FACILITY PLANNING CRITERIA FOR NAVY AND MARINE CORPS SHORE INSTALLATIONS

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130 COMMUNICATIONS, NAVIGATIONAL AIDS, AND AIRFIELD LIGHTING

The communications, navigational aids, traffic aids, lighting, and other facilities included in this category group are for naval vessels and aircraft and their shore support facilities. Applicable to naval vessels are the communications facilities and certain navigational aids. The communications facilities and navigational and traffic aids are designed to furnish constant audio and visual orientation for aircraft operation and navigation. Category groups pertaining to these operations are as follows:

Group 131 Communications - Buildings
Group 132 Communications - Other than Buildings
Group 133 Navigation and Traffic Aids - Buildings (Non-Ship Related)
Group 134 Navigation and Traffic Aids - Other than Buildings (Non-Ship Related)
Group 135 Communication and Control Lines
Group 136 Airfield Pavement Lighting
Group 137 Ship Navigation and Traffic Aids - Buildings
Group 138 Ship Navigation and Traffic Aids - Other than Buildings

131 COMMUNICATIONS BUILDINGS

This group includes buildings in support of radio and wire communications systems. Definitive designs for some category codes are available for reference in NAVFAC P-272.

131 10 CABLE HOUSE (SF)

A Cable House contains the junction of cables connecting the Transmitter Building, Receiver Building, Air Station Control Tower, Operations Radio Area, Fleet Tactical Base Radio, Operations Duty Officer, Aerology Command Areas, and others.

131 15 COMMUNICATIONS CENTER (SF)

A Communications Center is the control activity for the component facilities of a designated Navy Communications Station. The center combined with a radio transmitting station and radio receiver station form a Naval Communications Station. There are no fixed planning criteria for this facility; all projects must be developed based on engineering studies.

Technical guidance is provided in NAVELEX 0101,102 (Handbook of Naval Shore Electronics Criteria) and NAVFAC DM-23.

131 17 TELECOMMUNICATIONS CENTER (SF)

In installations handling large and complex volumes of communications for several activities, a telecommunications center may be provided as an independent unit from Communications Center, Code 131-15.

131 20 COMMUNICATIONS CONTROL LINK BUILDING (SF)

The communications control link building is used at communications terminals and at intervening sites as required to relay line-of-sight microwave transmission. The building is a small specialized structure that houses the necessary radio equipment and the storage batteries and automatic-start engine generator equipment to supply the operating power. The building has an approximate gross area of 170 square feet.

Occasionally the equipment may be housed in a commercial container adapted for electronic installations, in which case a hardstand and utilities must be provided.

131 22 VHF/UHF COMMUNICATION FACILITY (SF)

A VHF-UHF Communication Facility requires building space to house control panels, power panels, equipment room, and power unit. The gross building area is approximately 500 square feet.

131 25 TELEMETRY BUILDING (SF)

This facility houses missile and satellite tracking and data recording equipment, associated with a telemetry system. The building varies in size with its specific function and the quantity of equipment to be housed. Some of the simpler functions may be handled by equipment in portable vans. The telemetry buildings of the more complex stations house the receivers, transmitters, recorders, and the necessary office and service equipment.

131 30 HELIX HOUSE (SF)

The helix house is a building especially designed to contain antenna tuning devices. The helix house is sited at or near the base of high-power low-frequency and VLF transmitting antennas. The size of the building will vary with the equipment to be housed. A typical helix house for a 50-kilowatt low-frequency and VLF transmitter has a gross area of approximately 1,000 square feet.

131 35 RECEIVER BUILDING (SF)

The receiver building is located in the center of its antenna field, remote from all other buildings. The size of the building varies with the type and quantity of operating equipment and the space required for administrative, storage, utility, and maintenance functions. The configuration of the building should approximate a square rather than a narrow rectangle. The land area required for a receiver installation will vary with its size and the existing and projected future environment. Attainment of minimum RF noise level is essential to efficient performance. Economic factors of cost in securing adequate buffer zones, and the probable nature of future encroachment must be considered. HF installations requires a much larger land area than VHF/UHF. Minimum separation distances from interference sources are given on Table 131.

TABLE 131
COMMUNICATIONS DISTANCE SEPARATIONS

Minimum isolation distances for communications sites have been established by NAVELEXSYSCOM as follows:

HIGH, MEDIUM AND LOW FREQUENCY RECEIVER SITE FROM:

HIGH POWER, VERY LOW FREQUENCY (VLF) TRANSMITTER STATIONS.....25 MILES

HIGH POWER, LOW FREQUENCY (LF) AND HIGH FREQUENCY (HF) TRANSMITTER STATIONS.....15 MILES

TRANSMITTER STATIONS NOT UNDER NAVY CONTROL (FIELD INTENSITIES ALSO GOVERN-SEE NAVELEX 0101,103).....5 MILES

RUNWAYS AND GLIDE PATHS
- AERONAUTICAL RECEIVERS.....1,500 FEET
- GENERAL COMMUNICATIONS RECEIVERS..... 5 MILES

TELETYPE AND OTHER ELECTROMECHANICAL SYSTEMS
- LOW LEVEL OPERATIONS.....NO MINIMUM
- HIGH LEVEL OPERATIONS IN SHIELDED ROOM.....NO MINIMUM
- HIGH LEVEL OPERATIONS IN UNSHIELDED ROOM-LARGE INSTALLATION (COMMUNICATIONS CENTER)...2 MILES FROM NEAREST ANTENNA
  -SMALL INSTALLATION (1 TO 6 INSTRUMENTS).....200 FEET FROM NEAREST ANTENNA

MAIN HIGHWAYS FROM NEAREST ANTENNA (MAXIMUM HOURLY TRAFFIC COUNT OVER 1200).....3,000 FEET

OVERHEAD HIGH TENSION POWER LINES AND RECEIVING STATION FEEDERS-(LESS THAN 100KV)....1,000 FEET FROM NEAREST ANTENNA
-(OVER 100KV).....2 MILES FROM NEAREST ANTENNA

HABITABLE AREAS (BEYOND LIMITS OF RESTRICTION).....1 MILE

AREAS CAPABLE OF INDUSTRIALIZATION (BEYOND LIMITS OF RESTRICTION)
- LIGHT INDUSTRY.....3 MILES
- HEAVY INDUSTRY.....5 MILES

RADAR INSTALLATIONS.....SEE NAVELEX 0100,103 TABLE 4-1

PRIMARY POWER PLANTS.....5 MILES

HIGH, MEDIUM AND LOW FREQUENCY TRANSMITTER SITE FROM:

TRANSMITTER STATIONS NOT UNDER NAVY CONTROL.....3 MILES

RUNWAYS AND GLIDE PATHS FOR AERONAUTICAL TRANSMITTING AT AIR STATIONS.....1,500 FEET

MAIN HIGHWAYS.....1,000 FEET

HABITABLE AREAS (FROM NEAREST ANTENNA)
- HF TRANSMITTER.....0.5 MILE
- LF/MF TRANSMITTER.....1 MILE

OVERHEAD HIGH TENSION POWER LINES (FROM TRANSMITTER STATION FEEDERS).....1,000 FEET

REMOTE VHF/UHF TRANSMITTER BUILDING FROM:

OPERATIONS BUILDING AND CONTROL TOWER.....1,000 FEET

VHF/UHF RECEIVER BUILDING AND HOUSING AREA.....1,500 FEET

REMOTE VHF/UHF RECEIVER SITE FROM:

VHF/UHF TRANSMITTER SITE.....1,500 FEET

HIGHWAYS, INDUSTRIAL AND HOUSING AREAS.....1,000 FEET

RADAR INSTALLATIONS.....1,500 FEET

WULLENWEBER ANTENNA FACILITY

NO OBSTRUCTION SHOULD PROTRUDE ABOVE A THREE DEGREE ANGLE OF ELEVATION MEASURED FROM THE BASE OF THE HIGH BAND ANTENNA ELEMENTS.

SEPARATION DISTANCES FROM POSSIBLE SOURCES OF INTERFERENCE ARE SIMILAR AS FOR OTHER HIGH, MEDIUM, AND LOW FREQUENCY RADIO RECEIVER SITES. FOR SPECIFIC GUIDANCE, SEE NAVELEX SHORE CRITERIA SECURITY GROUP STATIONS 0101,108.

131 40 TELEPHONE EXCHANGE BUILDING (SF)

Telephone exchange facilities for small activities may be housed in the station administration or communications building. At larger stations a separate telephone exchange building will be planned. Prior to planning for a telephone system, an estimate of the total main line and extension telephones required should be derived from a schedule of prospective station users. This schedule should be based on the requirements for each department or office on the station. The estimate of telephone requirements should be accomplished sufficiently in advance to permit planning for the telephone central office and the outside cable distribution system. A separate building for the telephone exchange may or may not be required depending upon the prospective size of the system, the load center, or other factors. As a general guide for determining space requirements for manually operated or dial central systems, the following information may be used:

Space for Manual Central Office

Line capacity	Switchboard positions	Net area (sq ft)
100	1	450
100	2	525
200	2	590
200	4	750
400	7	1,400
600	10	1,725
800	11	1,850
1,000	14	2,100
1,200	16	2,280
1,600	22	3,150
2,000	27	3,150
2,800	40	4,260

Note: Space includes provision for switchboard operating room, equipment, frame and maintenance room battery and power room operators' rest and lounge rooms, small locker room, small supply room, and administration office (officer in charge, chief operator, wire chief, and records).

Table for Dial Control Office on next page.

Space for Dial Central Office

Line capacity		Appropriate space requirements	
Initial	Expandable to	Dimensions (ft)	Area (sq ft)
200	400	30 x 55	1,650
400	600	38 x 55	2,090
600	1,000	35 x 70	2,450
1,000	1,400	35 x 82	2,870
1,400	2,000	40 x 95	3,800
2,000	3,000	45 x 110	4,950
3,000	4,800	49 x 119	5,851

Note: Space includes the same components as manual office except for dial switchboard space instead of operating room.

131 42 AUTOMATIC COMMUNICATION SWITCHING CENTERS (SF)

Automatic Communication Switching Centers house the facilities for distribution of communications. The switching center may be located in the communications center or in a separate building. The types of centers vary with the material to be handled and its classification. Specific types of centers and their space requirements are described below.

Autovon. (Automatic Voice Network). An Autovon switch with necessary auxiliary equipment requires about 3,000 square feet of space and contains a 100-300 line switch.

Autosevocom. (Automatic Secure Voice Communication). An autosevocom switch with necessary auxiliary facilities requires about 3,000 square feet of space for a 25-100 line switch.

Autodin. (Automatic Digital Network). An autodin switch with necessary auxiliary equipment will require an average of 12,000 feet of space for a 100 line switch.

Autodin Subscriber Terminal. An Autodin subscriber terminal requires about 300 square feet of space. In cases where more than one terminal is required by a subscriber, the total space requirement has to be determined individually.

131 45 TERMINAL EQUIPMENT BUILDING (SF)

The building contains equipment for high or low frequency capacity terminals of communications systems that support transmitting and receiving buildings. The terminal building varies in size depending upon the function of the system, the quantity of equipment to be housed. For design criteria, see NAVFAC DM-23.

131 50 TRANSMITTER BUILDING (SF)

Transmitter Building for Naval Communications is normally located in the center of its antenna field. The general design follows a cruciform configuration with transmitter wings having an internal width of 23 feet, allowing for two rows of transmitters. A control area forms the center of the cross. One wing may be wider and is used for shop, administrative, storage, and auxiliary mechanical equipment space. The length of the wings should be limited to about 100 feet. If four or more wings are required for transmitter installation, the cruciform configuration may be modified to provide a pentagonal or hexagonal control area with sides approximately 23 feet to permit extra wings for transmitters and a wing for support spaces. Approximately 800 acres of land is required for a transmitter station.

Transmitter Building for Air Operations is planned for every naval air activity except outlying fields. It houses equipment of ground-to-air communications, control of aircraft, administrative communications with other stations, and connections to the Naval Communications System. The size is dependent on the quantity and type of equipment. Several graduated sizes of transmitter buildings for air operations have been designed. They range in size from 2,647 square feet to 13,568 square feet. See NAVFAC P-272.

Space for Transmitter Building Equipment. Space allowed for transmitter equipment room is the sum of the square foot areas for equipment as compiled from the table as given below:

Transmitting Equipment	Area in SF
High frequency transmitters (15-50 watts, 2 ea per rack)	50 per rack
High frequency transmitter, 1 kilowatt	70
High frequency transmitter, 3 kilowatts	100
High frequency transmitter, 10 kilowatts	120
High frequency transmitter, 40-50 kilowatts	250
High frequency transmitter, 200 kilowatts	350
High frequency transmitter, 600 kilowatts	350
Low frequency transmitter, 2 kilowatts	120
Low frequency transmitter, 15 kilowatts	150
Low frequency transmitter, 100 kilowatts	300
UHF transmitter, 4 channels per rack	20 per rack
UHF transmitter, 15 watts, 4 channels per rack	20 per rack
UHF transmitter, 100 watts, 2 channels per rack	20 per rack
Link and terminal equipment, 26 channel terminal	70 per terminal

Transmitting Equipment	Area in SF
Control and monitoring	576
UHF multicouplers	30
Coaxial patch panel	95
Dehydrator	65

Communications Distance Separations. Minimum isolation distance for radio receiver and transmitter sites are given in text for Category Code 131 35, Receiver Building.

131 55 CIRCULARLY DISPOSED ANTENNA ARRAY BUILDING (SF)

This facility is planned as an interrelated part of the Circularly Disposed Antenna Array (Wullenweber), Category Code 132 55. Identification of workload is listed for each station in USSID 2000, NAVSECGRUINST S2000.1C (for communications circuits) and individual COMSEC tasking documents from cognizant fleet commanders. Translation of position/equipment type (workload) into space requirements is calculated using the applicable NAVELEXSYSCOM Standard Installation Plan in accordance with NAVSECGRUINST 11010.3.

Special communication distance separation restrictions for Wullenweber facilities are provided in Category Code 131 35. Navy control of land is required for an area measured by a radius of 5,280 feet beyond the outside edge of the high-band element of the Circularly Disposed Antenna Array.

131 56 DIRECTION FINDER BUILDING (SF)

Space for this function is normally provided by the Circularly Disposed Antenna Array Building (Category Code 131 55). For Naval Security Group activities, however, it continues to be a separate requirement as a specialized facility which houses equipment to position the source of radio signals. It also may house administrative, maintenance, and operational functions associated with missions assigned by the Chief of Naval Operations. Criteria are in NAVELEX 0101,108, Naval Shore Electronics Criteria and NAVFAC DM-23

131 60 MILITARY AFFILIATE RADIO STATION (MARS) (SF)

The Military Affiliate Radio System is part of Navy telecommunications complex. Size of the station varies with the type of operations and equipment used. As a general rule, the space for a MARS station is provided within existing Navy facilities and no specific projects should be planned. This code is mainly intended for inventory purposes.

131 65 FREQUENCY CONTROL/ANALYSIS BUILDING (SF)

This facility houses the necessary electronic equipment for radio frequency analysis and control. It is essential that the site selected for

this location be properly isolated from possible electronic interference sources. The size of the building is dependent upon the equipment to be housed and the required support areas, such as administration, storage and maintenance. Requirements figures must be accompanied with a detailed space analysis.

132 COMMUNICATIONS-OTHER THAN BUILDINGS

This facility group encompasses radio antennas, switching stations and public address systems. The antennas required are a function of the number and type of radio circuits to be incorporated in the communications system. Definitive designs for some of these facilities are available for reference in NAVFAC P-272.

132 10 ANTENNA-COMMUNICATIONS (EA)

Planning for communications antennas involves consideration of three basic aspects: siting, selection of types, and structures for support.

Requirements for siting, arrangements, types of antennas, circuitry, and other aspects, are determined by the Naval Electronics Systems Command and the office having support responsibility. Standard design antennas and their supporting structures are shown in NAVELEX publications 0101,104 (HF Communications Systems) and 0101,113 (VLF, LF and HF Communications Systems). The antenna types and their heights are:

Uniform lattice (guyed)	.to 1500 feet
Uniform lattice (self supporting)	.to 600 feet
Pole	.to 220 feet

Vertical radiators make use of the tower structure as the radiator. The Naval Electronics Systems Command provides the electronic specifications for vertical radiator antennas. The Naval Facilities Engineering Command provides the structural design.

The majority of antenna installations used at radio communications facilities are tower/pole and wire construction. These are:

(1) Antenna system supported between self-supporting or guyed towers, transmitting/receiving
(2) Vertical radiator, transmitting only
(3) Rhombic, transmitting/receiving
(4) Tilted folded doublet transmitting/receiving
(5) Vee, transmitting/receiving
(6) Horizontal LF, transmitting/receiving
(7) Vertical doublet transmitting/receiving
(8) Horizontal parasitic doublet, transmitting/receiving
(9) Horizontal two-wire doublet, transmitting only
(10) Horizontal three-wire doublet, transmitting only
(11) Various UHF and VHF antennas
(12) Rotatable log periodic, transmitting/receiving (tower supported)
(13) Horizontal log periodic, transmitting/receiving (tower supported)
(14) Vertical log periodic, transmitting/receiving (tower supported)
(15) Conical monopole, transmitting/receiving (tower supported)
(16) Discone, transmitting/receiving
(17) Inverted cone, transmitting/receiving
(18) Wire grid lens, receiving only
(19) Wullenweber, receiving only (Code 132 55)
(20) High take off angle, transmitting/receiving (tower supported)

(21) Hermes loop array, receiving only
(22) Umbrella top-loaded monopole, transmitting (tower supported)
(23) Inverted-L, transmitting (tower supported)
(24) T-antennas, transmitting (tower supported)
(25) Various VLF antennas, transmitting/receiving

132 40 SWITCHING STATION - OUTDOOR ANTENNA (EA)

Antenna switching stations are generally planned as part of the respective transmitter or receiver buildings. This code is mainly for inventory purposes in older installations where switching facilities are still located outdoors on supporting framework.

132 50 PUBLIC ADDRESS SYSTEM - OUTDOOR (EA)

Outdoor public address systems will be planned and installed to meet individual needs of a facility. Separate justification is required.

132 55 CIRCULARLY DISPOSED ANTENNA ARRAY (WULLENWEBER) (EA)

This antenna array is generally planned in conjunction with a Circularly Disposed Antenna Array Building. See Category 131-55 for additional guidance.