Provide safe access for walking around the exterior of the control cab to facilitate exterior observations, window washing, etc. Use guardrails with vertical painted or galvanized metal balusters (38 mm [1.5 in]) system at a minimum of 100 mm (4 in.) The 4-inch sphere rule does not apply to the railing systems on the catwalk or roof. These areas are considered maintenance areas and the railing should comply with the regulations for maintenance areas. The exterior catwalk can be a galvanized-metal or aluminum grate that allows snow to melt directly through without building up at the edge.

2-5.3.6 **Elevators**.

For ATCTs that have a tower cab floor height of 30.48 m (100 ft.) to the cab floor, or less, use a hydraulic elevator. For ATCTs that have a cab floor height of over 30.5 m (100 ft.), use traction-type elevator. Refer to ITG 01-1, *Elevator Design Guide*.

2-5.3.7 **Retractable Covers**.

Electrically operated retractable covers for tower cab windows at sites prone to hurricane and typhoon conditions. Electrically operated covers will have a method to mechanically open the covers in case of malfunction.

2-5.3.8 **Electrical Hoist**.

Provide a 226 Kg (500lb) capacity, remote controlled commercially available electric hoist in the tower cab. Suspend hoist from tower cab roof framing over the floor hatch. Coordinate posted hoist capacity with the cab floor hatch described in paragraph 2-5.3.4 to ensure that the cab floor hatch is not overloaded by lifted items. Post appropriate administrative controls for the hoist and the floor access hatch

2-5.3.9 **Raceway**.

See SSCC FRD. Provide a cable raceway to tower cab roof through tubular cab roof columns. A cable raceway running horizontally around the roof through tubular steel section attached to the cab roof columns as part of the overall cab structural system. The horizontal tubular steel can either be placed at 1066 mm (42 in.) above the roof or lower with a metal guardrail attached to the tubular steel to a height of 1066 mm (42 in.) above the roof. The tubular steel can be

used as a passageway for wiring to communication antennas on the roof perimeter. Base cable layout on distances from the inside of cab windows to back of consoles should be from 381 to 457 mm (15 to 18 in), maximum. (Consider the use of aluminum or steel, unfilled, access flooring in tower cab.)

2-5.3.10 **Interior Walls**.

Provide fire-rated walls for stair enclosure, plumbing and electrical chases.

2-5.3.11 **Windows**.

A window wall system could be used in the tower structure that has the capability to have other elements, such as louvers and metal panels completely interchangeable with glazing sections. Provide window walls on at least two sides of the tower (stairwell side is optional). This will allow both supply and return for HVAC equipment located within the floor from separate sides. If windows are used, maintenance and cleaning should be considered.

Unless wind design requirements dictate greater thickness, provide tower cab with 25.4 mm (1 in.) laminated glass that is composed of two layers of annealed glass with a clear plastic interlayer. Provide units with a light transmissivity of not less than 84 percent, heat transmission (U-value) of 1.00 maximum, and free of parallax or other optical distortion. Provide window shades for the tower cab windows. Refer to FAA Specification FAA-E-2470, *Transparent Plastic Window Shades*.

/4/ When laminated glass is used, designer shall provide for special cab HVAC design to minimize condensation forming on the gab glazing using humidity controls and attention to return air ducts adjacent to the cab side. Use insulated glazing when wind and other structural loadings permit. Navy control towers are generally located in high wind areas that do not permit use of insulated glass.

2-5.3.12 Glazing Retainage

The can designer shall design for wind and seismic loading required by sections 2-5.7.3.1 and 2-5.7.4, respectively. For special cases, an intermediate mullion strip may be considered only as a last resort. Only one intermediate mullion strip per cab side is allowed. /4/

2-5.4 **Mechanical Requirements**.

Design the mechanical system to meet the criteria as follows:

a. The tower cab and the supporting electronics areas will be considered essential spaces. The HVAC criteria will be as follows.

- Winter indoor design temperature = 20 ^{o}C (68 ^{o} F)

- Summer indoor design temperature = 21 ^{o} C (70 ^{o} F)
- Cooling control set point = 24 ^{o} C (75 ^{o} F)
- Humidification set point = 40%
- Dehumidification set point = 50%
- Noise Criteria = The tower cab should be 25 or less. The Electronic equipment rooms can be 45.

b. ATCT cab HVAC distribution: The distribution will be continuous under the window diffuser system. The duct system will be low noise with a max static resistance of 21.17 Pa per 30.5 m (0.085 in of water per 100 linear ft). The duct routing will be under the access floor and coordinated with electrical and equipment wiring routes. Access in the base of the structural columns is critical for installing antenna cables. Diffusers will be floor grade linear type, located at the base of the windows providing an even coverage of glazing preventing condensation and drafts. Duct system will be coordinated with the structure, electrical, SPAWAR, and the control cabinet sizes and proximity to the window.

c. ATCT cab HVAC system: The system will be located directly under the tower cab level and consist of redundant HVAC equipment.

d. The pipe chase will be fire stopped at every floor. To prevent freezing, the chase will be opened with louvers, one high and one low between each floor. Provide supply grilles at every other landing complete with fire dampers.

e. Heat and cool the elevator equipment. Consideration will be given to ventilation air entering low and exiting high for cooling.

f. Air-condition the corridor and electrical room.

g. Heat the stair pressurization room and vestibule.

h. Heat the fire pump room.

i. Heat and air-condition the electronic spaces.

j. Heat the vestibule.

k. Air-condition the office and vestibule room.

l. The janitor and toilet room will have ceiling-mounted exhaust fans providing six air changes per hour minimum.

m. Air-condition and heatthe Briefing room.

n. Heat the mechanical room.

o. Heat and air-condition the tower cab. The cab will also have a smoke removal fan controlled from the cab.

p. An elevator shaft smoke damper will be provided to meet life-safety criteria.

q. All critical spaces will have complete redundant system with automatic primary and secondary control to be able to maintain temperature and ventilation requirements.

r. All mechanical units will have automatic thermostatic control utilizing direct digital control.

s. The first choice for the heating and cooling system will be a four-pipe chilled and hot water distribution system with separate air handlers for each zone or dehumidifying system.

t. The chilled water system will consist of two parallel piped air-cooled chillers, each designed for 60 percent of the total ATCT cooling load. Alternate operation of chillers automatically, on a regular basis, when load is less than 60 percent. Consider cold storage in minimize power peaks. One chilled water circulation pump for each chiller, plus a manifold spare pump will be provided. The spare pump will automatically come on line to act as a redundant pump for either chiller system.

u. Provide fuel oil or gas operated boiler-heating system designed to accommodate the largest heating load anticipated. Provide two circulation pumps, each designed for 100 percent of the total building-heating load. Design the pump controls to regulate the pumps as primary and secondary with each pump alternating as the primary.

2-5.5 **Plumbing**.

a. Provide drainage from the elevator pit.

b. Provide freeze proof hose bib at the exterior door to the tower cab catwalk and at the exterior of the ground floor of the ATCT.

c. In Fire Pump/Mechanical Room, provide floor sink and reduced pressure backflow preventer for domestic water system. Provide a duplex pump system and tanks to provide ample pressure for tower

domestic system if the domestic system does not have adequate pressure.

d. On Mechanical Equipment floor, provide floor sink for equipment.

e. Provide floor sink for fire system maintenance and back flow preventer drainage.

f. Provide floor drain for condensation. Provide deionization system for ultrasonic humidifier in the Electronic Equipment Rooms and ATC Cab.

g. Provide house vacuum outlet at electronic equipment floors, break room, and tower cab. Design central vacuum system to have minimum velocity in piping of 4,500 ft. per minute (FPM). Hoses will be 50.8 mm (2 in) diameter with 150 SCFM, 7.62 m (25 ft) long with tool attachments rated for 3.5 in. Hg.

h. Provide floor-mounted mop sink, floor drain, hot water heater, and central vacuum system.

i. At briefing room: Provide kitchen-type sink and electric water cooler.

j. Floor drains are not provided on the outside deck. Deck will be sloped to exterior for positive drainage.

k. If a mechanical room is located under the tower cab, provide floor drain, deionized water system for the humidifier (if required by climate and water source), and hot water heater for the tower cab. Provide water closet lavatory.

l. Tower cab: Provide stainless steel sink, chilled water bubbler, insta-hot, kitchen-type faucet. Provide freeze proof wall hydrant on catwalk. All pipe routings between the roof and tower cab floor will be routed in rear structural mullions.

m. Roof tower cab: Provide roof drain and overflow roof

n. Drain to storm drain. All pipe routings between the roof and tower cab floor will be routed in rear structural mullions. Note: “rear” is defined as the mullions adjacent and above the cab stairwell. These two mullions are exposed during initial construction. The front mullions should be reserved as spares for future expansion to the greatest extent possible.

2-5.6 Design Dead Loads

a. Dead loads are defined as the weight of all permanent structural and nonstructural components of the building, such as walls, floors, roofs, ceilings, finishes, stairways, and fixed service, mechanical, and utility equipment, including forces caused by prestressing.

b. In estimating dead loads for the purposes of the structural design, the actual weight and materials in construction will be used.

c. The weights of all partitions will be considered as dead loads, and will be estimated in accordance with the partition layouts shown in the design documents. In the absence of definitive (non-loadbearing) partition layouts, a unit value of 0.96 kn/m^2 (20 psf) on the floor area will be used in the design.

2-5.7 Design Live Loads

2-5.7.1 Roof Loads

a. Snow Load: Per UFC 1-200-01, *Design: General Building Requirements* or applicable local codes, whichever is more stringent.

b. Roof Live loads per UFC 1-200-01.

c. Antenna dead load, 0.24 Kn/m^2 (5 psf) with 12 mm (1/2 in) radial ice.

2-5.7.2 Floor Loads

Table 1 Floor Loads

AREA	ENGLISH	METRIC
Tower Cab Floor	150 PSF	7.2 Kn/m^2
Office Areas	100 PSF	4.80 Kn/m^2
Restrooms	50 PSF	2.40 Kn/m^2
Locker Rooms	50 OSF	2.40 Kn/m^2
Public Areas (corridors/Stairs/Walkways)	100 PSF	4.80 Kn/m^2
Mechanical and Electrical Rooms	250 PSF	12.00 Kn/m^2
UPS	250 PSF	12.00 Kn/m^2
Storage Rooms (Light)	125 PSF	6.00 Kn/m^2
Electronics Equipment Rooms	150 PSF	7.20 Kn/m^2

2-5.7.3.1 Wind Loads.

Design ATCTs with a height-to-width ratio less than or equal to 5, in accordance with UFC 1-200-01 using the 50-yr. recurrent wind speed.

Provide calculations signed by a registered professional structural engineer for government review in the following cases.

a. Structures with a height-to-width ratio larger than 9 and having a minimum plan dimension less than 10.3 m (34 ft.).

b. Structures with a height-to-width ratio equal to 5 that are located in special wind regions or in regions having a 50-year recurrent wind speed greater than 100 mi. per hour (161 km per hour).

c. Structures located in hurricane zone.

Per FAA Order 6480.7, ATCT will be designed to have a limiting drift ratio (story lateral deflection/story height) of 0.002 or less due to design wind loads.

2-5.7.3.2 **Design Special Loads**.

a. Antennas and other special equipment: The structural designer will provide for the support of communication, future ceiling track, and other special equipment per SSCC FRD and FRS.

b. Provide a pad-eye and support structure for attaching a 226 kg (500 lb) capacity hoist on the underside of the tower cab roof structure directly over the center of the tower cab floor hatch. See paragraph 2-5.3.8 for administrative controls to ensure the cab floor access hatch is not overloaded.

c. Tower Cab Glass: The catwalk will be designed to support the weight of glass panels weighing a minimum of 545 kg (1,200 lb.) each with a minimum area of 21 m^2 (70 ft^2); and hoisting, scaffolding, personnel, and other loads associated with the replacement of tower cab glass.

d. Elevators: Design will be consistent with the load data required for specific type of elevator as specified by the architect. Use 100 percent impact for support of elevators.

e. Fireproofing: Use actual dead load of materials selected.

2-5.7.4 **Seismic Design**.

A Structural Basis of Design must be written for each ATCT. The structural design of the tower cab mullions and the glazing design of the windows should be a design focus area to ensure an adequate load path for the transfer of anticipated loads. Design ATCT as essential per UFC 1-200-01 unless the special requirements listed below are satisfied.

The Navy does not consider ATCT design to be essential per TI-809-04, *Seismic Design for Buildings* (i.e. requiring immediate occupancy (IO) design) if:

a. Inbound air traffic could be diverted to surrounding or nearby airfields.

b. Emergency and alternate communication systems are available at the facilities to enable the controllers to maintain contact with pilots.

c. Such systems are designed to remain operational following a major earthquake, which implies that an alternate power source is available, special seismic restraints are used to secure the equipment, and training of changeover to this equipment is regularly conducted.

d. Temporary ATC capability can be set up following a major earthquake without the use of the ATCT.

e. A relatively long outage of the ATCT (on the order of months) and use of temporary control is acceptable to the operators of the facility; this outage reflects the time it may take to bring a damaged ATCT back on line following a major event.

2-5.8 **Antiterrorism Requirements**.

Design facilities in accordance with UFC 4-010-01, *DoD Minimum Antiterrorism Standards For Buildings*.

2-5.9 **Electrical Requirements**.

2-5.9.1 **Emergency Electrical Power**.

Provide an emergency generator with automatic starting and switching capability as described in Paragraph 3-5.2. Consider a common generator when the ATCT is sited adjacent to the air operations building, RATCF, FACSFAC, and JCF. Provide emergency power to:

a. All loads as required by NFPA-101.

b. Electronic equipment in the tower cab and electronic equipment rooms.

c. Building mechanical systems supporting electronic equipment.

d. Exterior security lighting and security systems.

2-5.9.2 **Uninterrupted Power Supply (UPS)**.

Provide non-redundant UPS in accordance with Paragraph 3-5.2.3. Use anticipated load to determine the size of UPS.

2-5.10 **Lighting**.

Design lighting in accordance with HB-9-00. Provide dimmer adjustable white ceiling lights in tower cab. Provide down lighting over work areas on separate dimmer adjustable switch for each operator position.

2-5.11 **Fire Protection**.

See UFC 3-600-01, *Design: Fire Protection Engineering for Facilities*, and NFPA 101, *Life Safety*.

2-5.12 **Security**.

ATCTs are normally located within restricted areas that meet the minimum-security measures for external security. If the facility is located within a restricted area of a lower level of security, provide additional measures to meet the minimum-security requirements for the level of security assigned to the facility. The level of security and the designer's responsibility for particular security elements will be designated in the IDSEP. See Paragraph 3-6. Provide an electronic cipher door lock at the first floor entrance with an intercom and remote lock release in the tower cab. The door at the stairs leading to the cab also requires a cipher lock. See FRD.

2-5.13 **Additional Design Criteria**.

Refer to Chapter 3, "General Design Criteria" for facility design requirements not addressed above.

CHAPTER 3 GENERAL DESIGN CRITERIA

3-1 FACILITY PLANNING.

Plan for the design and construction of the facilities discussed herein in accordance with NAVFAC P-80, *Facility Planning Criteria for Navy and Marine Corps Shore Installations*, MIL-HDBK-1190, *Facilities Planning and Design Guide*, and NAVFACINST 11010.45, *Regional Planning Instruction*.

3-2 AIRFIELD SAFETY.

Consider safety clearances when siting facilities in or near aviation operational areas. See UFC 3-260-01 *Airfield and Heliport Planning and Design* and NAVFAC P-80.3, *Facility Planning Factor Criteria for Navy and Marine Corps Shore Installations*, Appendix E: "Airfield Safety Clearances" and Title 14, CFR Part 77, *Objects Affecting Navigable Airspace*. Objects located within runway clear zones must be fabricated for low impact resistance in accordance with FAA Specification FAA-ER-530-81-04, *Structural/Mechanical Design Requirements for Low Impact Resistance Microwave Landing System Structures (MLS/LIRS)*. Objects penetrating the airspace surfaces described in P-80.3 and CFR Part 77 require a waiver of clearance criteria. The point of contact for waiver of Navy criteria is NAVAIR, (Code NAVAIR 7.10). The point of contact for waiver of FAA criteria is the Chief, Air Traffic Division of the FAA Regional Office having jurisdiction over the area within which the construction will be located. Provide obstruction marking or lighting for facilities located in or near aviation operational areas in accordance with FAA Advisory Circular AC 70/7460, *Obstruction Marking and Lighting*.

3-2.1 Objects Located on Airfield.

Location of any objects within airfield clear zones and/or airspace surfaces will be made by SSCC with NAVAIR concurrence.

3-2.2 Objects in Violation of Airfield Safety Criteria.

Objects that must be located in violation of UFC 3-260-01, NAVFAC P-80 and P-80.3 criteria must be located to result in the minimum violation possible compatible with the function of the object. Construct objects in violation of P80 and P80.3 with lightweight and low impact resistant materials in accordance with FAA-ER-530-81-04. Ensure footings and bases for such objects are flush with the ground surface and the height of the object is the minimum necessary. A waiver request indicating key points of contact, along with the associated BESEP, must be submitted to NAVAIR, (Code NAVAIR 7.10) for any facility in violation of any NAVFAC airfield safety criteria.

3-3 ARCHITECTURAL AND STRUCTURAL REQUIREMENTS.

Place design emphasis on: fire resistance; minimal maintenance and repair cost; and ease of facility expansion or modification. Electronic communications equipment housed in the building varies with the mission of the installation. Design facility exterior in accordance with BEAP or local command architectural guidance.

3-3.1 **Acoustics**.

Provide the means to manage building acoustics by proper selection of construction assemblies and finishes. See pages 4.7 through 4.45 of *Time Saver Standards for Architectural Design Data* and American Institute of Architects (AIA) *Architectural Graphics Standards*. Analyze and control the acoustical properties of construction assemblies by modifying room acoustics through control of reverberation (absorption) and attenuating structure-borne sound from exterior sources, interior sources between rooms and equipment generating sound (isolation). Provide the following room noise levels:

Table 2 Room Noise Levels

AREA	ROOM CRITERIA (RC)
ATC Operations and IFR Control, Conference, Training, Projection, and Bunk Rooms	30
Private Offices	35
Open Offices, Lobbies, Ready Rooms and Waiting Areas	40
Restrooms, Corridors, Computer and Electronic Equipment Rooms	45
Cargo and Materials Handling and Vehicle Areas, Mechanical, Electrical, and Generator Rooms, Remote and Unattended Facilities	50

3-3.2 **Handicapped Employees**.

Provide barrier-free access to civilian workspaces and other spaces intended for public access. Design facilities to locate handicapped access spaces on first floor only unless the size of the facility's administration and other accessible areas requires a second floor. Control cab and areas hazardous to disabled

persons, as well as the bathroom on the upper floor, need not be accessible. Comply with current criteria in UFAS. See MIL-HDBK-1190.

3-3.3 **Structural Design**.

Design in accordance with UFC 1-200-01. Base an economical structural system on facility size, projected load requirements, quality of local available materials, local labor and construction materials, and local wind, snow, seismic, geologic, and permafrost conditions. Design structural systems to support roof-mounted and/or suspended loads, when required.

3-3.3.1 **Lateral Loads**.

Design all buildings and towers (antenna supports) to withstand wind and seismic loads appropriate to the region in which they are to be constructed. See UFC 1-200-01. Seismic analysis of government-furnished buildings and antenna supports is not required.

3-3.3.2 **Antenna Supports**.

Before undertaking unique antenna support designs, consider the use of existing commercial products suitable for the purpose. Navy standard designs for UHF/VHF and ASR antenna supports are available. See Figure 19, "Radio Antenna Tower" and Figure 20, "ASR Antenna Tower".

3-3.4 **Reflective Surfaces**.

To prevent mirror like reflections from building surfaces to aircraft in flight, provide roofs and other external surfaces with a specular reflectance compatible with the location of the building on the airfield. If the building is so located that glare may be an operational hazard, provide the critical surfaces of that building with a light reflectance of not more than 10, measured at an angle of 85-degrees in accordance with American Society for Testing and Materials (ASTM) D 523, *Standard Test Method for Specular Gloss.*

3-3.5 **Permanent Floors**.

Consider the placement of cables and wiring for electronic equipment when selecting floor construction. The preferred method of placing cables and wiring is given in the BESEP for the facility. All ATC operational spaces and equipment rooms must have access flooring with an equipotential plane conforming to FAA-STD-019D, *Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment* and FAA-STD-020B, *Transient Protection, Grounding, Bonding and Shielding Requirements for Electronic Equipment*. See SSCC FRD.

3-3.5.1 **Access Flooring**.

See SSCC FRD. Floor should be supported around entire perimeter. Provide access flooring to meet the requirements of NFPA 75, *Computer/Data Processing Equipment*, MIL-F-29046, *General Specifications for Raised Flooring*, and UFC 3-600-01. Provide a bolted grid (stringer) or a rigid grid system. Provide seamless vinyl or laminated plastic finishes. Keep all air supply panels and similar inserts flush with the flooring surface. Specify installation procedures to conform to FAA-STD-019D and FAA-STD-020B. Provide depressed structural framing and slabs in areas where access flooring occurs to result in uniform, continuous finish floor levels between adjacent floor spaces. Provide a raised floor installation above a level permanent floor when it is not economical or practical to depress the structural framing and slab.

3-4 **MECHANICAL ENGINEERING**.

3-4.1 **Energy Conservation**.

Design climate controlled facilities for energy efficiency. Consider isolated ventilation of air conditioning systems for equipment with high heat loads or that require more critical temperature or humidity control than would otherwise be required for the remainder of the occupancy.

3-4.2 **Equipment Selection**.

Select adequately sized air conditioning equipment for personnel within these areas. Computer rooms and electrical equipment rooms produce predominantly sensible heat and require specially designed units. Ensure mechanical systems do not interfere with electronic equipment or radiated signals.

3-5 **FIRE PROTECTION**.

3-5.1 **Electronic Equipment Areas**.

Design per UFC 3-600-01.

Within buildings protected by an automatic sprinkler system, provide a wet pipe sprinkler system in areas having mission essential or high monetary value electronic equipment. Provide controls to discontinue electric power to electronic equipment upon water flow. Provide manual disconnect of electric power to air traffic control equipment. Provide separation from other areas with fire-rated partitions. Provide smoke detection, at ceilings and in sub-floor areas, connected to building fire alarm system. Areas containing only word processing equipment and personal computers are not within the scope of this paragraph.

3-5.2 **Elevators**.

See UFC 3-600-01.

3-5.3 **Fire Alarm and Detection Systems**.

Provide fire alarm and detection systems per UFC 3-600-01.

3-5.4 **Electronic Equipment Spaces**.

Provide smoke detection systems in electronic equipment areas to transmit local and remote signal as well as activate extinguishing system where provided. Include automatic supervision of alarm circuits. Provide manual fire alarm systems capable of transmitting the same signals. Areas containing only word processing equipment and personal computers are not within the scope of this paragraph.

3-5.5 **Raised Floor Cable Spaces**.

Provide automatic detection systems.

3-5.6 **Remote and Unattended Facilities**.

Provide manual and automatic fire alarm and detection systems at all remote and unattended facilities. Provide local and remote signaling systems.

3-6 **ELECTRICAL ENGINEERING**.

3-6.1 **General Requirements**.

Design in accordance with MIL-HDBK-1004 series, *Electrical Engineering*. Ensure all electrical work not covered by Navy criteria meets the requirements of NFPA 70, *National Electrical Code*.

3-6.2 **Emergency Electrical Power**.

3-6.2.1 **Emergency Generator**.

Provide emergency generators with electronic line monitoring equipment and automatic starting and switching capability. When used in conjunction with an UPS, provide generator output at least 1.5 times the output rating of the UPS. Ensure emergency generator is capable of supplying the rated load within 15 seconds of a power failure. Provide the following for all emergency generators:

a. An isolation switch to bypass the emergency generator during generator maintenance.

b. An automatic battery charger for maintenance of generator starting batteries.

c. An isolated mounting slab for the generator to reduce noise and vibration transmission.

See Figure 21, "Indoor Emergency Generator Room Layout." Provide the following when an indoor emergency generator is required:

a. A separate generator room with an independent ventilation system.

b. An engine exhaust system connected to the exterior of the facility with an exterior muffler. Configure the exhaust system to prevent rainwater or condensation from entering the engine manifold.

c. Adequate engine cooling by a radiator duct or externally mounted radiator.

Consider a pre-manufactured building to house an indoor generator. Consider an outdoor unit in mild climate conditions. Consider a below ground generator vault for units which must be sited within airfield clear zones or primary surfaces.

3-6.2.2 **Emergency Generator Fuel Storage**.

Design fuel storage for diesel or jet fuel powered generators in accordance with UFC 3-460-01, *Design: Petroleum Fuel Facilities*, state and local regulations, and the following:

3-6.2.2.1 **Above Ground Storage Tanks**:

- Title 40, CFR Part 112, *Oil Pollution Prevention*
- Title 40, CFR Part 113, *Liability Limits for Small Onshore Storage Facilities*, Subpart A “Oil Storage Facilities”

3-6.2.2.2 **Underground Storage Tanks**:

- Title 40, CFR Part 280, *Underground Storage Tanks Technical Requirements*

Provide fuel storage capacity for 24 hours of continuous generator operation. Provide separation between fuel storage tanks and adjacent buildings, parking aprons and property lines in accordance with UFC 3-460-01. Provide double wall storage tanks and piping.

3-6.2.3 **Uninterrupted Power Supply (UPS)**.

Provide an UPS in electronic facilities and air traffic control installations for all critical technical loads and the specific requirements of the ordering authority. Install the UPS in accordance with MIL-HDBK-1004/1, *Electrical Engineering Preliminary Design Considerations* and MIL-HDBK-1012/1.

3-6.2.4 **400-Hz Power**.

When required by the ordering authority, provide 400-Hz (Hz) solid-state converter in accordance with UFGS-16268, *400-Hz Solid State Frequency Converter*. Design in accordance with MIL-HDBK-1004/5, *400-Hz Medium-Voltage Conversion/Distribution and Low Voltage Utilization Systems*. De-rate all 400 Hz cables and locate in separate non-magnetic raceway system. See MIL-HDBK-1012/1.

3-6.2.11 **Communications Systems**.

Provide voice, data and equipment control communications systems in accordance with MIL-HDBK-1004/7, *Wire Communications and Signal Systems*. Consider fiber optic systems in facilities requiring extensive internal communications systems for electronic equipment.

3-7 PHYSICAL SECURITY.

3-7.1 General Requirements.

Physical security is concerned with limiting, controlling, or preventing personnel access to specific areas. A sound physical security program is the result of good planning. The best and most economical programs are those incorporated in the facility's design and construction. The facility configuration and location; the use of barriers, protective lighting, type of construction, IDS, CCTV, and security fencing; and the guard communication network must be coordinated with the user to ensure conformance with the installation security plan. The mode of operation, level of security, and designer's responsibility for particular security elements will be designated in the BESEP and IDSEP.

3-7.2 Antiterrorism/Force Protection (ATFP).

Incorporate ATFP issues at the initial phase of the design. Formulate the basis for design on UFC 4-010-01. Coordinate all protection features with the current standards and any additional requirements in place at the time of the design. Ascertain the exact requirements for protection based on a site-specific survey, or lacking one, provide the minimum protection standards outlined in the standards. Coordinate all ATFP issues with the base that may be a part of another project or impact adjacent facilities such as security fencing, parking, etc.

3-7.2.1 Security Lighting.

Install lighting inside the perimeter security fence in a manner to illuminate the fence completely and to prevent an intruder from using the light poles and guy wires to gain access to the area. Provide illumination in accordance with the lighting requirements of MIL-HDBK-1013/1 *Design Guidelines for Physical Security of Facilities*.

a. Illuminate areas shadowed by structures.

b. Ensure that failure of one lamp in a circuit will not affect other lamps in the same circuit.

c. Provide overlapping light distribution to minimize reductions in illumination levels upon lamp failure.

d. Protect all components of the system from vandalism.

e. Provide lights on buildings.

f. Provide an emergency power generator within the security area. Provide emergency power source adequate to sustain protective lighting of all critical areas and structures for 8 hr. Provide generator- or battery-powered lights at key control points in case a failure disables the secondary power supply.

g. Install special-purpose lighting (such as fog penetration) when climatic or other local factors dictate.

h. Provide additional lighting for (CCTV) security surveillance, as necessary.

3-7.2.2 **Intrusion Detective Systems (IDS)**.

Provide IDS when required by the level of security assigned to the facility. See NAVFAC DM-13.02, *Commercial Intrusion Detection Systems (IDS)*. The IDSEP or user command will provide specific IDS requirements.

3-7.2.3 **CCTV**.

Provide CCTV when required to supplement security guard personnel, assist in threat assessment and surveillance. See MIL-HDBK-1013/1.

3-7.3 **Interior Physical Security**.

3-7.3.1 **Delay Times**.

Guidelines for selecting and designing facility components to meet specified delay times are provided in MIL-HDBK-1013/1. Procedures for determining delay times, if not specified by the IDSEP or the user command, are given in MIL-HDBK-1013/1.

3-7.3.2 **Building Layout**.

Portions of the building requiring special security consideration will be identified by the IDSEP or by the user command.

3-7.3.3 **Wall Construction**.

Design secure area wall using 102 mm (4 in.) of reinforced concrete or 204 mm (8 in.) of solid masonry, without windows, and with controlled access. See DCID 6/9, *Physical Security Standards for Sensitive Compartmented Information Facilities (SCIF)* and MIL-HDBK-1013/1.

3-7.3.4 **Roof and Floor Construction**.

Provide at least 101.6 mm (4 in.) of reinforced concrete for roof and floor construction. Hardening methods for other types of construction are provided in MIL-HDBK-1013/1. False ceilings or raised floors provide a means of concealment. False ceilings or floors are considered part of the protected area to which they are attached; therefore, ensure the true walls, floors, and ceilings meet the applicable requirements. Provide at least one quick-remove access panel, 457 by 457 m (18 by 18 in.), for each 142 m^2 (400 ft^2) of false ceiling or floor area.

3-7.3.5 **Exterior Doors**.

Provide entry and exit doors of secure areas as specified in the IDSEP or DCID 6/9. Provide exterior doors with delay times commensurate with those of the structure in which they are installed.

3-7.3.6 **Windows, Air Vents and Ducts**.

Windows, ducts, and other openings that breach the facility perimeter require protection as specified in DCID 6/9 and MIL-HDBK-1013/1. Openings that exceed the man-passable size of 600 mm^2 (96 in^2) require protection.

3-7.3.7 **Roof Doors and Hatches**.

Secure roof doors and hatches with internal padlocks and hasps meeting the provisions of MIL-P-43607, *Padlock Key Operated, High Security, Shrouded Shackle*. Alternatively, provide roof doors with a cylindrical case or bored lockset. Mount such locksets, when installed, with the lock cylinder to the exterior.

3-7.3.8 **Cipher Locks**.

If required for control of routine access, install an electrically controlled and operated latch mechanism for interior doors. Ensure radio frequency (RF) emissions meet the requirements of MIL-STD-461, *Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference*, for Class II-A equipment. Ensure mechanisms do not mate or interface with other locksets. Add separate surface-mounted night latches or specialty hardware to the door to accommodate the electrically operated mechanism. Do not use key-operated bypass cylinders.

3-7.4 **Vaults**.

A secure-document vault may be included in the ATC design. Construction will be specified by the IDSEP or the user command. Specific criteria for construction and installation are given in DCID 6/9 and MIL-HDBK 1013/1 *Design Guidelines for Physical Security of Buildings*.

3-8 **SAFETY AND HEALTH**.

3-8.1 **General Requirements**.

Design occupied buildings with maximum consideration given to safety and health. See Title 29, CFR, Part 1910, *Occupational Safety and Health Standards*, with particular emphasis on noise control for hearing conservation and safety standards for toxic and hazardous substances. Provide suitable facilities for quick drenching or flushing of the eyes and body within the work area for immediate emergency use where any person may be exposed to injurious corrosive materials.

3-8.2 **Human Engineering**.

Consider safety in relation to operational function, accessibility for maintenance and repair, physical layout for traffic, interface with other equipment, and environmental factors, such as lighting, temperature, and humidity. See MIL-STD-882, *System Safety Program Requirements*, and MIL-STD-1472, *Human Engineering Design Criteria for Military Systems, Equipment and Facilities*.

3-8.3 **Electromagnetic Hazards**.

Many facilities discussed herein contain equipment that radiates an electromagnetic signal. Consider the effect of electromagnetic radiation (EMR) on personnel (HERP), ordnance (HERO) and fuel (HERF) when planning and designing facilities housing EMR emitting equipment. Provide safety measures to eliminate or reduce hazardous conditions. See MIL-HDBK-1012/1.

3-8.4 **Hazard Classification**.

UFC 3-600-01 provides guidance for Classification of Occupancy and Occupancy Hazard Classification. Classification of Occupancy is a function of the intended use of the building and is one of seven major occupancy classification groups. Occupancy Hazard Classification is a function of the quantity and combustibility of the contents. The principal hazard classifications are light, ordinary, and extra.

3-8.4.1 **Windowless Buildings**.

A number of facilities, or portions of facilities, discussed herein may be classified as windowless buildings. Provide additional fire protection and life safety measures for windowless buildings in accordance with UFC 3-600-01.

3-8.5 **Life Safety**.

Provide life safety systems in accordance with UFC 3-600-01.

3-9 DESIGN STANDARDS.

The information and references herein are presented as a guide for the designer. It is intended that the requirements presented herein be considered a minimum and that they take precedence over requirements of the references or from other sources. However, if in the best judgment of the designer, a more restrictive requirement is appropriate, the more restrictive requirement may be applied after consulting with the user.

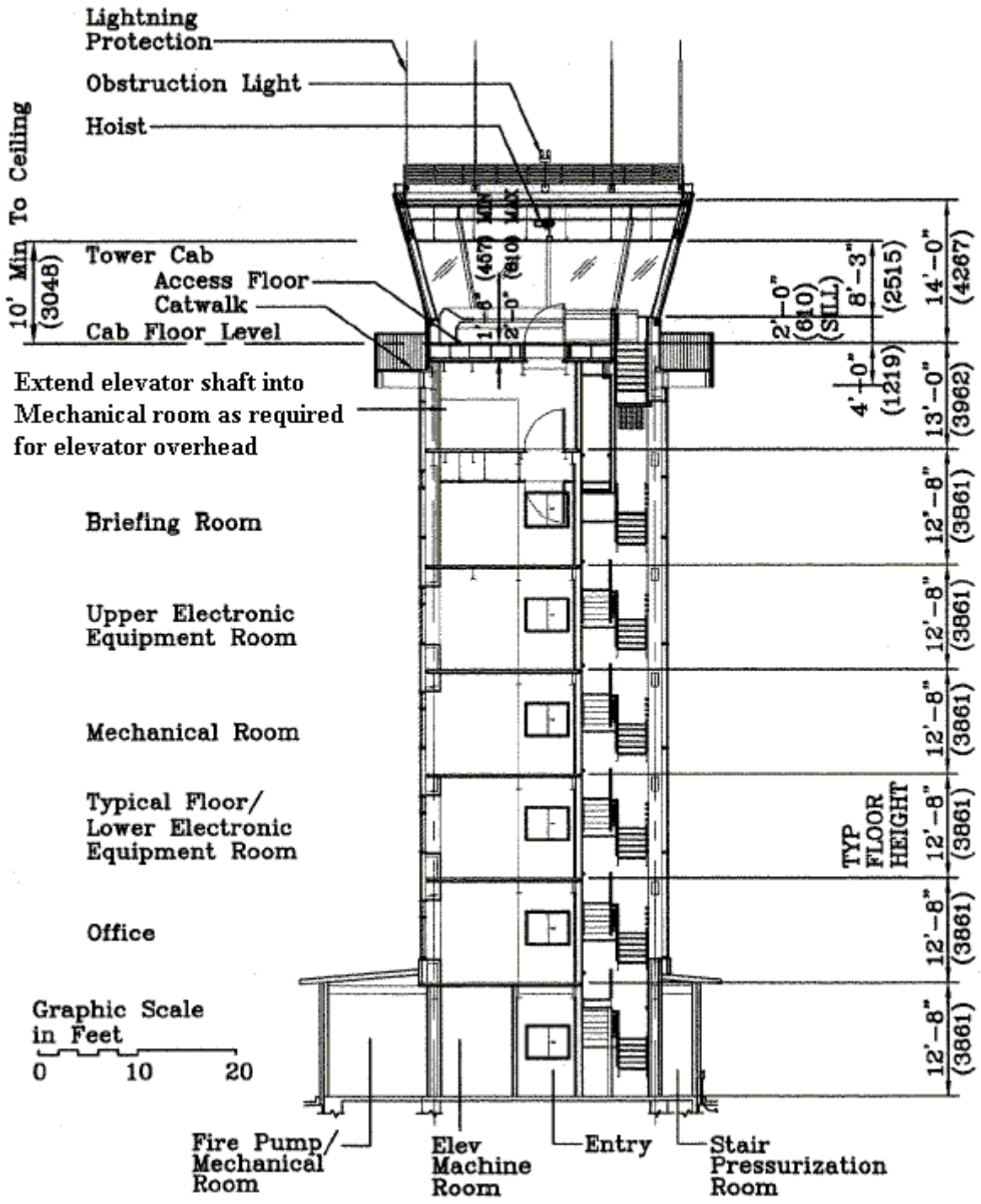
Table 3 Air Traffic Control Activity Gross Area Allowances

ATC Activity Level	Normal ATC Operator Level including Trainees up to: (People)	CAB Area (SF)	Ground Floor (SF)	Tower Stem Upper Floors Including Mech Equipment Room (SF)	Gross SF including Ground Floor, 5 Intermediate Floors & 1 Upper (SF)
Standard Low Activity Cab	6	370	1026	3455	4851
Standard Intermediate Activity Cab	8	500	1026	3455	4981
Standard Major Activity Cab	10	620	1026	3455	5101

Table 3M Air Traffic Control Activity Gross Area Allowances

ATC Activity Level	Normal ATC Operator Level including Trainees up to: (People)	CAB Area (SM)	Ground Floor (SM)	Tower Stem Upper Floors Including Mech Equipment Room (SM)	Gross SF including Ground Floor, 5 Intermediate Floors & 1 Upper (SM)
Standard Low Activity Cab	6	34.37	95.31	320.97	450.65
Standard Intermediate Activity Cab	8	46.45	95.31	320.97	462.73
Standard Major Activity Cab	10	57.60	95.31	320.97	473.88

\1\ Figure 1 ATCT, Typical Building Section



/1/

Figure 2 ATCT, Typical Floor Layout

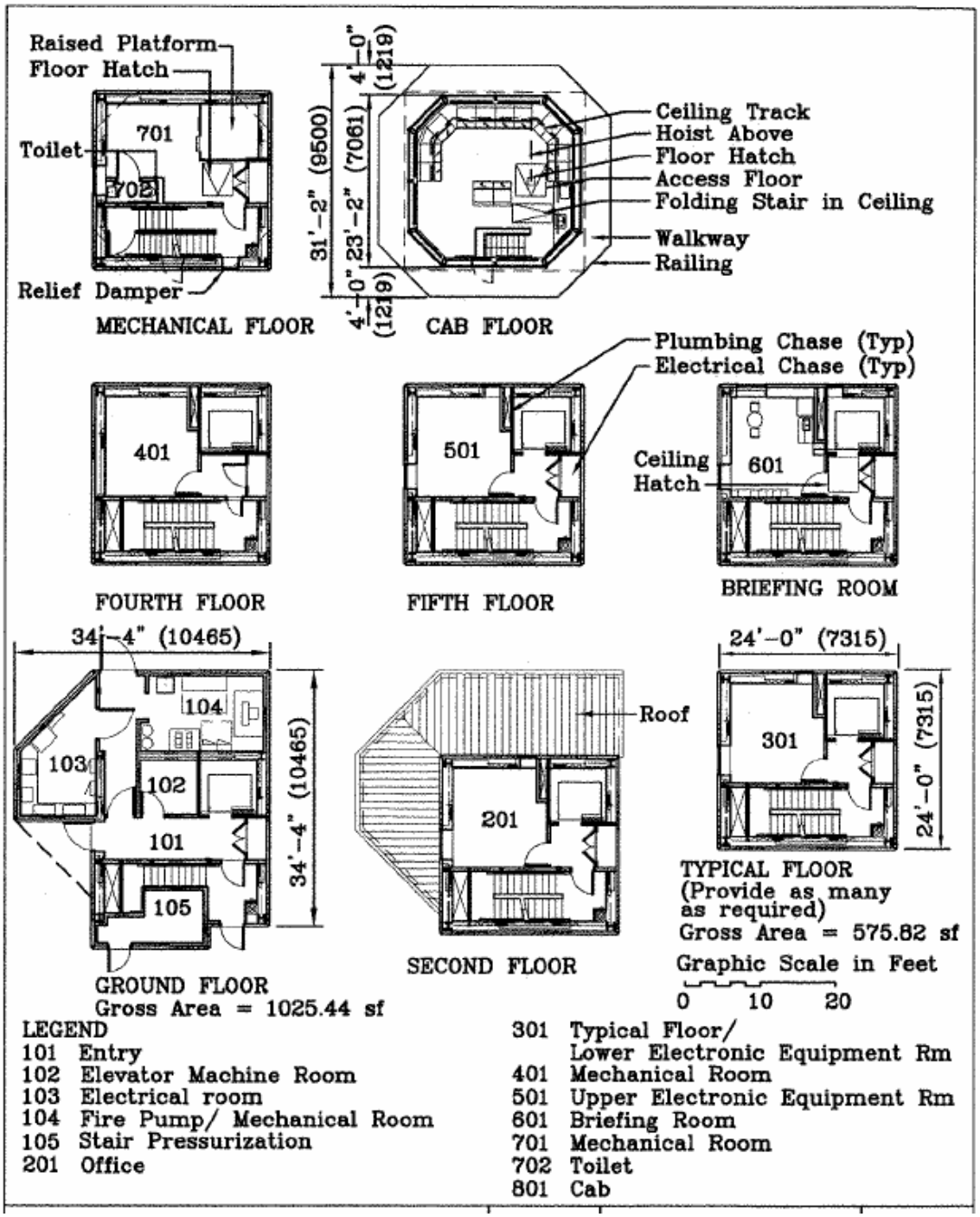


Figure 3 ATCT, Ground Floor Layout

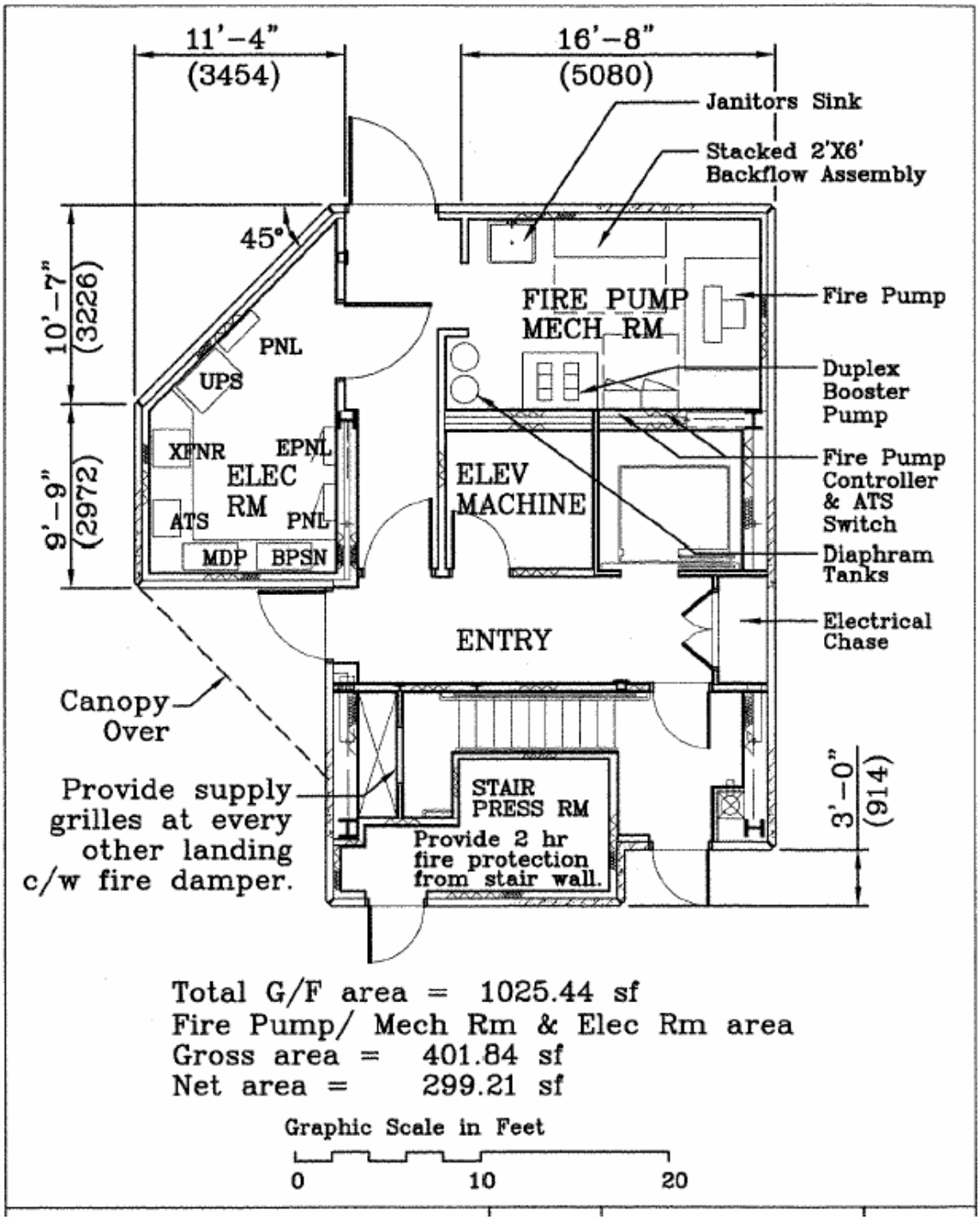


Figure 4 ATCT, Cab Layout

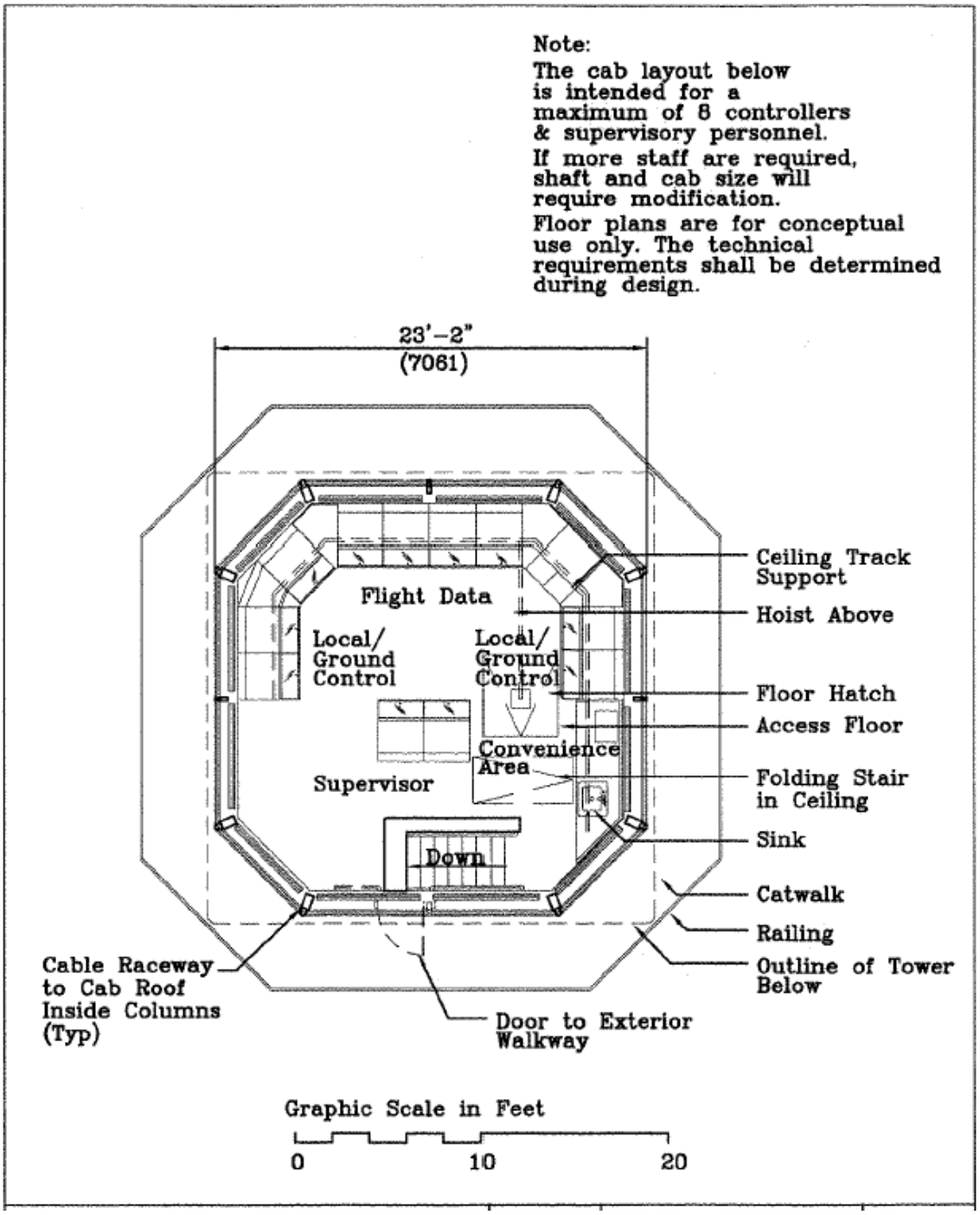


Figure 5 ATCT, Roof Plan

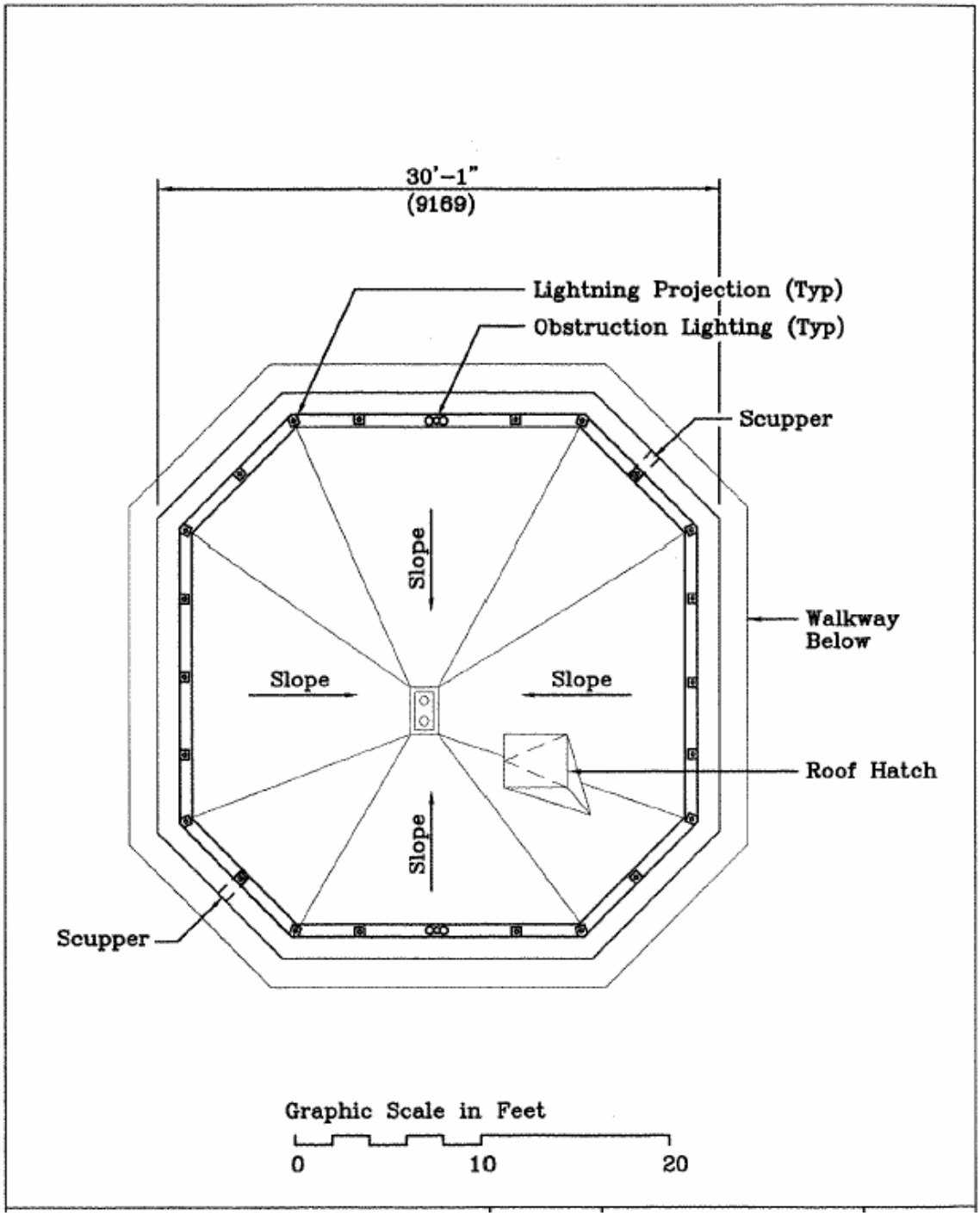


Figure 6 RATCF Facility Site Plan

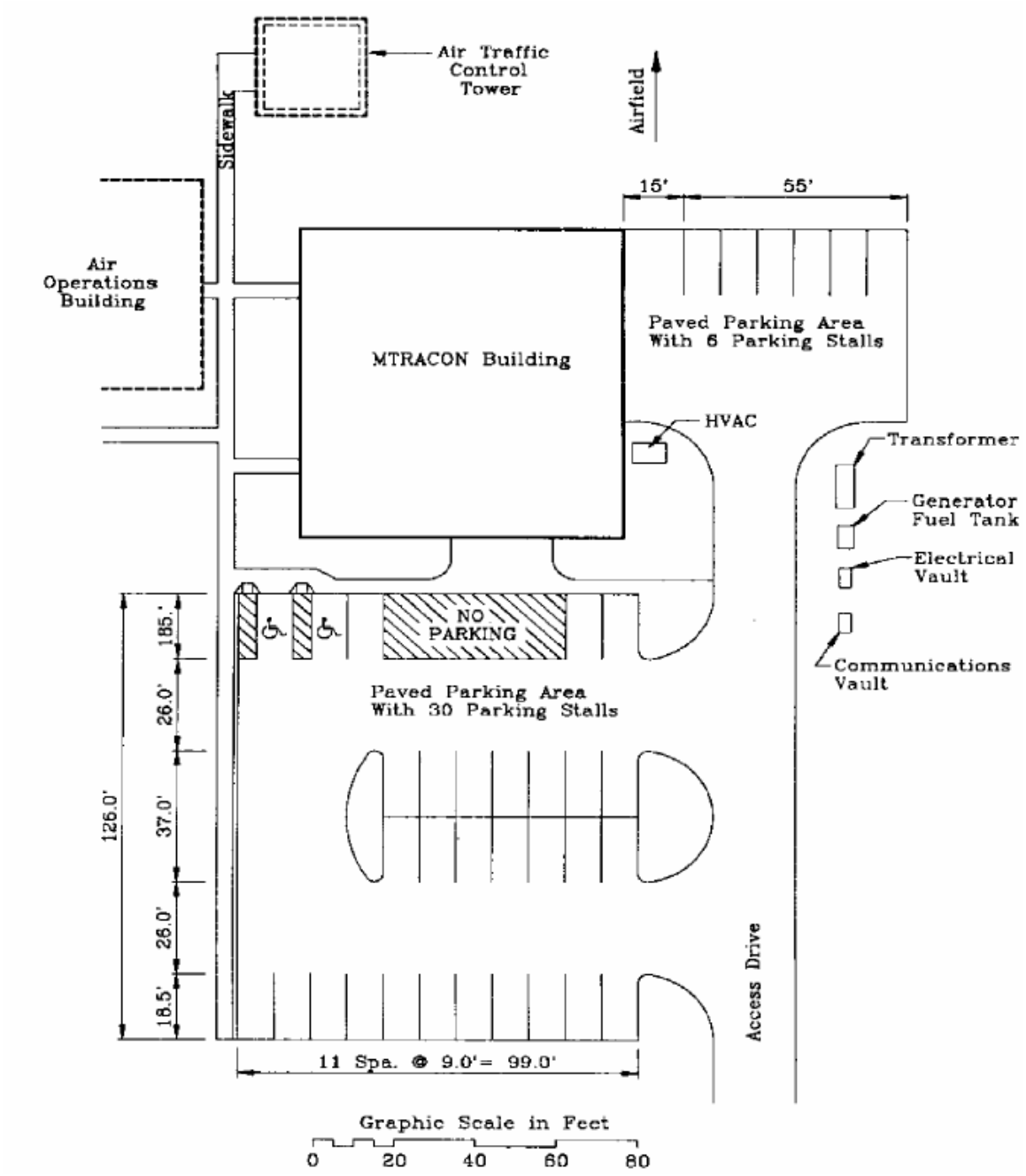


Figure 7 RATCFBuilding Layout

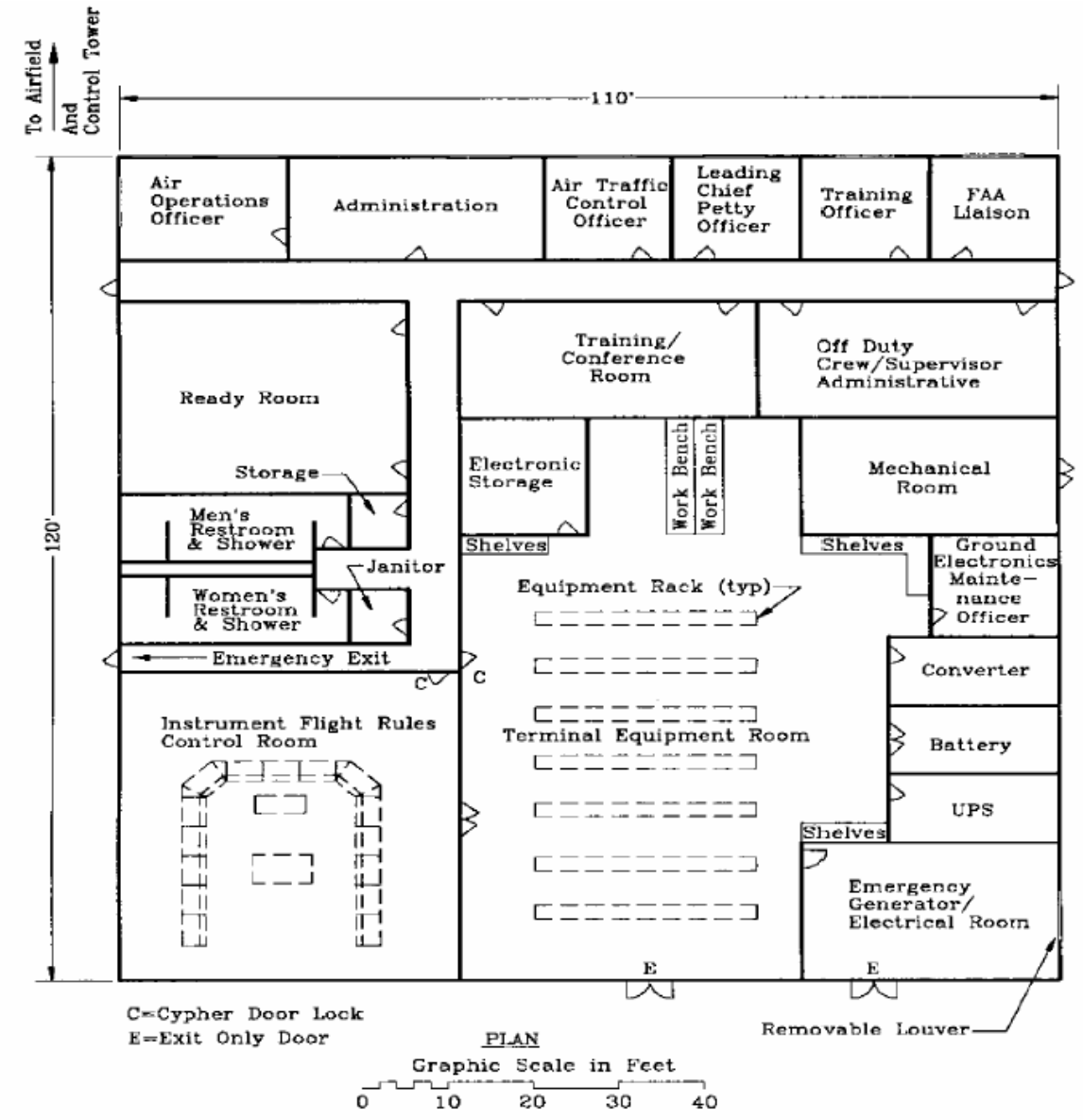
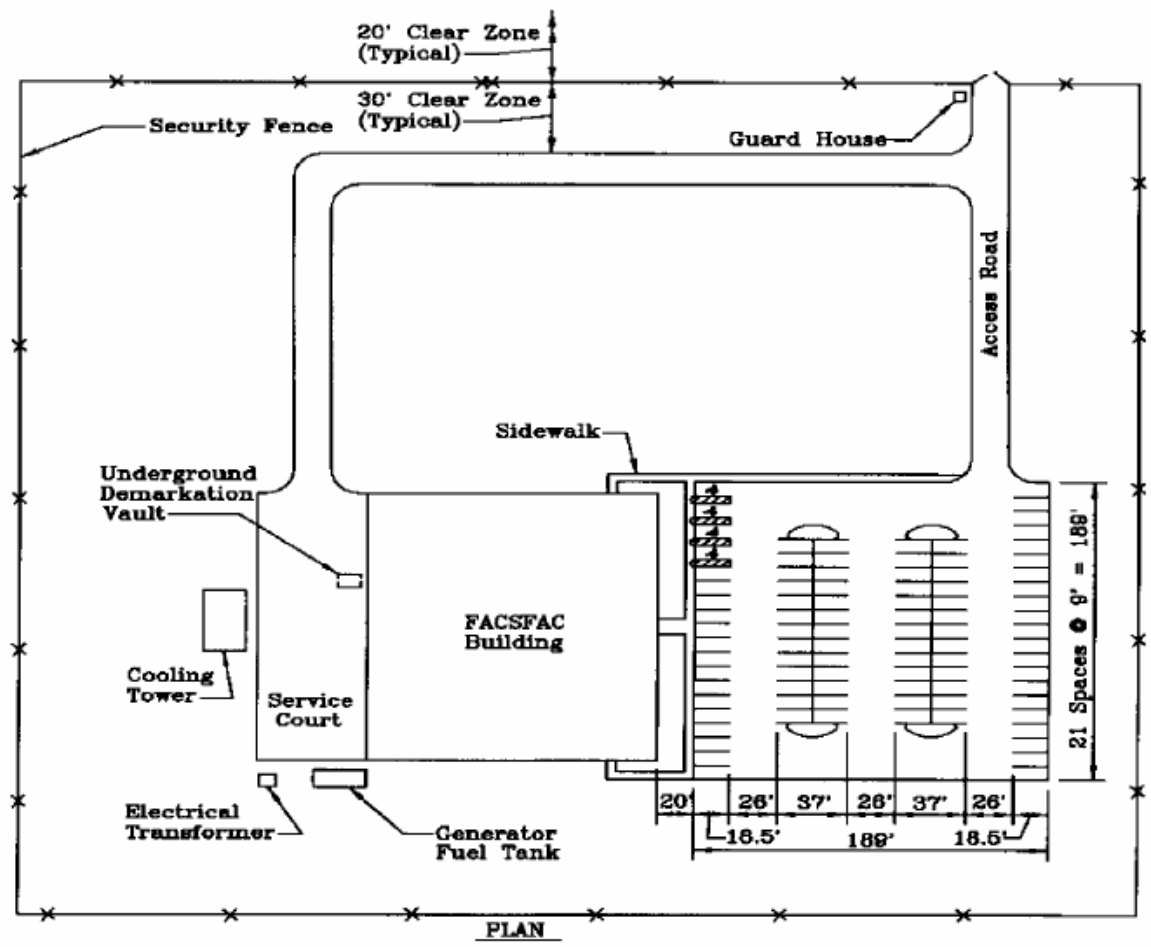


Figure 8 RATCF Facility Design Notes

		MTRACON
Plumbing Requirements (GPM):		
Water;		
Cold		65
Hot		
Recovery Rate (100 Deg. Rise)		30
Storage (Gal.)		40
Fire Protection Requirements		
Not Included		
Heating Requirements (BTU/HR x 1000):		
(Inside Design Temperature = 72 Degs. F)		
Outside Design Temperature	-5 Degs. F	110
	+5 Degs. F	100
	+15 Degs. F	80
	+25 Degs. F	65
Air Conditioning Requirements (BTU/HR x 1000):		
Based on 91 Degs. D.B. 76 Degs. W.B. Outside Design Conditions; Cooling Load		523
Heat rejected to conditioned spaces by energized test.		
Equipment & parts under repair not included.		
Electrical Requirements (KVA):		
Lights;		
Connected Load		44.0
Estimated Demand		31.0
Power;		
Connected Load		116.0
Estimated Demand		81.0
Air Conditioning;		
Connected Load		124.0
Estimated Demand		87.0
Total;		
Connected Load		284.0
Estimated Demand		199.0
Emergency Generator (KW)		150.0
Areas (SF):		
Gross area including mechanical equipment room		13,200
General Notes:		

Figure 9 FACSFAC Facility Site Plan



Any Facility located within the Airfielf Safety Clearance Zone as defined by NAVFAC P 80.3 requires a criteria waiver approved by COMNAVAIRSYSCOM (Code 09Y1). Any equipment that must be located in violation of the Safety Clearance Zone criteria shall be coordinated with the In Service Engineering Agent(ISEA).

Graphic Scale in Feet
0 25 50 75 100

Figure 10 FACSFAC Building Layout

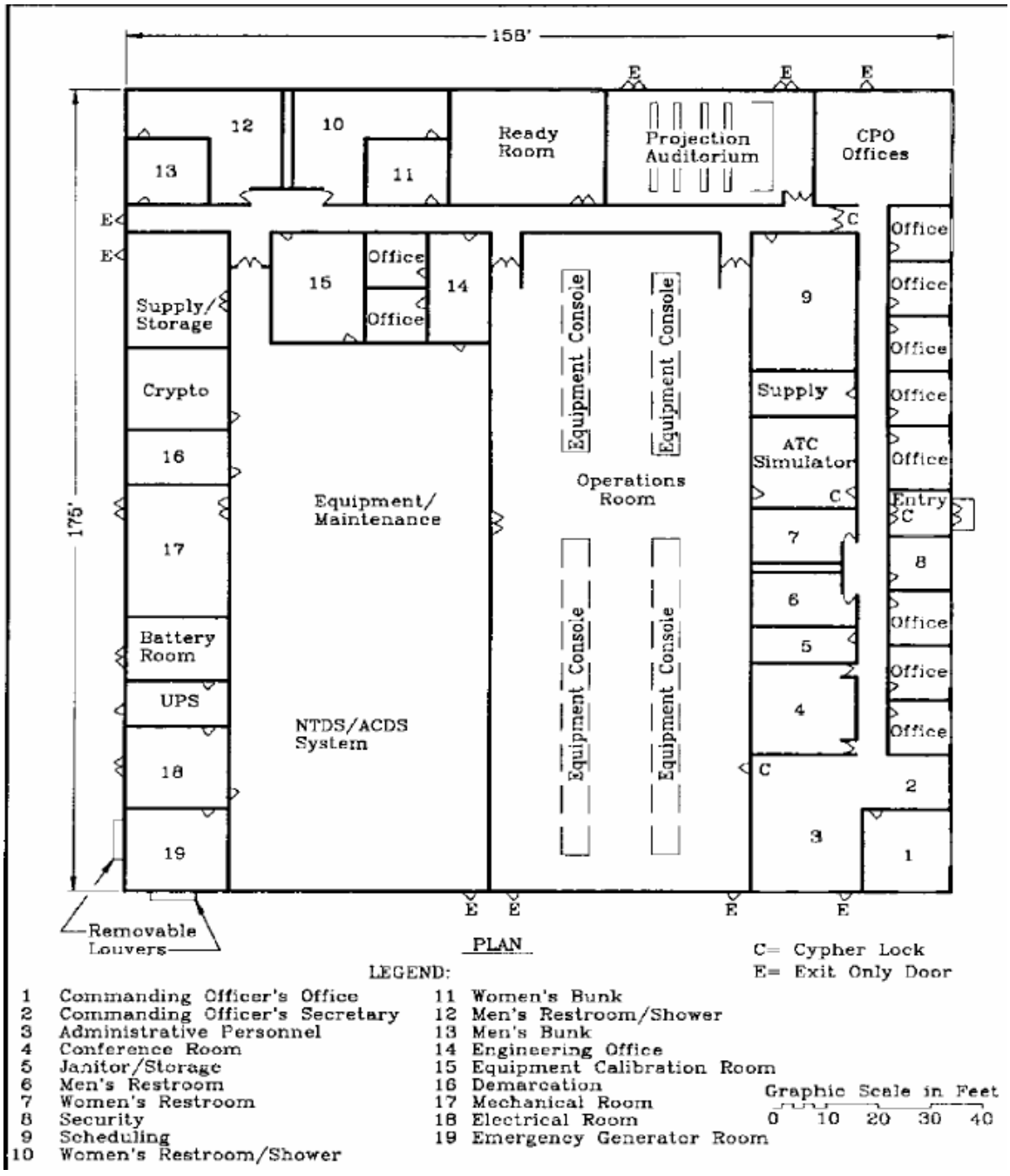


Figure 11 FACSFAC Facility Design Notes

		FACSFAC
Plumbing Requirements (GPM):		
Water;		
Cold		56
Hot		
Recovery Rate (100 Degs. Rise)		75
Storage Gal		160
Fire Protection Requirements		
Not Included		
Heating Requirements (BTU/HR x 1000):		
(Inside Design Temperature = 72 Degs. F)		
Outside Design Temperature	-5 Degs. F	380
	+5 Degs. F	330
	+15 Degs. F	300
	+25 Degs. F	230
Air Conditioning Requirements (BTU/HR x 1000):		
Based on 91 Degs. D.B. 76 Degs. W.B. Outside Design Conditions; Cooling Load		1095
Heat rejected to conditioned spaces by energized test.		
Equipment & parts under repair not included.		
Electrical Requirements (KVA):		
Lights;		
Connected Load		90
Estimated Demand		63
Power;		
Connected Load		418
Estimated Demand		293
Air Conditioning;		
Connected Load		377
Estimated Demand		264
Total;		
Connected Load		885
Estimated Demand		620
Emergency Generator (KW)		400
Areas (SF):		
Gross area including mechanical equipment room		27,650
General Notes:		

Figure 12 Joint Control Facility (Medium Density) Site Plan

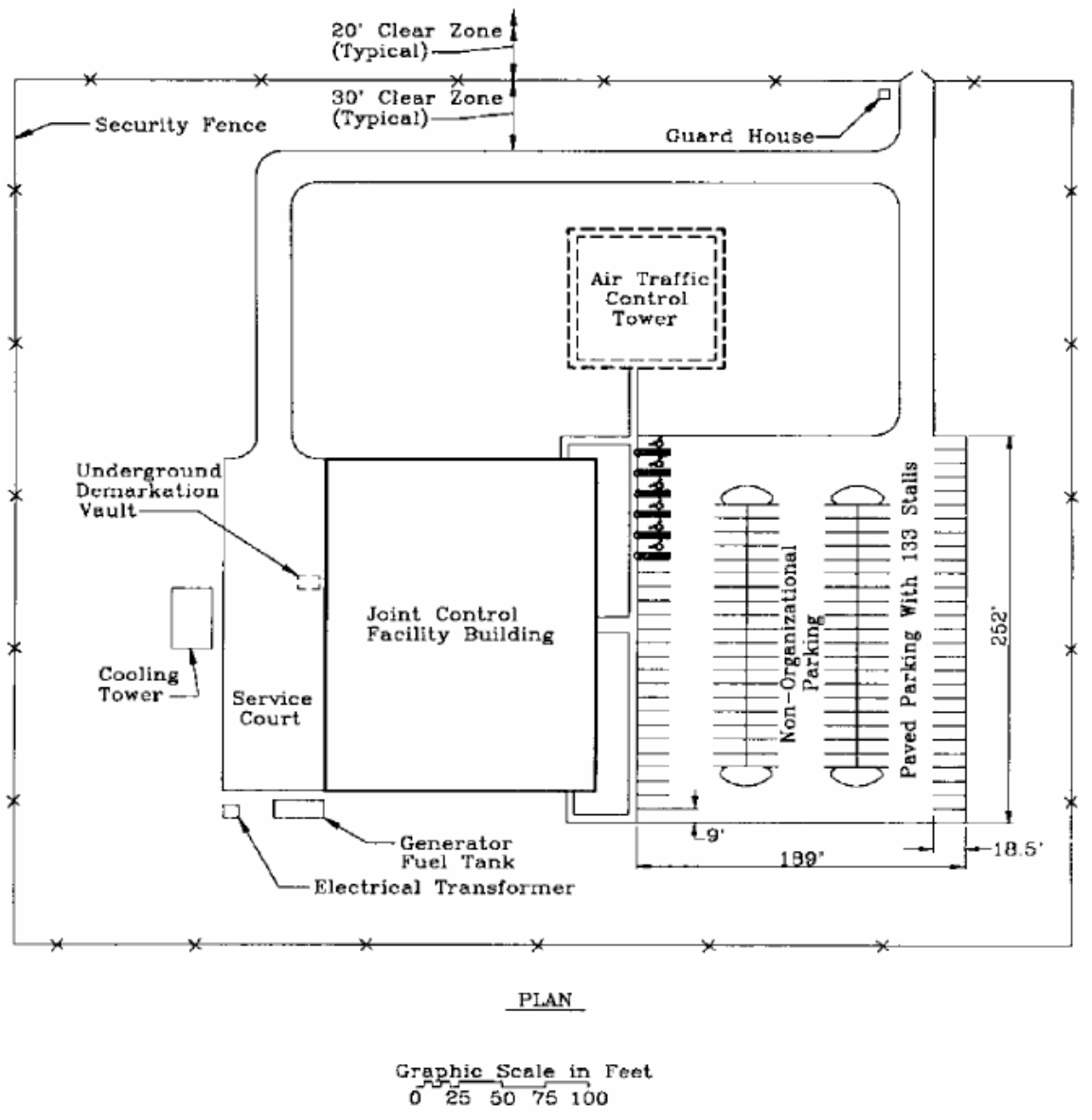


Figure 13 Joint Control Facility (High Density) Site Plan

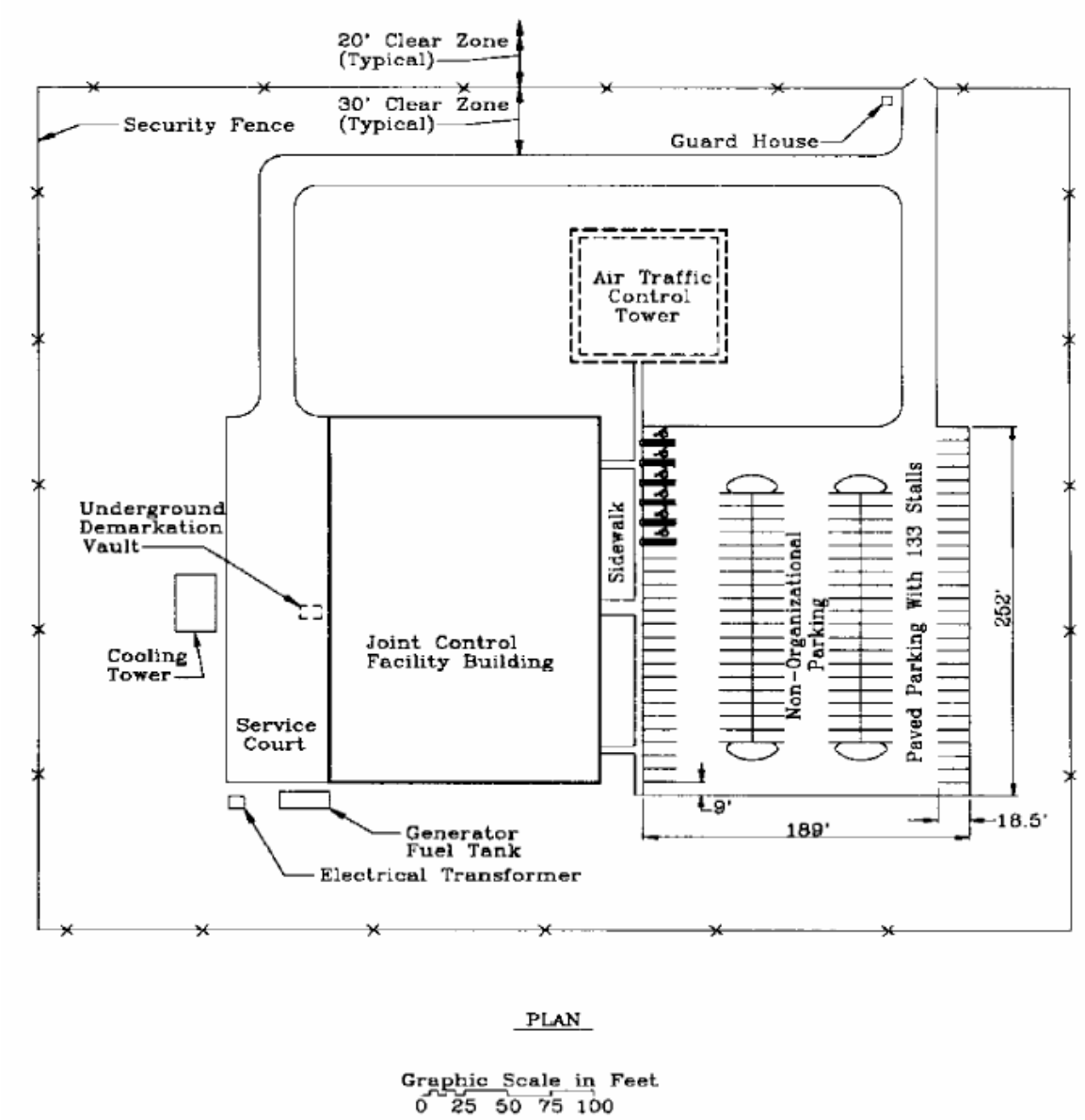


Figure 14 Joint Control Facility (Medium Density) Building Layout

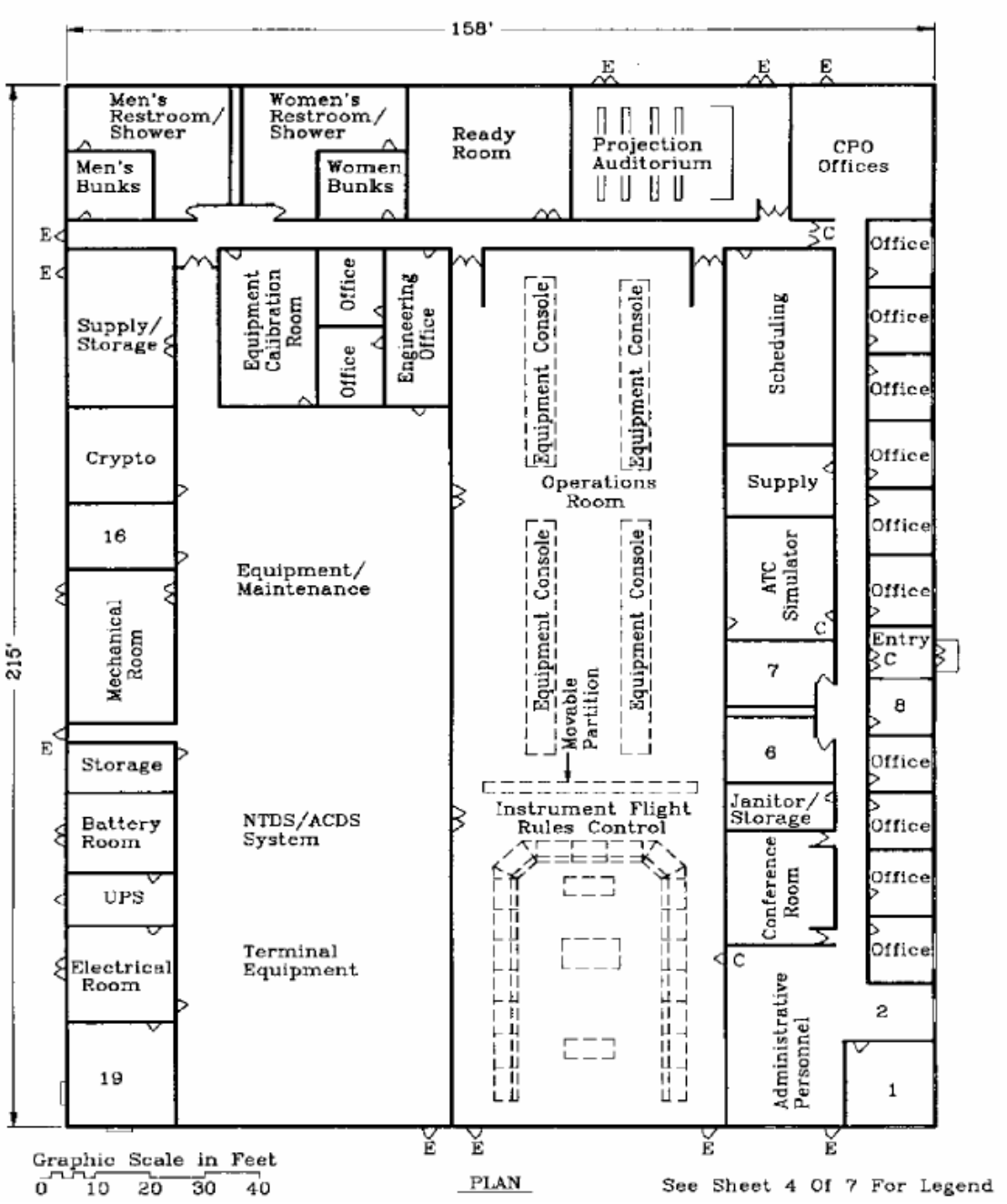


Figure 15 Joint Control Facility (High Density) Building Layout

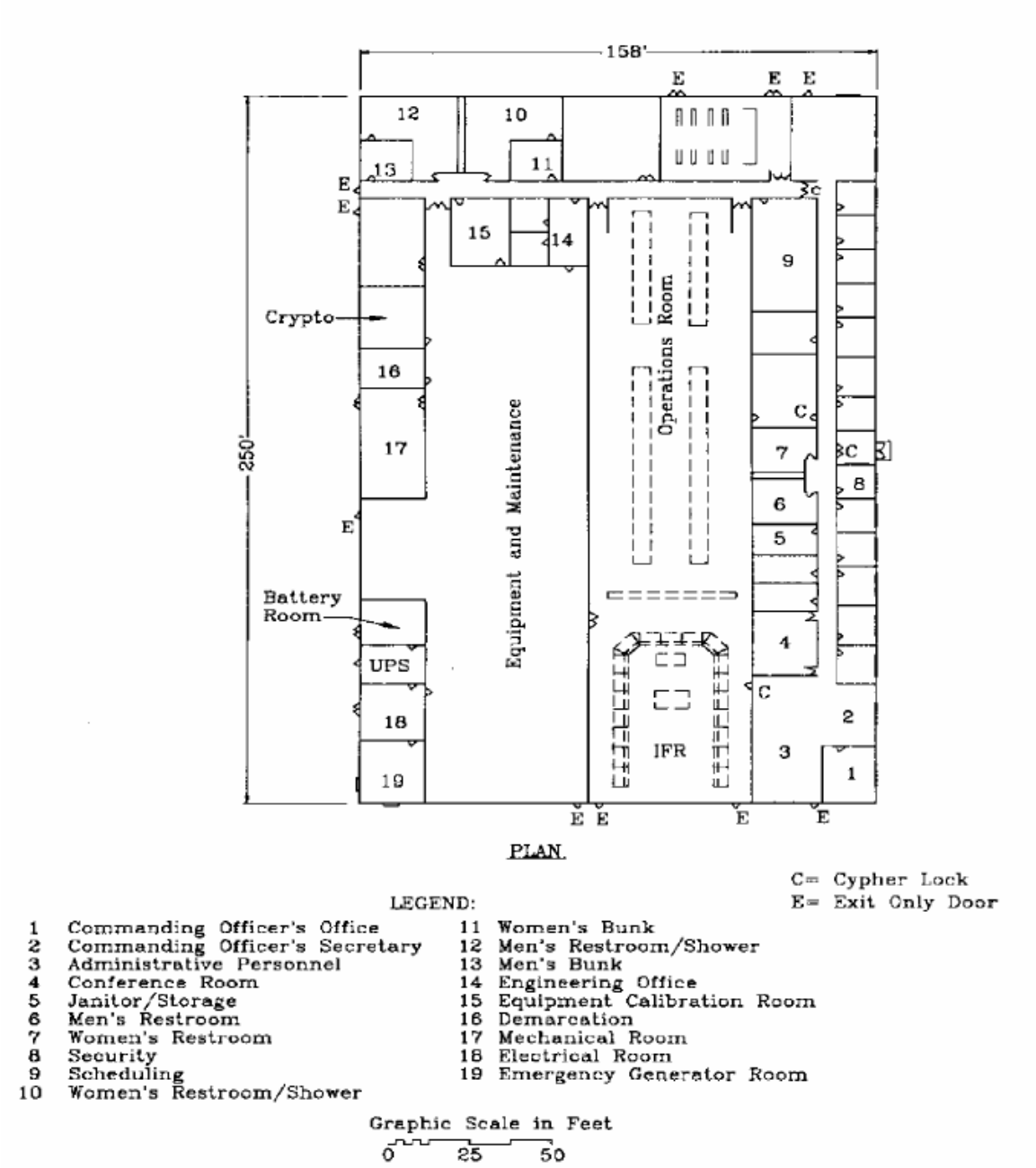


Figure 16 Joint Control Facility (High Density) Building Layout – Part 1

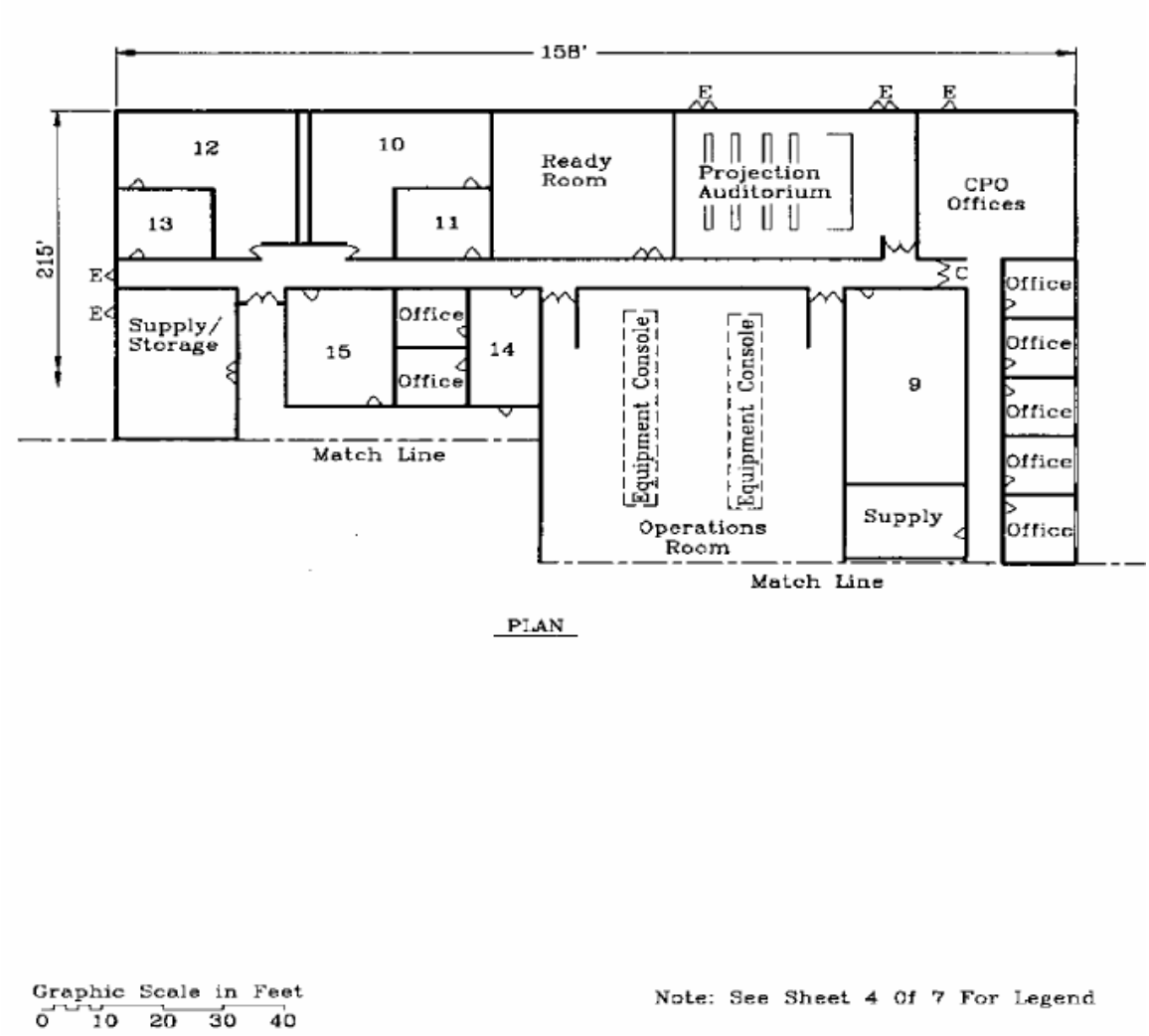


Figure 17 Joint Control Facility (High Density) Building Layout – Part 2

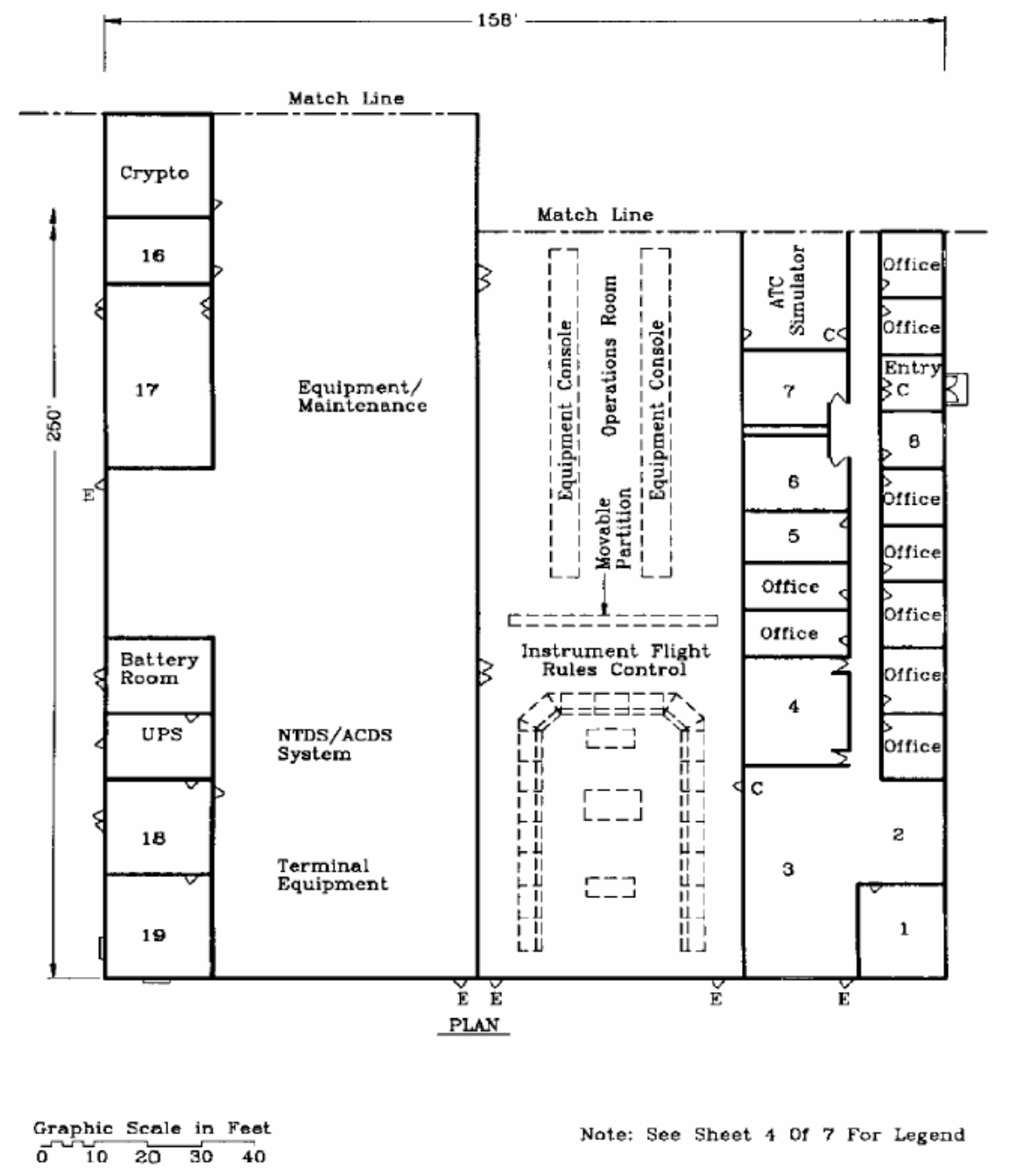


Figure 18 Joint Control Facility Design Notes

		Joint Control Facility	
Plumbing Requirements (GPM):		Medium Density	High Density
Water;			
Cold		74	74
Hot			
Recovery Rate (100 Degs. Rise)		100	100
Storage (Gal.)		160	160
Fire Protection Requirements			
Not Included			
Heating Requirements (BTU/HR x 1000):			
(Inside Design Temperature = 72 Degs. F)			
Outside Design Temperature	-5 Degs. F	490	600
	+5 Degs. F	430	530
	-15 Degs. F	380	460
	-25 Degs. F	295	360
Air Conditioning Requirements (BTU/HR x 1000):			
Based on 91 Degs. D.B. 76 Degs. W.B. Outside Design Conditions;			
Cooling Load		1620	2140
Heat rejected to conditioned spaces by energized test.			
Equipment & parts under repair not included.			
Electrical Requirements (KVA):			
Lights;			
Connected Load		90	90
Estimated Demand		63	63
Power;			
Connected Load		514	610
Estimated Demand		360	427
Air Conditioning;			
Connected Load		377	784
Estimated Demand		264	550
Total;			
Connected Load		981	1484
Estimated Demand		687	1040
Emergency Generator (KW)		400	600
Areas (SF):			
Gross area including mechanical equipment room		33,970	39,500

Figure 19 Radio Antenna Tower

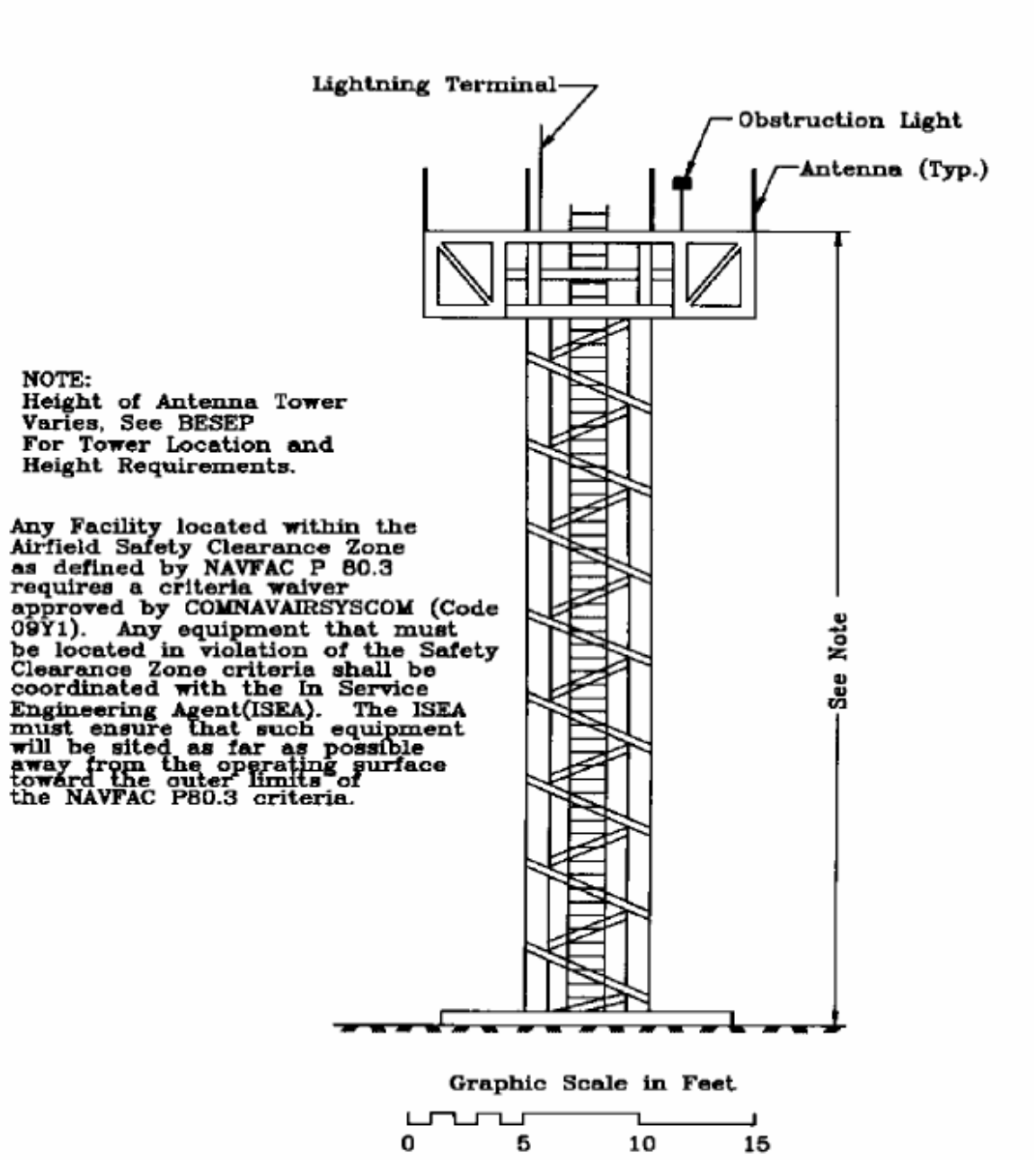


Figure 20 ASR Antenna Tower

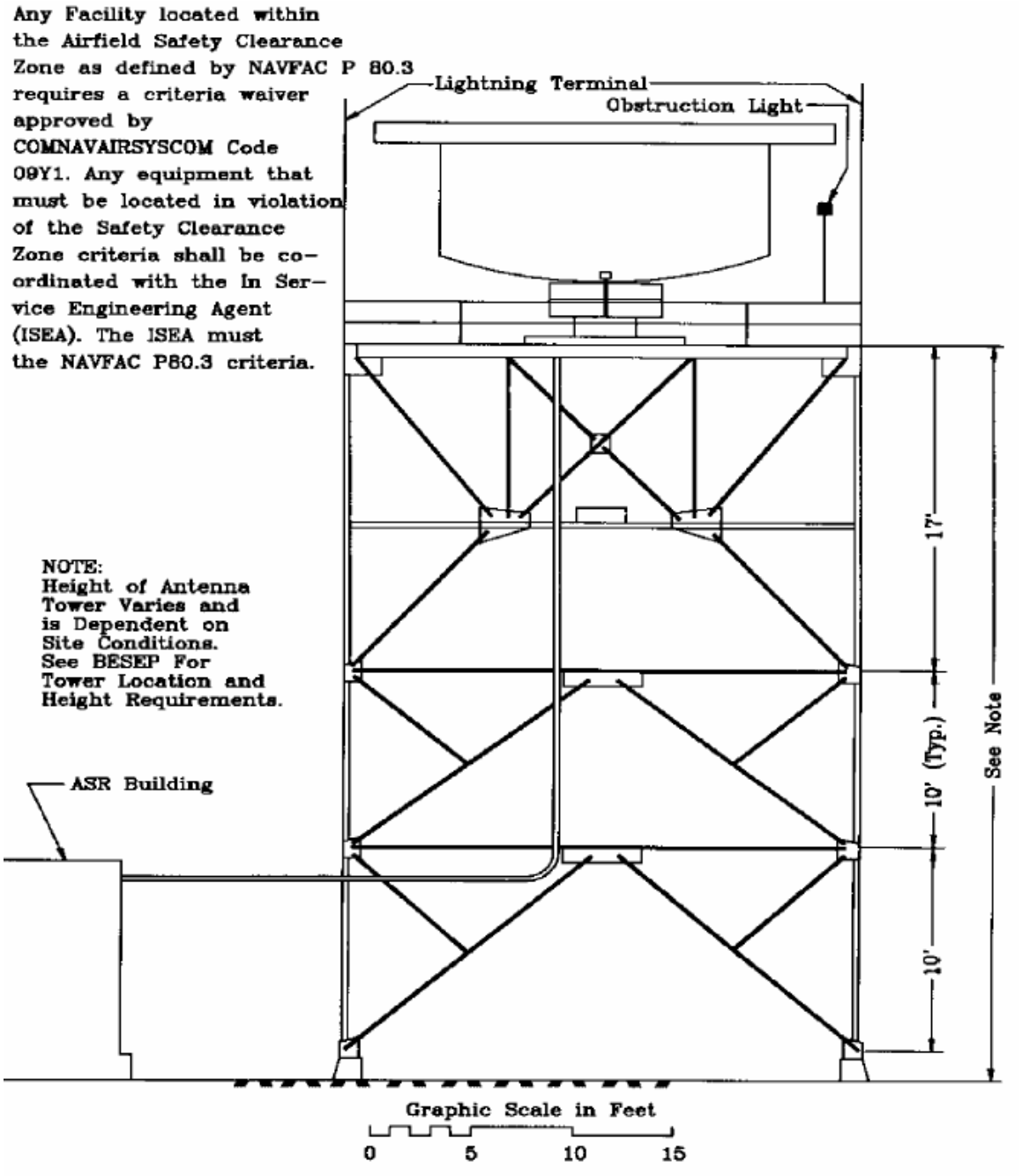
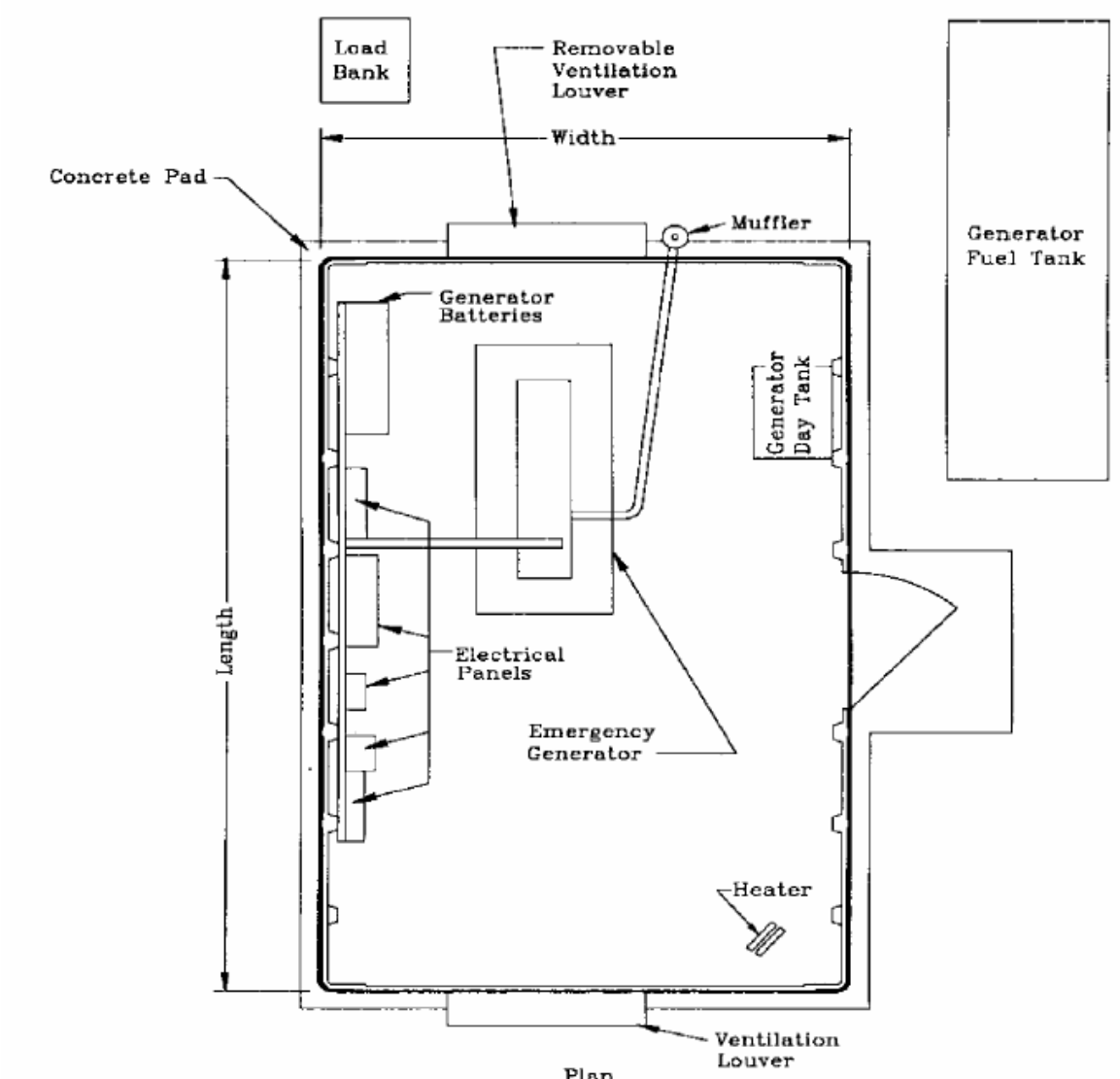


Figure 21 Indoor Emergency Generator Room



Generator Rating (Kw)	Length (Ft)	Width (Ft)
50	18.0	11.5
100	16.0	11.5
250	16.0	13.0
500	18.0	14.0

APPENDIX A GLOSSARY OF ACRONYMS

ACDS	Advanced Combat Direction System
ASR	available supply rate
ATC	Air Traffic Control
ATCF	Air Traffic Control Facility
ATCMB	Air Traffic Control Maintenance Branch
ATCT	Air Traffic Control Tower
ATFP	antiterrorism force protection
BEAP	Base Exterior Architecture Plans
BESEP	base electronic system engineering plan
CCTV	closed circuit television
CNO	Chief of Naval Operations
NISCOM	Naval Investigative Service Command
DON	Department of the Navy
DOT	Department of Transportation
EMR	electromagnetic radiation
ESD	Electrostatic Dissipating
ESS	Electronic Sensor System
FAA	Federal Aviation Administration
FACSFAC	Fleet Area Control and Surveillance Facility
FRD	Facility Requirements Documents
FRS	Facility Requirements Supplements
GCI	Ground Controlled Intercept
GEMD	Ground Electronics Maintenance Division
HERF	Hazards Of Electromagnetic Radiation To Fuel

HERO	Hazards Of Electromagnetic Radiation To Ordnance
HERP	Hazards Of Electromagnetic Radiation To Personnel
IDS	Intrusion Detection System
IDSEP	Intrusion Detection System Engineering Plan
IFR	Instrument Flight Rules
JCF	Joint Control Facility
LFA	Navy Lead Field Activity
MILCON	Military Construction Program
MLS/LIRS	Low Impact Resistance Microwave Landing System
NAALS	Air Navigational Aids and Landing Systems
NAS	National Airspace System Modernization
NATOPS	Naval Air Training and Operating Procedures Standardization
NAVAIDS	Navigational Aids System
NAVAIR	Naval Air Systems Command
NAVFAC	Naval Facilities Engineering Command
NESSEC	Naval Electronics Systems Security Engineering Center
NTDS	Navy Tactical Data System
OCIR	Operational Capability Improvement Request
OPNAV	Operations Navy
OPS	Operations
PALS	Precision Approach Landing System
PAR	Precision Approach Radar
RATCF	Radar Air Traffic Control Facility
RF	Radio Frequency
SPAWAR	Space and Naval Warfare Systems Command

SSCC	Space and Naval Warfare Systems Center Charleston
TRACON	Terminal Radar Approach Control
UPS	Uninterrupted Power Supply
VFR	Visual Flight Rules

APPENDIX B REFERENCES

GOVERNMENT PUBLICATIONS

1. Unified Facilities Criteria

available from:
National Institute of Building Sciences (NIBS)
Whole Building Design Guide and Construction Criteria Base (CCB)
1090 Vermont Ave, NW Suite 700
Washington, DC 20005-4905
202-289-7800
fax 202-289-1092
http://dod.wbdg.org

UFC 1-200-01, Design: General Building Requirements

UFC 3-260-01, Airfield and Heliport Design and Planning

UFC 3-460-01, Design: Petroleum Fuel Facilities

UFC 3-600-01, Design: Fire Protection Engineering for Facilities

UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings

UFGS 16268, 400-Hz Solid State Frequency Converter

2. Naval Facilities Engineering Command
NAVFAC
Atlantic Division
Engineering Innovation and Criteria Office (EICO)
6506 Hampton Blvd
Norfolk, VA 23508
757-322-4200
fax 757-322-4416
http://dod.wbdg.org
www.navfac.navy.mil

NAVFACINST 11010.45, Regional Planning Instruction

DM 13.02, Commercial Intrusion Detection Systems

ITG 01-1, Elevator Design Guide

MIL-HDBK-1004/1, Electrical Engineering Preliminary Design Considerations

MIL-HDBK-1004/5, 400-HZ Medium-Voltage Conversion/Distribution and Low Voltage Utilization Systems

MIL-HDBK-1004/7, Wire Communications and Signal Systems

MIL-HDBK-1012/1, Electronic Facilities Engineering

MIL-HDBK-1013/1, Design Guidelines for Physical Security of Facilities

	MIL-HDBK-1190, Facility Planning and Design Guide
	MIL-HDBK-1195, Radio Frequency Shielded Enclosures
	P-80, Facility Planning Criteria for Navy and Marine Corps Shore Installations
	P-80.3, Facility Planning Factor Criteria for Navy and Marine Corps Shore Installations
3. Space and Naval Warfare Systems Command SPAWAR 4301 Pacific Highway San Diego, CA 92110-3127 http://enterprise.spawar.navy.mil	SPAWARINST 2804.1, Policy and Procedures Concerning Base Electronic Systems Engineering Plan
4. U.S. Army corps of Engineers USACE Headquarters 441 G. Street, NW Washington, DC 20314 202-761-0011 http://www.hnd.usace.army.mil/techinfo/	TI 809-04, Seismic Design for Buildings
5. Federal Aviation Administration FAA 800 Independence Ave, SW Washington, DC 20591 www.faa.gov	FAA Order 6480.4, ATCT Siting Criteria
	FAA Order 6480.7, Airport Traffic Control Tower and Terminal Radar Approach Control Facility Design
	FAA Specification FAA-E-2470, Transparent Plastic Window Shades
	FAA-ER-530-81-04, Structural/Mechanical Design Requirements for Low Impact Resistance Microwave Landing System Structures (MLS/LIRS)
	FAA Advisory Circular AC 70/7460,

	Obstruction Marking and Lighting
	FAA-STD-019D, Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment
	FAA-STS-020B, Transient Protection, Grounding, Bonding and Shielding Requirements for Electronic Equipment
6. Code of Federal Regulations (CFR) available from: Office of Public Relations Room C803 Stop: PR U.S. Government Printing Office Washington, DC 20401 202-512-1957 http://www.gpoaccess.gov/cfr/index.html	Title 14, CFR Part 77, Objects Affecting Navigable Airspace Title 40, CFR Part 112, Oil Pollution Prevention Title 40, CFR Part 113, Liability Limits for Small Onshore Storage Facilities, Subpart A, “Oil Storage Facilities” Title 40, CFR Part 280, Underground Storage Tanks Technical Requirements Title 29, CFR Part 1910, Occupational Safety and Health Standards
8. The Access Board 1331 F Street, NW, Suite 1000 Washington, DC 20004-1111 202-272-0080 TTY 202-272-0082 fax 202-272-0081 http://www.access-board.gov/	UFAS, Uniform Federal Accessibility Standards
9. Defense Standardization Program DSPO Defense Logistics Agency, J-307 8725 John J Kingman RD, Stop 6233 Fort Belvoir, VA 22060-6221 703-767-6888 fax 703-767-6876 http://www.dsp.dla.mil/	MIL-F-29046, General Specifications for Raised Flooring MIL-STD-461, Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference

to get documents: http://assist.daps.dla.mil/online/start/	MIL-STD-882, System Safety Program Requirements MIL-STD-1472, Human Engineering Design Criteria for Military Systems, Equipment and Facilities
10. Director of Central Intelligence Office of Public Affairs Washington, DC 20505 703-482-0623 fax 703-482-1739 available from: www.fas.org/irp/offdocs/dcid.htm	DCID 6/9, Physical Security Standards for Sensitive Compartmented Information Facilities (SCIF)

NON-GOVERNMENT PUBLICATIONS

1. National Fire Protection Association NFPA 1 Battermarch Park Quincy, MA 02169-7471 617-770-3000 fax 617-770-0700 www.nfpa.org	NFPA 70, National Electric Code NFPA 75, Standard for the Protection of Information Technology Equipment NFPA 101, Life Safety
2. Illuminating Engineering Society of North America (ESNA) 120 Wall Street, Floor 17 New York, NY 10005 212-248-5000 fax 212-248-5017/5018 www.iesna.org	HB-9-00, Lighting Handbook – 9th edition
3. American Standards for Testing and Materials ASTM 100 Barr harbor Drive West Conshohocken, PA 19428-2959 610-832-9585 fax 610-832-9555 www.astm.org	ASTM D 523, Standard Test Method for Specular Gloss
4. American Institute of Architects The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006-5292 800-AIA-3837 or	Architectural Graphics Standards

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infocentral@aia.org
www.aia.org