CHAPTER 7

GENERAL CRITERIA FOR BUILDINGS

7.1 GENERAL

Permanent communications station buildings are designed to promote operational efficiency as well as to provide protection and physical security for equipment. Each building is tailored specifically for the communications functions to be performed. To emphasize this individuality of buildings, the criteria peculiar to the construction of the transmitter and receiver buildings and the communications center are set forth in chapters 3, 4 and 5. This chapter contains general building criteria applicable to all communications station buildings.

Although the primary objective of the design is to facilitate installation, maintenance and operation of the electronic equipment, other factors must be considered in determining the total floor area and the structural methods to be used. Administrative areas must be included, and personnel support requirements must be met. The possibility of earthquake, hurricane, and bomb damage must be considered in the structural design; however, the need for such survivability must not be permitted to degrade the primary mission of the structure which is to support communications.

The basic criteria governing the construction of communications buildings are contained in the following publications:

- NAVFAC DM-2 - Structural Engineering
- NAVDOCKS DM-3 - Mechanical Engineering
- NAVFAC DM-4 - Electrical Engineering
- NAVFAC DM-23 - Communications, Navigation Aids, and Airfield Lighting
- NAVELEX Inst. 011120.1, Shore Electronics Engineering Installation Guidance for for Equipments and Systems Processing Classified Matter

Related criteria concerned with construction is found in:

- NAVDOCKS DM-1 - Architecture
- NAVFAC DM-5 - Civil Engineering
- NAVDOCKS DM-7 - Soil Mechanics, Foundations, and Earth Structures
- NAVDOCKS P-89 - Engineering Weather Data

The structures are designed by NAVFAC. NAVFAC is guided by the specific requirements of the electronic installation which must be made known in the BESEP (see chapter 1). The following discussion presents general criteria that must be considered for applicability and effect upon the overall design of communications buildings both as to ultimate cost and effectiveness of communications.

7.2 BUILDING FEATURES

7.2.1 Ceilings

Suspended acoustical ceilings in the equipment and operational areas are preferred. It may be desirable to install in the false ceiling a unistrut grid system capable of supporting signal and power cable ducting or trays. The unistrut system would be on 4-foot centers and would be mounted flush with the suspended ceiling. A ceiling height of 10 feet is preferred.

7.2.2 Floors

Exposed concrete floors are not acceptable in electronic facilities due to dusting of the wearing surface. Vinyl asbestos tile should be provided as the finish flooring. General requirements for floor finishes are contained in NAVFAC Design Manual DM-23. Where the use of exposed concrete flooring is unavoidable a floor hardener should be applied to the concrete finish.

7.2.3 Cable Ways

Equipment cabling must be considered in building design. The preferred cable routing is through trays or ducts suspended from the overhead. When raised flooring is used, all cabling will be done within the space provided by the raised floor.

7.2.4 Fire Protection

Normally, for protection of electronic equipment a carbon dioxide hose reel protection system will be required. This requirement is applicable to government owned electronic equipment installations in which the total equipment value is in excess of $100,000 or the operating requirements of the installation are of strategic importance. Requirement for equipment to be protected by carbon dioxide hose reel system will be stipulated in the Physical Plant Section of the Project BESEP.

Specific design criteria for protection of electronic equipment and raised floor spaces containing exposed cables is found in NAVFAC Design Manual DM-8 and NAVFAC Design Technical Note No. 38.

7.2.5 Lighting

General illumination in electronic equipment spaces in radio transmitter and receiver buildings, communication centers, and terminal equipment building require an illumination intensity of 40 to 50 foot candles. Where specific tasks require higher intensity illumination in accordance with I. E. S. recommendations, it shall be provided. This shall be accomplished either by increasing the general illumination level over the work area involved or by supplemental lighting at the particular task site. Fluorescent lighting may be used in all buildings except transmitter helix houses. When fluorescent lighting is used in a receiver building, the fixtures must be grounded with green, third wire of the power feeder and fitted with power line filters. Battery-powered floodlights are required for the emergency lighting of individual rooms and areas.

These battery-powered lighting systems are to be activated by relays in the normal lighting circuit.

7.2.6 Battery Room

Except for a remote or unattended facility, a separate battery room should be included in the design of those buildings containing large microwave systems requiring on-line batteries for emergency operation. The Project BESEP will stipulate when a separate battery room is required.

Control of the air temperature and humidity within communications building is required both for personnel and equipment. The anticipated heat dissipation of the electronics equipments as well as the limits for equipment ventilating air temperature and humidity must be stated in the BESEP.

Each electronic equipment should be carefully investigated as to its true requirement for ventilation before the BESEP writer specifies rigid temperature and humidity figures such as may be found in the equipment instruction book. A requirement for a specific amount of continuous ventilating air at a specific temperature may impose unnecessarily rigid restrictions on the building designer. Such an unqualified statement requires that the equipment must be supported by systems having 100 percent reliability and exact temperature control. A thorough investigation of the equipment may prove that operation is possible for a short period of time without ventilation or support from an outside system. On the other hand, if it is found that the equipment cannot operate without a support system the designer should be so informed. To design the best environmental system for the building, the designer should know the acceptable ranges for humidity, temperature and volume of ventilating air, along with any rate of change limitations.

Humidification is usually accomplished by introducing steam into the air stream. Facilities for steam are not usually planned for small stations or semi-transportable stations. Therefore, a requirement for humidity control at any of these locations should be carefully considered. The introduction of water vapor into the air stream for humidification purposes is not recommended because the water vapor is detrimental to the electronic equipment.

A designer may desire to include the equipment exhaust heat in his plan for controlling the overall building environment. In the cold climates exhaust heat may be used to heat a building; in tropical climates it may be more economical to cool the exhaust air for reuse rather than to dehumidify the outside air.

When the BESEP is prepared the requirement for an electronic equipment to exhaust ventilating air should not be translated to mean exhaust to the atmosphere, since all air exhausted to the atmosphere must be replaced. Individual equipment air exhaust or supply systems are expensive, seldom practical and difficult to maintain. Ducting of ventilating air to and from equipment should be specified on a special case basis only.

The preferred method of providing ventilating air to a space is through ducts along the overhead or through ducts above the suspended ceiling. The ventilating air should be expelled and exhausted through ducts that lead directly into the space that is ventilated. Systems that require air to be distributed through perforated ceilings or by the void space under a raised floor are not recommended.

When the degree of reliability is specified for an environmental system, a reliability percentage figure without qualifying factors should be avoided. In lieu of a stated percentage figure, the permissible total system down time could be specified thereby allowing the designer to provide a system that would permit short interruptions of service such as might occur when a drive belt requires replacement. Another possibility would be to designate as critical a portion of the system. This may allow the designer to split the environmental control requirement among several units so that one unit would always be available for the critical load. Alternatively, one additional unit could be provided for reliability assurance.