FACILITY PLANNING CRITERIA FOR

NAVY AND MARINE CORPS SHORE INSTALLATIONS

NAVFAC P-80

OCTOBER 1982

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ABSTRACT

Planning factors, standards, and guides to compute quantitative facilities requirements are presented. The publication deals with the basic philosophy of planning factors, their authority, and use. The final chapter, which comprises the bulk of the publication, is a compilation of planning factors, planning data, and related space criteria. The material is arranged numerically by category groups, basic categories, and Navy codes.

FOREWORD

This publication provides facility planning criteria for use in computing quantitative facility requirements for Navy and Marine Corps Installations. Included are planning criteria and data applicable to those categories of facilities to which a planning factor or data can be applied in the computation of facility requirements.

Planning criteria contained in this publication are used in the preparation of Basic Facility Requirements Lists, evaluation of existing assets and the determination of specific facility requirements for shore facilities programs. These criteria apply equally to proposed and existing facilities. Their application to existing facilities provides a basis for planning against deficiencies or disposition of excess property as appropriate.

Chapter 1 includes the authority and responsibilities of the Naval Facilities Engineering Command for the preparation and publication of planning criteria for use in calculating facility requirements at Navy/Marine Corps installations and describes the use and applicability of the facility planning factors. Chapter 2, PLANNING FACTORS AND CRITERIA, contains a compilation of planning data and related space criteria developed by the Naval Facilities Engineering Command, furnished by systems commands, bureaus and offices of the Department of the Navy and issued by the Secretary of Defense. The material in Chapter 3 is arranged numerically by Category Groups and Basic Categories, in accordance with category codes for Naval Facility Assets, NAVFAC P-72.

Planning criteria are established as a guide and normally will be considered as maximum for facilities listed.

The system for updating this publication will minimize inconsistencies or contradictions with other applicable current directives. Users are invited to call to the attention of the Commander, Naval Facilities Engineering Command (Att'n: Code 2013) any criteria requiring updating, clarification, or revisions due to error.

This manual supersedes NAVFAC P-80 of Aug 1974, including Changes 1 through 5. The publication is certified as an official publication of this Command and has been reviewed and approved in accordance with Secretary of the Navy Instruction 5600.16.

W. M. Zobel
Rear Admiral, CEC, U. S. Navy
Commander
Naval Facilities Engineering Command

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NAVFAC P-80

FACILITY PLANNING CRITERIA

FOR

NAVY AND MARINE CORPS SHORE INSTALLATIONS

CHAPTER ONE

GENERAL GUIDELINES

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Section I. INTRODUCTION

1. PURPOSE. This Publication is intended to provide planning criteria for determining the requirements for shore based facilities needed to support Fleet and Marine Corps Operations. In addition, these criteria are used to evaluate the adequacy of existing facilities, to identify facility deficiencies or excesses, and to validate construction project submittals. Definition of the term "criteria" is given in Section II of this chapter.

2. AUTHORITY. The Navy Department facilities acquisition and improvement programs are guided by the Shore Facilities Planning and Programming System which has been established by OPNAV Instruction 11010.1 series. In this instruction, the Naval Facilities Engineering Command is directed to develop and maintain planning criteria for facilities requirements determination. Within the Navy Department, the OPNAV Instruction is implemented by NAVFACINST 11010.44 and MC0 11010.12 series.

3. ORGANIZATION OF NAVFAC P-80. Chapter I of this publication contains the introduction, general information, technical guidelines, guidance on criteria application and definitions of terms. Chapter II contains the specific criteria for various facility types. The information in Chapter II is in category code sequence corresponding to NAVFAC P-72, Category Codes for Navy Facilities Assets. Appendix A is a key word alphabetical index of facilities contained in this publication with identifying category code numbers. The page numbering system corresponds to the first three digits of a category group.

Certain criteria and planning guidance are applicable only to a limited number of Navy installations. This information is published as appendices under separate cover (NAVFAC P-80.1, .2, etc.) and have limited distribution. The appendices are listed in Table of Contents.

Section II. DEFINITION OF CRITERIA

For the purpose of this publication, criteria are data for establishing facility requirements and sizes. There are several purposes for this planning tool. One is to ensure that the existing and planned facilities are neither too small nor too large to accomplish mission objectives. Another purpose is to establish common planning standards within the Navy and other Services. The criteria information can be separated into several components as follows:

1. DESCRIPTION OF FACILITY. This provides the basic facility information:

a. Primary function
b. Relationship with operational components
c. Installation types requiring this facility

d. Authorization requirements by higher headquarters
e. List and relationships of internal functional elements
f. References to other publications with more specific data

2. SPECIFIC PLANNING FACTORS. These are quantitative data on facilities needed to support specific mission objectives and tasks. The information is usually presented in one of the following forms:

a. Tables, relating facility size to the number of ships, aircraft, people or equipment
b. Formulas, relating size to workload or logistics support needs
c. Fixed allowances, where a specific facility type is uniform throughout the Navy.

3. APPROXIMATE PLANNING FACTORS. There are a number of facilities for which the development of specific planning factors is not feasible or is impractical. The size of some of these facilities, however, will fall within a limited range which has been identified by engineering surveys. In these cases, the criteria will provide this range instead of specific planning factors and justification may be requested for requirements validation. If the requirements fall outside this range or if this publication provides no planning factors, a detailed justification is mandatory. See Section IV for guidelines.

Section III. LIMITATIONS AND COMPLIANCE

1. ENTITLEMENT. A fundamental aspect of these criteria is that an activity is not automatically "entitled" to the facility scope, or even the facility itself, simply because it is listed in this publication. In the majority of cases, these criteria represent maximum allowance. This does not mean that a facility has to meet the maximum P-80 allowances for a particular population range. A smaller facility at an individual location may be sufficient to meet the needs, based on professional analysis and judgment. Individual requirements must be tailored to suit the specific circumstances. The planner must analyze the need to accommodate a particular function and develop the requirements to most economically satisfy these needs. These requirements may or may not fit the maximum established by criteria.

2. CRITERIA AS A PLANNING GUIDE. The information in NAVFAC P-80 is a planning guide and not a regimented list of formulas. This philosophy requires the planner to be responsible for exercising professional judgment in determining requirements. As a matter of course, he must be prepared to provide appropriate justification data, for it is impossible to establish absolute facility planning factors which will perfectly fit every circumstance at every location. There are, however, certain limitations imposed by higher authorities which will be discussed in a subsequent paragraph.

Professional judgment is needed in the disposition of surplus facilities as the criteria and circumstances change. Revised criteria will affect the size of facilities and the evaluation of their use. The planner will need to follow the disposition guidelines explained in the Shore Facilities Planning Manual, NAVFACINST 1010.44 series.

3. COMMUNITY INTERFACES. A military installation is seldom situated in a location where there are no neighboring urban areas, communities or other military activities. Certain support facilities, especially in the morale, welfare and recreational field, have a general commonality, and the availability of such neighboring assets must be recognized in the planning process. To this end, a number of Environmental Adjustment Factors (EAF's) have been developed as modifiers for use in planning. These modifiers are described in more detail within the appropriate category code group.

4. ADHERENCE REQUIREMENTS. The extent to which these criteria may be regarded only as guides has limitations. These are imposed for several reasons. For example:

a. To ensure adherence to operational safety criteria
b. To ensure that certain OSD imposed maximum allowances are not exceeded
c. To ensure adherence with operational security criteria

Guidance has been provided throughout the text. Where such limitations exist, variances from criteria will require a waiver. Approvals will be based on individual justification and may have to be obtained from the cognizant Systems Command, Bureau or OSD, as appropriate.

Section IV. SPECIALIZED FACILITIES

For some facilities, it is impractical to develop specific planning factors because the requirements vary depending on individual location or the facility is one-of-a-kind type. In such cases, this publication will attempt to provide the facility description, but the planner must prepare detailed scope justification containing the following data:

a. Functions to be accommodated
b. Space needed for each function
c. Number and organizational status of personnel
d. Support space requirements
e. Industrial engineering analysis of operations

There are two most commonly accepted methods of accomplishing a simplified industrial engineering analysis. One method is to prepare a scale drawing showing each piece of equipment, workbench, desk or other operational feature and their corresponding required working or access spaces. The drawing does not necessarily have to resemble any existing facility as its only purpose is to calculate the space requirement. Another method is to list in columnar form each of the above components along with their corresponding sizes and working or access space requirements. The totals obtained by either method plus any aisle spaces, if required, equal the total net square feet requirement for the function to be performed.

The approval of a requirement will depend upon the technical thoroughness of data. A justification based merely on existing facilities will not be acceptable, unless the existing operations and facilities are used to establish space need factors through one of the above methods.

Section V. REAL PROPERTY CATEGORIES

1. CATEGORY CODE STRUCTURE. The real property category code system provides uniform identification of all facilities. It is used in every phase of planning, programming, project processing, construction and inventory of real property assets. The basic concept was implemented by OSD and applies to all Services. Under the system, each facility type is given a name and a five digit code number. The names and numbers are provided in this publication and also in NAVFAC P-72, Category Codes for Navy Facility Assets. The planner must ensure the correct codification of each particular facility, since an error will cause delays in processing through the planning and programming system. The planner also should make every effort to use the published facility type name unless a more descriptive name improves clarity.

2. UNIT OF MEASURE. The category code system also assigns units of measure for each facility type. Each category code has a prime unit of measure; it is provided after each individual facility name in this publication. The correct prime unit of measure must be used in all planning documentation, project processing and real property inventory reporting since the planning data processing system will not transact incorrect units. Additional units of measure are provided to facilitate planning analysis. These are shown in NAVFAC P-72.

Section VI. APPLICATION OF CRITERIA

The first step in calculating facility requirements is the assembly of basic planning information. The major items are activity mission and base loading. The planner must remember, however, that the Shore Facilities Planning System is designed to provide support for mid-range operational requirements. Therefore, it is important that input data reflect any scheduled changes.

1. MISSION ANALYSIS. A mission statement for an activity is a list of tasks or services it must perform. These must be associated with the facilities needed for mission performance. As an example, a starting point for mission analysis could be the identification of major functional element groups with associated facilities:

a. Operational (Airfields, waterfront, communications)
b. Logistics (Ammunition, fuel and consumables storage)
   Industrial (Maintenance and overhaul facilities)
d. Training (Schools, trainers, ranges)
e. Personnel support (Housing, welfare, recreational)
f. Medical (Hospitals, clinics)
g. Administrative support

Mission analysis should also recognize the possible support provided by adjacent civilian communities and nearby military installations. Such interdependence may have a direct impact on facilities requirements in one of two ways:

Services provided (Tenants, other military installations)
Services received (Other military installations, community)

Each of these functional groups can be further subdivided down to the lowest denominator - the individualcategory code. At this point the planner has the data necessary to translate operational concepts into the framework for the basic facilities requirements section of planning documentation.

2. BASE LOADING. Base loading data is a list of specific numbers of ships, aircraft, personnel and equipment assigned to perform the tasks and services of an activity. The basic source of this information is the SFPS Base Loading Report issued annually by the Chief of Naval Operations, but this report is only a starting point. For requirements calculations, the base loading figures must recognize several other variables which may not be reflected in the basic Base Loading Report:

a. Rotational ships and aircraft present at any time
b. Homeported ship and aircraft deployment schedules
c. Dependent population
d. Retired personnel in the area

3. OTHER DATA SOURCES. The basic SFPS Base Loading Report information is sufficient to arrive at many of facilities requirements figures. In a number of cases, however, the calculations require more specialized input data. Following is a list of additional input data documents and their applications:

a. Naval Air Training and Operating Procedures Standardization Program. (Runway lengths)
b. OPNAVINST 3721.1, Air Traffic Control Facilities Manual (Air traffic control facilities, airfield lighting)
c. OPNAVINST 3150.2, Authorized Photographic Laboratories Ashore (Self evident)
d. Inactive Officer and Enlisted Strength by Unit and NRTC (BUPERS PAMI Report) (Reserve training facilities)
e. OPNAVINST 4790.2, Naval Aviation Maintenance Program (Level of maintenance required)
f. MC0 11010.12, Facilities Planning and Programming for Marine Corps Ground, Aviation, and Reserve Activities (Storage space requirements)
g. NAVSEA Op5, Vo1.1., Ammunition and Explosives Ashore (Explosive storage and safety distances)
h. DOD Form 805, Storage Space Management Report and NAVSUP Form 605, Storage Unit Report (Warehousing requirements)
i. BUMED Report 11010-1, Personnel Loading Plan (Personnel loading for medical facilities)
j. DD Form 1377/1378, Family Housing Survey (Family and bachelor housing requirements)
k. NAVELEX series 0101-102, 104 & 108, Handbook of Naval Shore Electronics Criteria (Communications facilities)

Section VII. GENERAL INFORMATION

1. OTHER PLANNING GUIDANCE DOCUMENTS. This publication contains the basic planning information relating mission objectives to facility requirements. In addition to these two volumes, there are other documents and manuals which may

be of use to the installation planner:

a. NAVFAC P-80.1, Airfield Capacity Handbook. This publication describes methodology for calculating the maximum number of air operations which can be accommodated by a runway.
b. NAVFAC P-80.2, Naval Mobile Construction Battalion Facilities, which provides criteria for facilities required by deployed NMCB's.
c. Airfield Safety Clearances. This publication is instrumental for air installation planning. It provides information on required airspace clearances, ground safety zones, minimum distances between airfield components and similar data.
d. NAVFAC P-970, Planning in the Noise Environment. This is a joint services manual for planning facilities with respect to aircraft and other noise sources.
e. NAVFAC P-272, Definitive Designs. This is a portfolio of standard drawings for representative facility types showing typical configurations, interior layouts and components.

2. USER INVOLVEMENT. The criteria in this publication do not remain static, but are subject to a continuous review and updating process. The users of this manual are often in the best position to identify deficiencies and suggest improvements. To that end, comments are solicited and may be submitted to NAVFACENGCOM Headquarters, Code 2013, with sufficient explanation for evaluation.

CHAPTER TWO

PLANNING FACTORS AND CRITERIA

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Section 1

FACILITY CLASS 100-OPERATIONAL AND TRAINING FACILITIES

Operational and training facilities planned for Navy installations will be grouped in the Facility Class 100. Category groups and coding must be as tabulated in Category Codes for Classifying Real Property of the Navy, NAVFAC P-72. Facilities for which planning factors have been developed are discussed under the appropriate code numbers. Category groups pertaining to operational and training facilities are as follows:

Group 110 Airfield Pavements
Group 120 Liquid Fueling and Dispensing Facilities
Group 130 Communications, Navigational Aids, and Airfield Lighting
Group 140 Land Operational Facilities
Group 150 Waterfront Operational Facilities
Group 160 Harbor and Coastal Facilities
Group 170 Training Facilities

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110 AIRFIELD PAVEMENTS

This category group includes all pavements necessary for use by operational aircraft. Planning for pavements shall include all safety clearances and facilities required to provide a fully operational field, complete with accessories such as aircraft tiedowns and pavement marking. Airfield pavement lighting is considered separately under Code 130. See NAVFAC P-80.3, Airfield Safety Clearances, for criteria on obstruction clearances and clear zones related to airfields and heliports. Clearances and separations related to a specific pavement type (for example: the separation between parallel runways) are given under the applicable category code within the 110 Code series.

Facilities considered in this category group are:

111 Airfield Pavements - Runways (includes helipads)
112 Airfield Pavements - Taxiways
113 Airfield Pavements - Aprons
114 Airfield Pavements - Other

Class A and B Runway Criteria. The airfield criteria published herein differs from previous criteria in that it has been revised to conform to the standards published in the new joint service manual, NAVFAC P-971, Airfield and Heliport Planning Criteria and the Air Installations Compatible Land Use Zone (AICUZ) program defined in OPNAVINST 11010.36. The joint service standards are defined in terms of class A and B runways and their supporting taxiways, aprons, etc. The A and B runways and the application of an A or B designation to a particular runway is explained in NAVFAC P-80.3 and is summarized below. All Navy and USMC supporting pavements such as taxiways, aprons, etc., shall be considered class B unless their use is totally dedicated to supporting a runway which has been designated class A and the application of class A standard has been approved by Headquarters NAVFACENGCOM and NAVAIRSYSCOM.

Runway Classification. The classification is dependent on the type of aircraft which operate from the runway.

TABLE 110-A
Runway Classifications By Aircraft Type

Class A Runways

C-l	C-47	OV-10	T-44
C-2	C-117	S-2	U-10
C-4	E-l	T-28	U-11
C-6	E-2	T-34	U-21
C-7	O-1	T-41	UV-18
C-12	O-2	T-42	
C-45	OV-1		

Class B Runways

A-3	C-10	F-4	P-2
A-4	C-14	F-5	P-3
A-5	C-15	F-8	S-3

A-6	C-118	F-14	SR-71
A-7	C-121	F-15	T-2
A-8	C-123	F-16	T-29
A-10	C-130	F-17	T-33
A-18	C-131	F-18	T-37
AV-8	C-135	F-100	T-38
B-l	C-137	F-101	T-39
B-52	C-140	F-104	TR-1
B-57	C-141	F-105	U-2
C-5	E-3	F-106	
C-9	E-4	F-111	

Class A runways are primarily used by small light aircraft as indicated in Table 110-A and the runway should not have the potential for development for use by heavier aircraft or have a foreseeable requirement for such use. Ordinarily, Class A runways are less than 8000 feet long and less than 10 percent of the operations involve class B type aircraft. Class B runways are all other runways except basic training outlying fields used by T-34 aircraft for which special criteria is specified.

The classification of Navy and Marine Corps runways is determined as a part of the Air Installations Compatible Land Use Zone (AICUZ) program and is published in AICUZ study for a particular installation. NAVFACENGCOM and NAVAIRSYSCOM concurrence and CMC/CNO approval is required prior to classifying any runway Class A or B. This approval is obtained via approval of the AICUZ study.

111 AIRFIELD PAVEMENTS - RUNWAYS (Includes Runway/Fixed Wing, Runway/Rotary Wing, and Helicopter Landing Pad).

See NAVFAC P-80.3, Airfield Safety Clearances, for runway clear zone criteria.

111 10 RUNWAY/FIXED WING (SY)

Description. Runways are paved surfaces for the landing and takeoff of aircraft. The number of runways required is determined by the expected traffic density, airfield mission, operational procedures and environmental factors. Runway orientation is determined from analysis of wind data, terrain, noise levels to be generated and local development planning. See NAVFAC DM-21.1 for wind rose analysis and design criteria.

Criteria. The following standards apply to fixed wing runways at all Navy and Marine Corps air installations, including outlying fields, unless specifically noted otherwise. Deviation from these standards must be approved by the Naval Air Systems Command.

Runway Width. The standard width for all runways constructed prior to June 1981 is 200 feet. For runways planned after June 1981, the standard width shall be 200 feet for all class B runways and 75 feet for class A runways except those class A runways where T-34 and T-44 aircraft are operated by the Naval Air Training Command. In this case, the runway width shall be increased to 200 feet in order to simulate the runway conditions found at fleet stations. (See 110 introduction for explanation of class A and B Standards.)

Length. The maximum planned length of a runway shall be long enough to accommodate a selected critical aircraft in takeoff and landing operations under stipulated load and environmental conditions. The critical aircraft for a station is defined as one which:

1. Is or will be assigned to the installation or is to be supported by the installation in accordance with the mission assigned by the major claimant/CNO.

2. Requires the longest takeoff ground run or landing roll of those aircraft meeting the above stipulation.

Critical Aircraft. The basic takeoff ground run or landing roll for the critical aircraft can be obtained from the pertinent NATOPS (Naval Air Training and Operating Procedures Standardization) Manual. The basic takeoff ground run (TGR) in most cases is the controlling characteristic. Basic TGR is defined as the distance the aircraft requires to lift off at a given gross weight on a level runway, at sea level (Barometric pressure 29.92 inches Hq.) with 59 degrees (F) ambient temperature and under conditions of zero wind. The weight to be used, and the consequent basic takeoff ground run, should be the one that corresponds to the probable mission that the aircraft will fly. The basis for the selected TGR should be indicated along with the runway requirement calculation.

Basic Length and Correction Factors. The planned runway length for an aircraft is the basic takeoff ground run or landing roll (whichever governs) of the critical aircraft, corrected for nonstandard conditions of altitude, temperature, and effective gradient, and with an appropriate safety factor applied. (Additional corrections are to be applied to crosswind runways and runways used by T-34 aircraft for basic training.) The safety factor allows for variation in pilot techniques, runway surface conditions, wind, minor mechanical difficulties, and psychological factors. Correction and safety factors are applied as follows:

1. Altitude. Increase basic runway length by 1.1 percent for each 100 feet the site is above sea level. See Table 111 10 for altitude correction factors.

2. Temperature. Increase above result by 0.66 percent for each degree F the anticipated mean high temperature is above 59 degrees F. The mean highest temperature is defined as the average of the highest temperature recorded each day during the month which has the highest average daily maximum temperature. See Table 111 10 for temperature correction factors.

3. Safety Factor. Multiply the above result by 1.6 for all runways except those at Air Training Command air installations where a safety factor of 2.0 shall be applied.

4. Effective Gradient. Increase the above result by 10 percent for each 1 percent of effective gradient. Effective gradient is the maximum difference in elevation along the centerline of the runway divided by the runway length and expressed as a percent.

5. Round off. Final runway length is the result of the foregoing calculations rounded off to the next higher 100 feet.

6. Basic Training Runways. At basic training runways used by T-34 aircraft, 1000 feet shall be added to the computed runway requirement. The additional runway length is required to practice precautionary emergency landings.

7. See the example computation at the end of category Code 111-10.

Crosswind Runway. The foregoing discussion applies to the primary runway. When the primary runway provides less than 95 percent wind coverage (that is, when a 15-knot crosswind component occurs more than 5 percent of the time), it becomes necessary to consider a crosswind runway. Justification based on wind data and operational needs is required before planning action is taken. In those cases where a crosswind runway is authorized for planning, the length is computed as for the primary runway with the exception that the takeoff ground run (or landing roll) is reduced by 20 percent. This accounts for headwinds, 15 knots or more, which normally will be encountered on the crosswind runway. If operational conditions, wind data, or runway configuration are such as to indicate that a headwind other than 15 knots should be planned for, then the NATOPS Manual for the critical aircraft should be consulted, and the appropriate takeoff ground run computed.

Runway separations/clearances. See NAVFAC P-80.3, Airfield Safety Clearances, for guidelines for determining obstructions to air navigation and the definition of airfield imaginary surfaces. The following lateral separations are required between runways and other airfield pavements. Deviations from criteria require a waiver from the Naval Air Systems Command unless specifically exempted from waiver per NAVFAC P-80.3.

1. Parallel Runways. A minimum of 1000 feet is required between centerlines of parallel runways. The separation shall be increased to 4300 feet if simultaneous Instrument Flight Rule (IFR) operations are to be flown from the parallel runways.

2. Parallel Taxiway. A minimum of 500 feet is required between the centerline of a runway and the centerline of a parallel taxiway. (Note: Aircraft using the parallel taxiway are under the direction of the air control tower and therefore are not considered an obstruction even though the taxiway lies within the runway primary surface.)

3. Parking Apron. The edge of a parking apron, including its peripheral taxilane, shall be sited outside the runway primary surface. Aircraft shall be parked such that they do not penetrate the 7:l transitional surface.

4. Any Object. Objects shall be sited outside the runway primary surface and such that they do not penetrate the 7:l transitional surface or other imaginary surfaces defined in NAVFAC P-80.3.

EXAMPLE COMPUTATION

The following is an illustrative example of the runway length computation:

GIVEN:

Patrol Plane Air Station	- P-3C is critical aircraft
Elevation of Site	- 300 feet above mean sea level
Mean Highest Temperature	- 70 degrees (F)
Effective Runway Gradient	- 0.8%

From aircraft performance curves, basic length is found to be determined by takeoff distance. TGR (P-3C) = 4,700 feet.

*Altitude Correction	$\frac{300}{100}$ x 1.1% = 3.3%
	4,700 x 1.033 = 4,855 feet
*Temperature Correction	(70-59) x 0.66% = 7.26%
	4,855 x 1.0726 = 5,207
Safety Factor Correction	5,207 x 1.6 = 8,331
Effective Gradient	0.8 x 10% = 8% increase
	8,331 x 1.08 = 8,997

Round off = 9,000 feet.

*(Table 111 10 may be used when temperature and altitude data are available).

TABLE 111 10
Runway Temperature and Altitude Corrections

Installation	Elevation (Ft)	Mean Highest daily temp. hottest month (Deg. F)	Altitude Correction Factor	Temperature Correction Factor
Adak, NAVSTA	17	56	1.0019	0.9802
Agana, NAS	277	87	1.0305	1.1848
Alameda, NAS	16	74	1.0018	1.0990
Argentia, NAVSTA	51	65	1.0056	1.0396
Atlanta, NAS	1068	87	1.1175	1.1848
Atsugi, NAS	185	87	1.0204	1.1848
Barbers Point, NAS	34	85	1.0037	1.1716
Barking Sands	14	88	1.0015	1.1914
Beaufort, MCAS	38	92	1.0042	1.2178
Bermuda, NAS	12	85	1.0013	1.1716
Brunswick, NAS	75	78	1.0083	1.1254
Cecil Field, NAS	80	92	1.0088	1.2178
Chase Field, NAS	190	95	1.0209	1.2376
Cherry Point, MCAS	29	92	1.0032	1.2178
China Lake, NWC	2283	102	1.2511	1.2838
Corpus Christi, NAS	19	90	1.0021	1.2046
Cubi Point, NAS	55	93	1.0061	1.2244
Dallas, NAS	495	97	1.0545	1.2508
El Centro, NAS	-43	105	0.9953	1.3036
El Toro, MCAS	380	82	1.0418	1.1518
Fallon, NAS	3934	93	1.4327	1.2244
Futema, MCAS	240	89	1.0264	1.1980
Glenview, NAS	653	86	1.0718	1.1782
Glynco, NAS	25	91	1.0028	1.2112
Guantanamo Bay, NAS	45	89	1.0050	1.1980
Iwakuni, MCAS	5	88	1.0006	1.1914
Jacksonville, NAS	22	92	1.0024	1.2178
Warminster, NADC	375	85	1.0412	1.1716
Kaneohe, MCAS	18	83	1.0020	1.1584
Keflavik, NAVSTA	168	55	1.0185	0.9736
Key West, NAS	6	90	1.0007	1.2046
Kingsville, NAS	50	93	1.0055	1.2244
Kodiak, NAVSTA	77	60	1.0085	1.0066
Lajes, NAF	182	76	1.0200	1.1122
Lakehurst, NAEC	103	84	1.0113	1.1650

TABLE 111 10
Runway Temperature and Altitude Corrections (continued)

Installation	Elevation (Ft)	Mean Highest daily temp. hottest month (Deg. F)	Altitude Correction Factor	Temperature Correction Factor
Lemoore, NAS	237	100	1.0261	1.2706
Mayport, NAVSTA	14	88	1.0015	1.1914
Memphis, NAS	322	94	1.0354	1.2310
Meridian, NAS	317	92	1.0349	1.2178
Midway, NAVSTA	10	84	1.0011	1.1650
Miramar, NAS	477	80	1.0525	1.1386
Moffett Fld., NAS	34	74	1.0037	1.0990
Monterey, NAF	164	67	1.0180	1.0528
Naha, NAF	14	89	1.0015	1.1980
Naples, NAF	289	88	1.0318	1.1914
New Orleans, NAS	3	91	1.0003	1.2112
New River, MCAS(H)	24	88	1.0026	1.1914
North Is., NAS	26	73	1.0029	1.0924
Norfolk, NAS	16	86	1.0018	1.1782
Oceana, NAS	22	86	1.0024	1.1782
Orange Grove, ALF	243	98	1.0267	1.2574
Patuxent River, NAS	38	87	1.0042	1.1848
Pensacola, NAS	30	87	1.0033	1.1848
Point Mugu, NAS	12	73	1.0013	1.0924
Quantico, MCAS	12	36	1.0013	1.1782
Quonset Pt., NAS	21	80	1.0023	1.1386
Imp. Beach, NAS	23	78	1.0025	1.1254
Roos. Roads, NAVSTA	18	88	1.0020	1.1914
Rota, NAVSTA	20	85	1.0022	1.1716
San Clemente, ALF	181	69	1.0199	1.0660
Sangley Pt., NAVSTA	8	92	1.0009	1.2178
Saufley Fld., NAS	85	90	1.0094	1.2046
Sigonella, NAF	77	95	1.0085	1.2376
So. Weymouth, NAS	161	82	1.0177	1.1518
Tustin, MCAS(H)	54	86	1.0059	1.1782
Whidbey Is., NAS	47	69	1.0052	1.0660
Whiting Fld. (North)	200	90	1.0220	1.2046
Whiting Fld. (South)	178	90	1.0196	1.2046
Willow Grove, NAS	361	85	1.0397	1.1716
Yuma, MCAS	213	107	1.0234	1.3168

111 15 RUNWAY/ROTAKY WING (SY)

Description. Runways/rotary wing are prepared surfaces for the landing and takeoff of helicopters. For planning purposes, helicopter landing/takeoff surfaces greater than 400 feet in length shall be considered d runway. Pavements equal to or less than 400 feet in length and-width (or diameter-) shall be classified as category code 111 20, Helicopter Landing Pad. See NAVFAC DM-21.1 for design criteria and NAVFAC P-80.3 for airfield safety clearances.

Criteria.

1. Width. The standard width for helicopter runways is 75 feet except that a 100 foot width shall be provided at those runways which support CH-53 (or any helicopter with rotor diameter greater than 70 feet).

2. Length. The basic runway length is 450 feet corrected for elevation and temperature.

a. Altitude correct ion. Increase the runway length by 10 percent for each 1000 feet the runway elevation is above 2000 feet Mean Sea Level (MSL).

b. Temperature Correction. Increase the runway Length by 4.0 percent for each 10°F that the average daily maximum temperature for the hottest month is above 59°F.

The basic runway described above is designed to support normal takeoff and landing operations and may be increased in length when training exercises are to be conducted from the runway. Due to the multiple missions assigned to helicopters and the flexibility of their operating methods, standard size training pavements are difficult to define. However, a 1000 foot long runway (no temperature and altitude correction is applied) is considered sufficient to conduct proficiency training and autorotation exercises for most Navy air installations. Where multiple touchdowns points are provided on a single runway, the touchdown points shall be spaced a minimum of 400 feet center to center. Multiple runway configurations that may be planned include parallel runways (parallel VFR runways shall have a minimum at 200 feet separation centerline to centerline) or arranging three runways as each side of a triangle.

For runways designed for Instrument Flight Rule (IFR) operations, the runway design must take into account the Ground Control Approach (GCA) system to be used and the number of instrumented touchdown points required. For example, two touchdown points located at opposite ends of a 1000 foot runway could be served by a single GCA located on a turn table offset near the mid point of the runway.

Aircraft Safety Clearances. The location of objects adjacent to helicopter runways is governed by the runway primary surface, transitional surface, and approach/departure surface. These surfaces differ for IFR and VFR operations and are defined in NAVFAC P-80.3, Airfield Safety Clearances. Also see P-80.3 for takeoff safety zone criteria for VFR helicopter runways.

111 20 HELICOPTER LANDING PAD (SY)

Description. Helicopter landing pads are prepared areas for the vertical takeoff and landing of helicopters. The pad is designed to accommodate only one helicopter at d time. The pad may service a hospital, administrative activity, command headquarters or other installations which require helicopter cargo or passenger service. Helipads may be planned at fixed wing air installations, but only if air traffic density or safety requirements preclude the use of the fixed wing runways by helicopters. See NAVFAC DM 21.1 for design criteria.

Criteria. The standard helicopter landing pad is 100 feet by 100 feet (1100 square yards) for both Visual Flight Rule (VFR) and Instrument Flight Rule (IFR) operations. The size may be modified to accommodate specific training or mission requirements, individual justification must be provided. Where more than one helicopter is to be at the pad location at one time, a connecting taxiway and parking apron is required.

Airfield Safety Clearances. The location of objects adjacent to a helicopter landing pad is governed by the helipad's primary surface, take off safety zone, transitional surface and approach departure surface. These surfaces differ for IFR and VFR operations and are defined in NAVFAC P-80.3, Airfield Safety Clearances.

112 AIRFIELD PAVEMENTS - TAXIWAYS

This basic category covers aircraft taxiway pavements and includes both normal and high speed runway exits. Criteria for peripheral and interior taxi lanes of aircraft parking aprons are included in category code 113 20.

112 10 TAXIWAY (SY)

Description. Taxiways are paved surfaces on which aircraft move under their own power to and from landing, service and parking areas. Surfaces for towing aircraft shall be coded 116 50, Towway.

Criteria. The length of a taxiway depends upon the specific airfield configuration and layout of support facilities. Taxiways are normally 75 feet wide except for taxiways which only support class "A" runways or helicopter landing pavements shall be reduced to a 40 foot width. (See Code 110 introduction for a definition of class A and B runways.) Runway exits are part of the taxiway system and include end, normal intermediate and high-speed turn-offs.

Exits for class B runways: End turn-offs are planned for each runway end and are 150 feet wide, except those from parallel runways to the parallel taxiway which are 200 feet wide. Normal intermediate turn-offs are required for all runways. They are 75 feet wide and are placed 2,000 feet from each end of the runway and in the remaining runway length at intervals of not more than 3,000 feet or less than 2,000 feet. High-speed turn-offs are provided where traffic studies indicate the requirement. High-speed turn-offs are 100 feet wide at the throat tapering to 75 feet and are a minimum of 1,000 feet long.

Exits for class A runways and Helicopter Runways: End turn-offs and intermediate taxiways shall be 40 feet in width.

Safety Clearances/Separations: Taxiways are located so as to provide adequate clearance between taxiing aircraft and aircraft in adjacent areas and obstacles. The following separation clearances apply to the siting of taxiways. The use of separations less than specified below require a waiver from the Naval Air Systems Command. The minimum clearance from the centerline of the taxiway to:

Centerline of parallel runway.....500 Ft
Centerline of parallel taxiway..... Ft
Edge of parking apron.....150 Ft (1) (2)
Obstacles.....150 Ft, May be reduced, See Note (3)

NOTES

(1) The parking apron must be sited outside the runway primary surface. Because of this requirement, the apron will normally be a greater distance than 150 feet from the parallel taxiway of a class "B" runway.

(2) Under certain conditions, a through taxiway may be incorporated within the parking apron as a peripheral taxilane. See the paragraph titled "Deviation for Criteria", Category Code 113 20 (Aircraft Parking Apron).

(3) Reduce to 100 feet along taxiways used only to support class A runways or helicopter landing facilities.

See NAVFAC DM-21.1 for design criteria related to taxiway grades and shoulders.

113 AIRFIELD PAVEMENTS - APRONS (Includes aircraft parking and access aprons)

113 20 AIRCRAFT PARKING APRON (SY)

Description. Aircraft parking aprons are required for loading, unloading and servicing of aircraft in addition to providing parking space. There is no standard size or apron configuration. The size is based on the type and number of aircraft to be parked, the requirement for squadron integrity and 45 versus 90 degree parking. The area required includes: parking space, wing-tip separation between aircraft, interior taxilanes and peripheral taxilanes. Aprons used for ordnance handling require special siting considerations, see category codes 116 55 and 116 56. For design criteria, see NAVFAC DM 21 series design manuals.

Criteria. In some cases, these criteria will refer to standards for aprons supporting class A or B aircraft. See introduction to the 111 category codes for explanation of class A and B. The determination of the apron requirement involves the following steps:

1) Determine the number of aircraft parking spaces required.

2) Layout the parking spaces using the dimensions given herein for clearances between aircraft and interior taxilanes.

3) Provide peripheral taxiways around the perimeter of the apron.

1. Number of Parking Spaces. The number of parking spaces required is based on the average number of aircraft on-board (including transients) reduced by a factor to reflect the number of aircraft expected to be in hangars for scheduled organizational maintenance. For planning purposes, assume that the following percentages of the average on-board aircraft assigned organizational maintenance at a station will be in the hangar for scheduled maintenance:

20%	- Single engine carrier aircraft (include single engine helicopters)
25%	- Twin engine carrier aircraft (include twin and three engine helicopters)
8%	- Patrol, early warning and training aircraft (or training versions of fleet aircraft)
No reduction	- Reduction not required for aircraft not indicated above such as transport aircraft.

Where organizational maintenance is provided by a commercial contractor, the average number of aircraft in hangars for scheduled maintenance shall be determined on an individual basis. The above reductions apply except that the reduction to the number of apron parking spaces shall not exceed 50 percent of the hangar spaces available. For example, if the reduction in apron size is computed to be 50 spaces but the hangars can only provide space for 80 aircraft, the apron reduction should be reduced to 50 percent of 80, or 40 parking spaces. Where an air installation is subject to peak loadings on a regular basis for training exercises or overlap of deployable squadrons, individual justification may be provided for additional

spaces to support peak loadings.

2. Spacing of aircraft. The following Tables and Figures provide dimensions for apron spacing and typical apron configurations:

Figure 113 20A - 90 Degree Aircraft Parking Configuration
Figure 113 20B - 45 Degree Aircraft Parking Configuration
Table 113 20A - Aircraft Spacing
Table 113 20B - Aircraft Parking Areas - Approximation
Figure 113 20C - Typical Aircraft Parking Apron
Figure 113 20D - Aircraft Parking Apron - (Fixed Wing Aircraft) (Minimal Through Traffic)
Figure 113 20E - Minimum Peripheral Taxilane (Fixed Wing Aircraft)

Parked aircraft must be separated to maintain proper wing-tip clearances, interior taxilane widths and protection from jet blast. The most efficient apron size results from parking jet aircraft at a 45 degree angle and propeller aircraft and helicopters at a 90 degree angle to the interior taxilane. See Figures 113 20A and 113 20B for the 45 and 90 degree configurations and the description of the A, B, C, D and E dimensions used for apron spacing. Table 113 20A provides the spacing dimensions which shall be used for Basic Facility Requirements determination. For rough estimates of apron requirements, Table 113 20B provides approximate square yards of apron space by aircraft type.

The apron spacing dimensions may be modified when a Fixed Point Utility System (FPUS), starting air and electrical service, is to be installed in the apron. The FPUS service points and the parking spaces are spaced to accommodate all Navy fighter and attack aircraft rather than designed for a particular aircraft. Aprons with FPUS may be planned using an "A + D" dimension of 145 feet and a "C" dimension of 71 feet, assumes 45 degree parking. For aprons which are expected to support S-3 aircraft, the "A + D" may be increased to 150 feet.

3. Peripheral Taxilanes. A peripheral taxilane is normally provided on all sides of a parking apron. The standard width is 150 feet except for those aprons which support only helicopters and no future requirement to support fixed wing aircraft can be identified. In this case the width shall be computed as:

Width = 1.5 x (Rotor Diameter) + 20 Ft.

Use the largest rotor diameter of those helicopters expected to use the apron. This width provides a 40 foot taxilane with a one rotor diameter clearance between taxiing and parking helicopters.

4. Safety/Lateral Clearances. See NAVFAC P-80.3 for the definition and application of airfield safety clearances. Parking aprons shall be sited outside the primary surface of the runway (or helipad). The edge of the apron may be adjacent to the outer edge of the primary surface, however, parked aircraft shall not penetrate the transitional surface.

Aircraft taxiing on the peripheral taxilane are not considered obstructions even though they do penetrate the transitional surface. The apron

edge shall be a minimum of 150 feet from the centerline of any parallel taxiway of the runway system. The minimum distance any object, except maintenance hangars, shall be sited from the apron edge is:

Aprons, class "A" aircraft	75 Ft.	
Aprons, class "B" aircraft	100 Ft.	
Aprons, Helicopters	75 Ft.,	increase to 100 feet where the CH-53 is assigned to an apron

Maintenance hangars opening to the apron shall be offset 50 feet from the apron edge. The 50 foot access pavement to the hangar is coded as 113 40.

Deviation From Criteria: The 150 foot separation between a parking apron and the centerline of a through taxiway must be maintained when the taxiway is expected to carry a substantial amount of through traffic; i.e., traffic other than that which starts or terminates at that particular apron. When the anticipated amount of through traffic is minimal and is so justified to NAVAIR, a parking apron may be located such that the through taxiway is incorporated within the apron peripheral taxilane, see Figure 113 20D. However, in this case, the through taxiway becomes a part of the apron and therefore must be located outside the runway primary surface. Any savings in pavement to be gained by combining taxiways shall be compared to any increases in pavement for runway turnoffs required due to moving the parallel taxiway outside the runway primary surface. Combined taxiways shall not be planned without prior approval of NAVAIR.

Figure 113 20C indicates that 150 foot wide peripheral taxilanes are to be provided on all sides of fixed wing aircraft parking aprons. Although such an arrangement is desirable, it is not always necessary. When small numbers of aircraft (one or two rows) are to be parked or when operational requirements allow, the number and/or width of the peripheral taxilanes may be reduced on the advice of local air operations personnel, subject to NAVAIR approval. See Figures 113 20C/D which indicate which fixed wing aircraft peripheral taxilanes may be reduced. The 150 foot wide taxilane is designed to accommodate two carrier type aircraft when passing and therefore could be reduced in width if the level of apron operations only require one aircraft to be on the taxilane at a time. In this case, the taxilane shall be sized to accommodate the largest aircraft to be parked on the apron. See Figure 113 20E which provides a sketch of the minimum taxilane clearances. Peripheral taxilanes for helicopters shall not be reduced from the dimensions shown in Table 113 20A.

113 40 AIRCRAFT ACCESS APRON (SY)

This apron provides access to aircraft maintenance hangars and is normally programmed at the same time as the hangar (Category Code 211 05). The paved area required varies with the hangar dimensions and the hangars displacement from the parking apron. The access apron requires a minimum 50-foot depth and must be at least as long as the hangar door width. See NAVFAC DM-21.1 for design criteria.

113 AIRFIELD PAVEMENTS - APRONS (Includes aircraft parking and access aprons)

113 20 AIRCRAFT PARKING APRON (SY)

Description. Aircraft parking aprons are required for loading, unloading and servicing of aircraft in addition to providing parking space. There is no standard size or apron configuration. The size is based on the type and number of aircraft to be parked, the requirement for squadron integrity and 45 versus 90 degree parking. The area required includes: parking space, wing-tip separation between aircraft, interior taxilanes and peripheral taxilanes. Aprons used for ordnance handling require special siting considerations, see category codes 116 55 and 116 56. For design criteria, see NAVFAC DM 21 series design manuals.

Criteria. In some cases, these criteria will refer to standards for aprons supporting class A or B aircraft. See introduction to the 111 category codes for explanation of class A and B. The determination of the apron requirement involves the following steps:

1) Determine the number of aircraft parking spaces required.

2) Layout the parking spaces using the dimensions given herein for clearances between aircraft and interior taxilanes.

3) Provide peripheral taxiways around the perimeter of the apron.

1. Number of Parking Spaces. The number of parking spaces required is based on the average number of aircraft on-board (including transients) reduced by a factor to reflect the number of aircraft expected to be in hangars for scheduled organizational maintenance. For planning purposes, assume that the following percentages of the average on-board aircraft assigned organizational maintenance at a station will be in the hangar for scheduled maintenance:

20%	- Single engine carrier aircraft (include single engine helicopters)
25%	- Twin engine carrier aircraft (include twin and three engine helicopters)
8%	- Patrol, early warning and training aircraft (or training versions of fleet aircraft)
No reduction	- Reduction not required for aircraft not indicated above such as transport aircraft.

Where organizational maintenance is provided by a commercial contractor, the average number of aircraft in hangars for scheduled maintenance shall be determined on an individual basis. The above reductions apply except that the reduction to the number of apron parking spaces shall not exceed 50 percent of the hangar spaces available. For example, if the reduction in apron size is computed to be 50 spaces but the hangars can only provide space for 80 aircraft, the apron reduction should be reduced to 50 percent of 80, or 40 parking spaces. Where an air installation is subject to peak loadings on a regular basis for training exercises or overlap of deployable squadrons, individual justification may be provided for additional

spaces to support peak loadings.

2. Spacing of aircraft. The following Tables and Figures provide dimensions for apron spacing and typical apron configurations:

Figure 113 20A - 90 Degree Aircraft Parking Configuration
Figure 113 20B - 45 Degree Aircraft Parking Configuration
Table 113 20A - Aircraft Spacing
Table 113 208 - Aircraft Parking Areas - Approximation
Figure 113 20C - Typical Aircraft Parking Apron
Figure 113 20D - Aircraft Parking Apron - (Fixed Wing Aircraft) (Minimal Through Traffic)
Figure 113 20E - Minimum Peripheral Taxilane (Fixed Wing Aircraft)

Parked aircraft must be separated to maintain proper wing-tip clearances, interior taxilane widths and protection from jet blast. The most efficient apron size results from parking jet aircraft at a 45 degree angle and propeller aircraft and helicopters at a 90 degree angle to the interior taxilane. Use of the most efficient configuration is mandatory; in case of deviations, the planner must provide full justification. See Figures 113 20A and 113 20B for the 45 and 90 degree configurations and the description of the A, B, C, D and E dimensions used for apron spacing. Table 113 20A provides the spacing dimensions which shall be used for Basic Facility Requirements determination. For rough estimates of apron requirements, Table 113 20B provides approximate square yards of apron space by aircraft type.

The apron spacing dimensions may be modified when a Fixed Point Utility System (FPUS), starting air and electrical service, is to be installed in the apron. The FPUS service points and the parking spaces are spaced to accommodate all Navy fighter and attack aircraft rather than designed for a particular aircraft. Aprons with FPUS may be planned using an "A + D" dimension of 145 feet and a "C" dimension of 71 feet, assumes 45 degree parking. For aprons which are expected to support S-3 aircraft, the "A + D" may be increased to 150 feet.

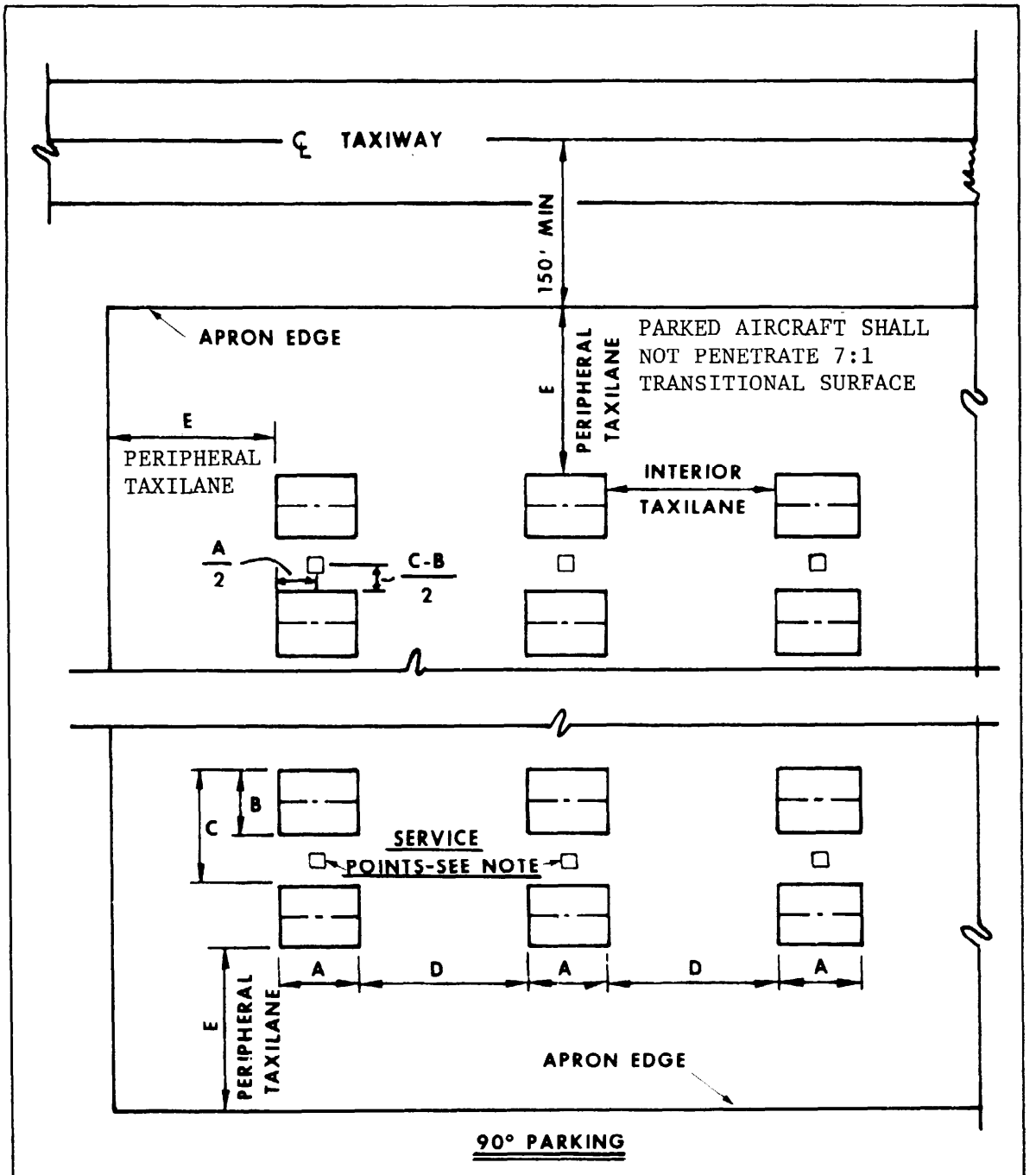
3. Peripheral Taxilanes. A peripheral taxilane is normally provided on all sides of a parking apron. The standard width is 150 feet except for those aprons which support only helicopters and no future requirement to support fixed wing aircraft can be identified. In this case the width shall be computed as:

Width = 1.5 x (Rotor Diameter) + 20 Ft.

Use the largest rotor diameter of those helicopters expected to use the apron. This width provides a 40 foot taxilane with a one rotor diameter clearance between taxiing and parking helicopters.

4. Safety/Lateral Clearances. See NAVFAC P-80.3 for the definition and application of airfield safety clearances. Parking aprons shall be sited outside the primary surface of the runway (or helipad). The edge of the apron may be adjacent to the outer edge of the primary surface, however, parked aircraft shall not penetrate the transitional surface.

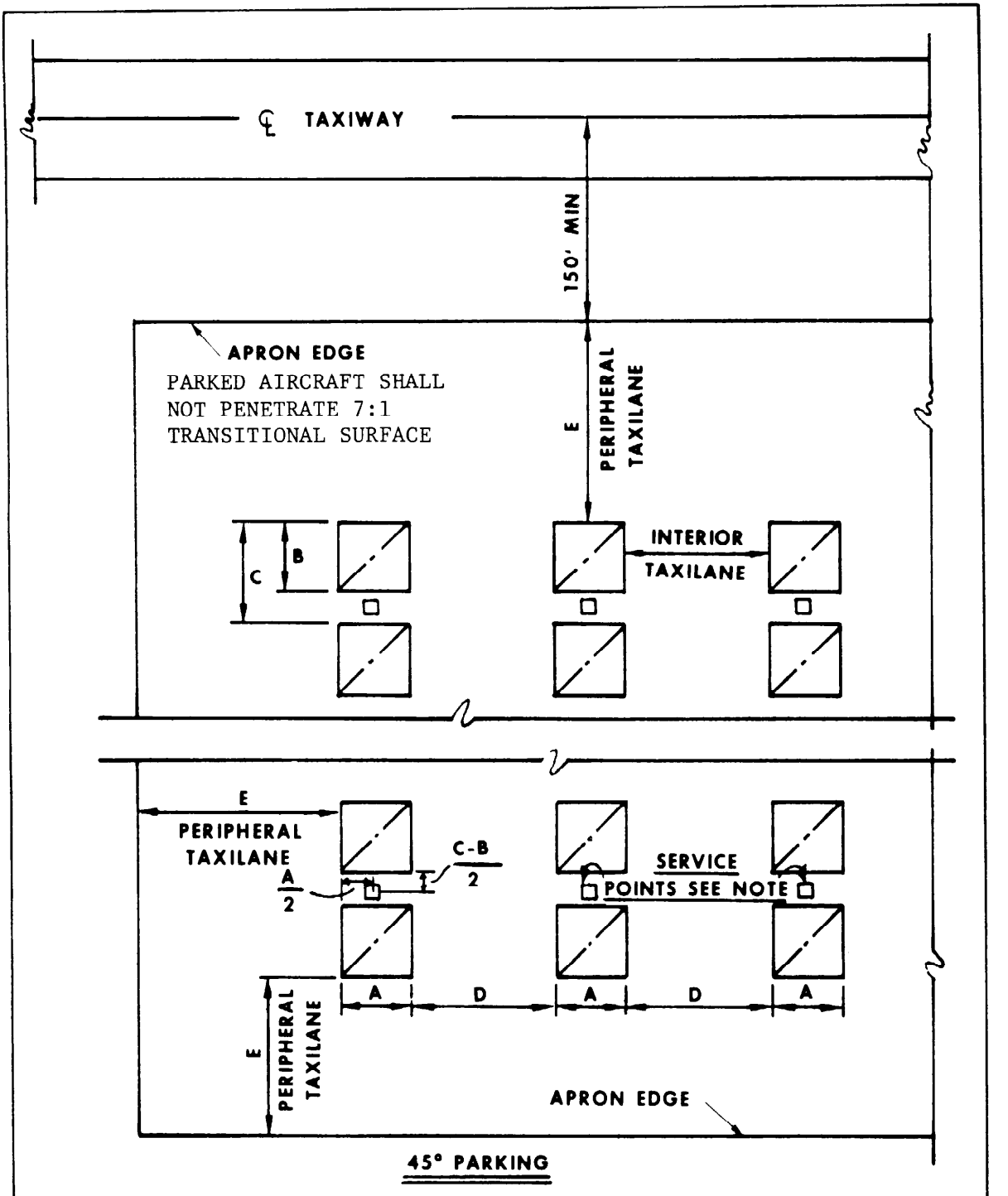
Aircraft taxiing on the peripheral taxilane are not considered obstructions even though they do penetrate the transitional surface. The apron



NOTES:

1. FOR DIMENSIONS A, B, C, D AND E, SEE TABLE 113 20A
2. FOR DESIGN OF SERVICE POINTS SEE NAVFAC P-272

FIGURE 113-20A
Aircraft Parking Configuration



NOTES:

1. FOR DIMENSIONS A, B, C, D AND E, SEE TABLE 113 20A
2. FOR DESIGN OF SERVICE POINTS SEE NAVFAC P-272

Aircraft Parking Configuration

FIGURE 113-20B

TABLE 113-20A
Parking Apron Spacing
Jet Aircraft - 45 Degree Parking

Aircraft Designation	Wingspan (FT) (In)	Length (Ft) (In)	A (Ft)	B (Ft)	C (Ft)	D (Ft)	E (Ft)
F-4	38-5	58-3	47	47	70	90	150
F-8	39-11	58-11	48	48	72	90	150
F-9	38-O	40-11	38	38	68	90	150
F-14	65-O	62-O	56	56	106	95	150
#F-14	38-3	62-O	55	55	70	90	150
F/A-18	40-5	56-O	47	47	71	90	150
A-3	72-6	74-5	64	64	124	103	150
A-4	27-6	39-5	31	31	53	90	150
RA-5	53-l	76-7	65	65	95	90	150
A-6	53-o	55-6	47	47	96	90	150
A-7	38-9	45-8	39	39	71	90	150
AV-8A	25-o	45-o	32	32	57	90	150
AV-8B	30-4	46-4	36	36	57	90	150
S-3	68-8	53-3	51	51	114	99	150
C-5	222-9	245-11	199	199	350	273	150
C-9	93-4	119-4	97	97	160	133	150
KC-135	130-10	136-3	130	130	220	181	150
C-141A	160-9	145-o	120	120	264	211	150
T-2	37-11	38-9	40	40	68	90	150
T-39	44-5	44-o	38	38	78	90	150

#Wings Swept

TABLE 113-20A
Parking Apron Spacing
Jet Aircraft- 45 Degree Parking

Aircraft Designation	Wingspan (Ft)	Wingspan (In)	Length (Ft)	Length (In)	A (Ft)	B (Ft)	C (Ft)	D (Ft)	E (Ft)
F-4	38	5	58	3	47	47	70	90	150
F-5E	28	0	48	3	*	*	*	*	150
F-5F	28	0	51	8	*	*	*	*	150
F-14	65	0	62	0	56	56	106	95	150
F-14#	38	3	62	0	55	55	70	90	150
F-14A+/F-14D	65	0	62	0	56	56	106	135	150
F-16	31	0	49	4	*	*	*	*	150
F/A-18	40	5	56	0	47	47	71	90	150
A-4	27	6	39	5	31	31	53	90	150
A-6	53	0	55	6	47	47	96	90	150
A-7	38	9	46	0	39	39	71	90	150
AV-8A	25	0	45	0	32	32	57	90	150
AV-8B	30	4	46	4	36	36	57	90	150
S-3	68	8	53	3	51	51	114	99	150
C-5	222	9	245	11	199	199	350	273	150
C-9	93	4	119	4	97	97	160	133	150
KC-135	130	10	136	3	130	130	220	181	150
C-141B	160	9	168	4	*	*	*	*	150
T-2	37	11	38	9	40	40	68	90	150
T-39	44	5	44	6	38	38	78	90	150
T-45	30	10	39	3	*	*	*	*	150

 # Wings Swept
*** Contact COMNAVAIRSYSCOM for guidance**

TABLE 113-20A
Parking Apron Spacing
Jet Aircraft - 90 Degree Parking

Aircraft Designation	Wingspan (Ft)	Wingspan (In)	Length (Ft)	Length (In)	A (Ft)	B (Ft)	C (Ft)	D (Ft)	E (Ft)
F-4	38	5	58	3	58	38	48	115	150
F-5E	28	0	48	3	48	28	38	100	150
F-5F	28	0	51	8	52	28	38	100	150
F-14	65	0	62	0	62	65	80	125	150
F-14#	38	3	62	0	62	38	48	125	150
F-14A+/F-14D	65	0	62	0	62	65	80	135	150
F-16	31	0	49	4	49	31	41	100	150
F/A-18	40	5	56	0	56	40	50	115	150
A-4	27	6	39	5	39	28	38	125	150
A-6	53	0	55	6	56	53	68	105	150
A-7	38	9	46	0	46	39	49	125	150
AV-8A	25	0	45	0	45	25	35	100	150
AV-80	30	4	46	4	46	30	40	100	150
S-3	68	8	53	3	53	69	84	125	150
C-5	222	9	245	11	246	223	248	273	150
C-9	93	4	119	4	119	93	113	133	150
KC-135	130	10	136	3	136	131	156	181	150
C-141B	160	9	168	4	168	161	186	211	150
T-2	37	11	38	9	39	38	48	110	150
T-39	44	5	44	6	45	44	54	115	150
T-45	30	10	39	3	39	31	41	100	150

 # Wings Swept

TABLE 113-20A
Parking Apron Spacing
Jet Aircraft - 90 Degree Parking

Aircraft Designation	Wingspan (Ft) (In)	Length (Ft) (In)	A (Ft)	B (Ft)	C (Ft)	D (Ft)	E (ft)
F-4	38-5	58-3	58	38	97	115	150
F-8	39-11	58-11	59	40	92	125	150
F-9	38-0	40-11	41	38	97	120	150
F-14	65-0	62-0	62	65	111	125	150
#F-14	38-3	62-0	62	38	111	125	150
F/A-18	40-5	56-0	56	40	101	115	150
A-3	72-6	74-5	74	73	115	125	150
A-4	27-6	39-5	39	28	92	125	150
RA-5	53-1	76-7	77	53	105	125	150
A-6	53-0	55-6	56	53	95	105	150
A-7	38-9	46-0	46	39	98	125	150
AV-8A	25-0	45-0	45	25	79	100	150
AV-8B	30-4	46-4	46	30	79	100	150
S-3	68-8	53-3	53	69	110	125	150
C-5	222-9	245-11	246	223	248	273	150
C-9	93-4	119-4	119	93	113	133	150
KC-135	130-10	136-3	136	131	156	181	150
C-141A	160-9	145-0	145	161	186	211	150
T-2	37-11	38-9	39	38	90	110	150
T-39	44-5	44-6	45	44	100	115	150

#Wings Swept

TABLE 113-20A
Parking Apron Spacing
Propeller Aircraft - 90 Degree Parking

Aircraft Designation	Wingspan (Ft) (In)	Length (Ft) (In)	A (Ft)	B (Ft)	C (Ft)	D (Ft)	E (Ft)
A-l	50-0	39-2	39	50	65	90	150
E-l	72-4	45-4	45	72	87	102	150
E-2	80-7	56-4	56	81	101	121	150
P-2	104-0	93-0	93	104	129	154	150
P-3	99-8	116-10	117	100	120	150	150
S-2	72-7	43-6	44	73	88	103	150
OV-10	40-0	41-7	42	40	50	90	150
OV-12	40-0	41-7	42	40	50	90	150
UC-12B	54-6	43-9	44	55	70	90	150
C-1	69-8	42-0	44	73	88	103	150
C-2	80-7	56-8	57	81	101	121	150
RC-45	47-8	34-2	34	48	58	90	150
C-117	90-0	67-9	68	90	110	130	150
C-118	117-6	107-0	107	118	143	168	150
C-121	123-0	116-2	116	123	148	173	150
KC-130	132-7	97-10	98	133	158	183	150
C-131	105-4	79-3	79	105	130	155	150
T-28	40-7	34-6	35	41	51	90	150
T-34	33-4	28-9	29	33	43	90	150
T-44	50-3	35-6	36	50	65	90	150

TABLE 113-20A
Parking Apron Spacing
Helicopters - 90 Degree Parking

Aircraft Designation	Wingspan (Ft) (In)	Length (Ft) (In)	A (Ft)	B (Ft)	C (Ft)	D (Ft)	E (1) (Ft)
UH-1	44-0	53-0	53	44	66	110	86
AH-1	44-0	53-1	53	44	66	110	86
UH-2	44-0	52-2	52	44	66	110	86
SH-3	62-0	72-6	73	62	93	124	113
UH-34	56-0	65-9	66	56	84	112	104
OH-43	50-6	47-0	47	51	76	101	96
UH-46	50-0	84-4	84	50	75	100	95
OH-50	20-0	20-0	20	20	30	50	50
CH-53D	72-3	88-3	88	72	108	144	128
CH-53E	79-0	99-0	99	79	119	158	139
CH-54	72-0	88-6	89	72	108	144	128
TH-57	33-4	38-10	39	33	50	84	70
SH-60B	53-8	64-10	65	54	81	108	101

Note (1) - The "E" dimension for helicopters is equal to 1.5 x (Rotor Diameter) plus 20 Ft.

$E = 1.5R + 20$

TABLE 113-20B
Aircraft Parking Apron - Approximation

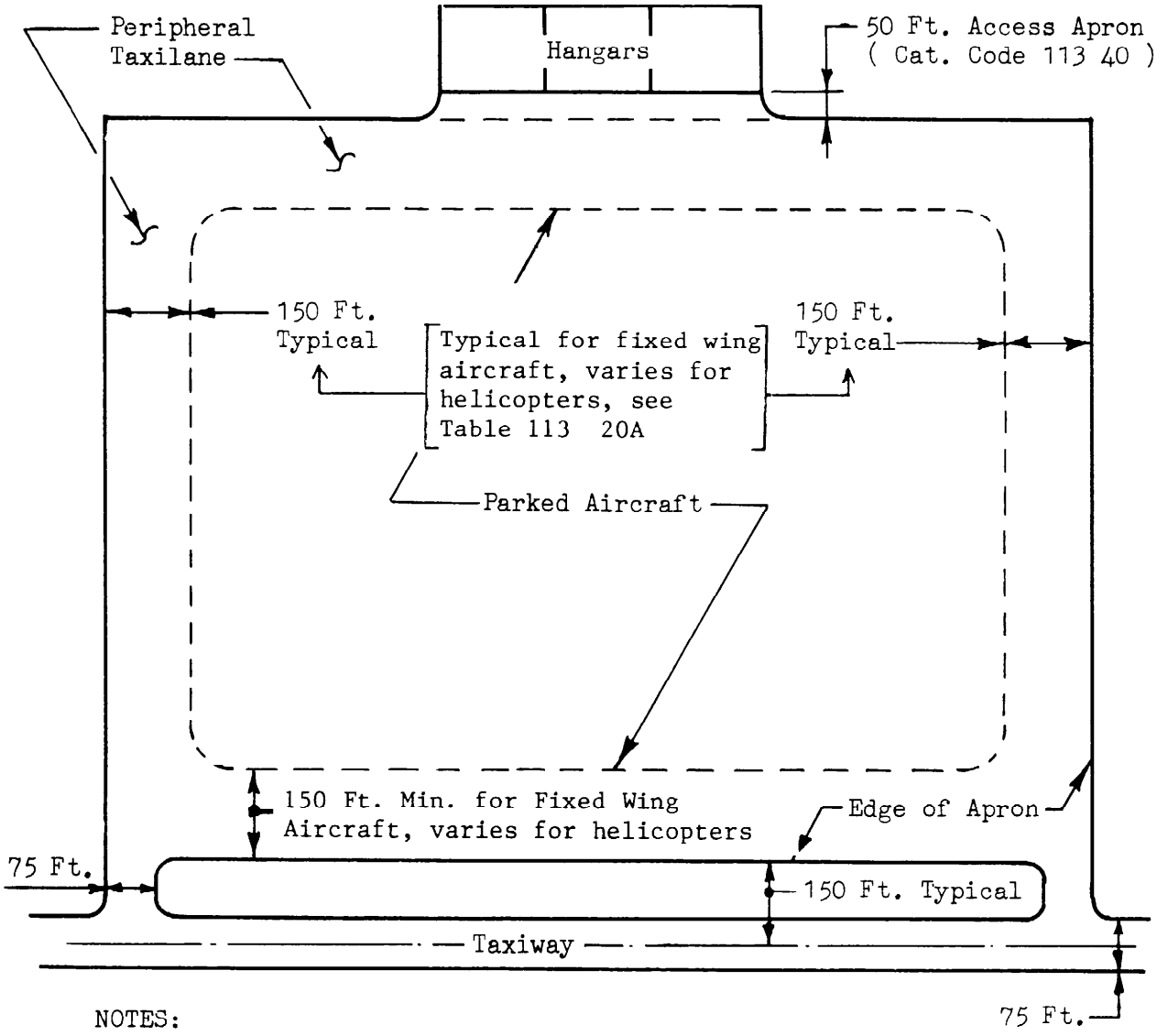
Propeller Aircraft			Helicopters	
Aircraft Type	Sy. Yds. Per* Aircraft (90° Parking)		Helicopter Type	Sy. Yds. Per* Helicopter (90° Parking)
A-1	935		UH-1	1195
E-1	1420		AH-1	1195
E-2	1985		UH-2	1190
P-2	3540		SH-3	2036
P-3	3560		UH-34	1661
S-2	1440		OH-43	1250
OV-10	735		UH-46	1533
OV-12	735		OH-50	230
UC-12B	1040		CH-53D	2784
C-1	1425		CH-53E	3398
C-2	2000		CH-54	2796
RC-45	800		TH-57	685
C-117	2420		SH-60B	1557
C-118	4375			
C-121	4750			
KC-130	4940			
C-131	3380	Continued on next page, see notes following the table.		
T-28	710			
T-34	570			
T-44	910			

TABLE 113-20B
Aircraft Parking Apron - Approximation

Jet Aircraft		
Aircraft Type	Sy. Yds. Per Aircraft*	
	45° Parking	90° Parking
F-4	1065	1860
F-8	1110	1880
F-14	1778	2310
F-14**	1128	2310
F/A-18	1080	1920
A-3	2300	2540
A-4	715	1675
PA-5	1640	2360
A-6	1460	1700
A-7	1020	1870
AV-8A	775	1275
AV-8B	800	1280
S-3	1900	2170
C-5	18350	14300
C-9	4090	3165
KC-135	7580	5500
C-141A	9680	7350
T-2	985	1490
T-39	1110	1780

* The parking area listed overlaps but does not include the entire peripheral taxilane. For planning purposes, compute the area of a peripheral taxilane around the entire apron and add 75% of the computed value to the area obtained from the table.

** Wings swept.

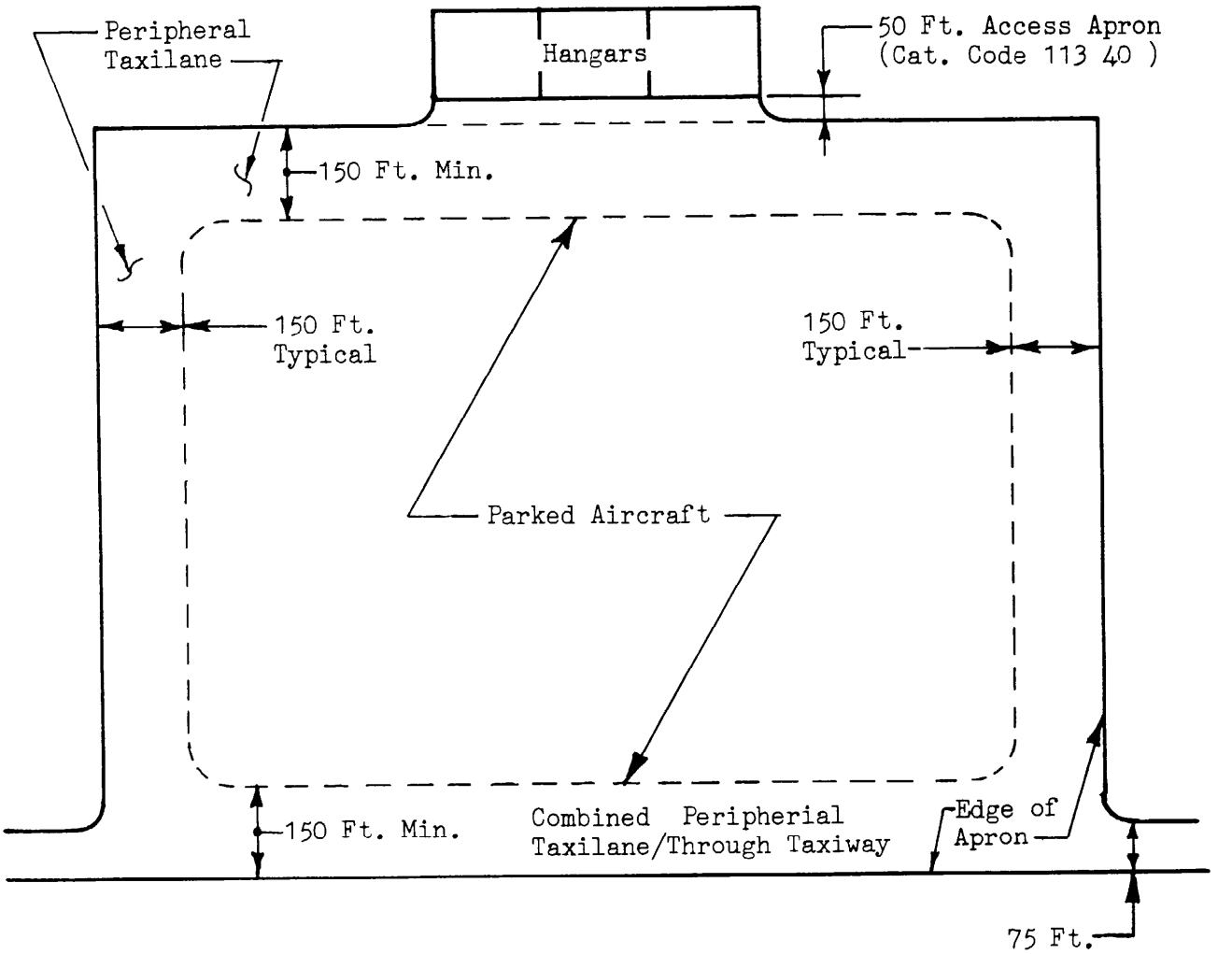


NOTES:

Dimensions marked "Typical" may be reduced under certain operating conditions. See paragraph titled "Deviations From Criteria".

The edge of the apron must be outside the Runway Primary Surface, parked aircraft shall not penetrate the 7:1 Transitional Surface.

FIGURE 113 20C
TYPICAL AIRCRAFT PARKING APRON
(NORMAL THROUGH TRAFFIC)



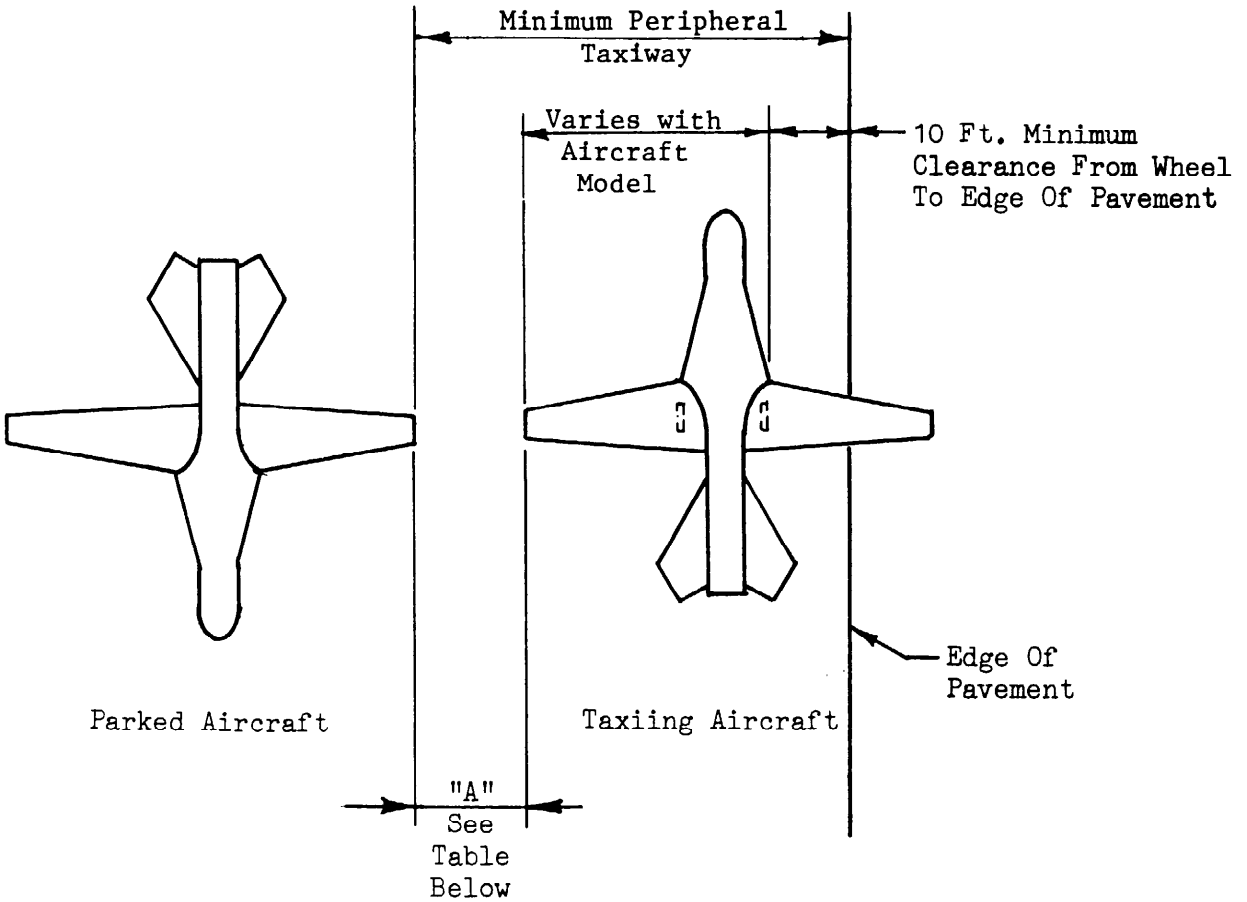
NOTES:

Dimensions marked "Typical" may be reduced under certain operating conditions. See paragraph titled "Deviations From Criteria".

The edge of the apron must be outside the Runway Primary Surface, parked aircraft shall not penetrate the 7:1 Transitional Surface.

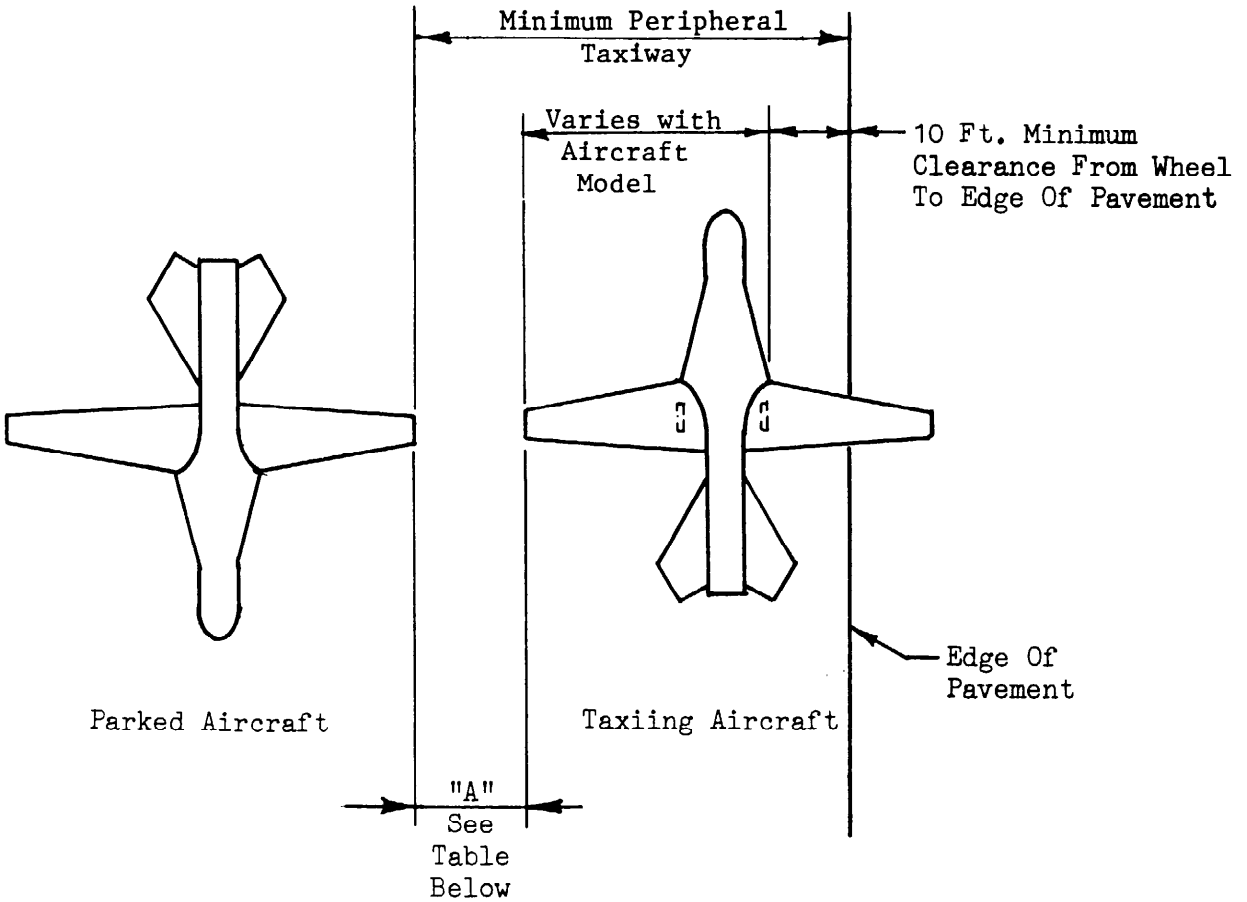
FIGURE 113 20D

AIRCRAFT PARKING APRON-FIXED WING AIRCRAFT
(MINIMAL THROUGH TRAFFIC)



Wingspan Of Taxiing Aircraft	"A" Min. Wingtip Clearance
Over 100 Ft.	25 Ft.
75 To 100 Ft.	23 Ft.
50 To 74 Ft.	15 Ft.
Less Than 50 Ft.	10 Ft.

FIGURE 113 20E
MINIMUM PERIPHERAL TAXILANE
(FIXED WING AIRCRAFT)



Wingspan Of Taxiing Aircraft	"A" Min. Wingtip Clearance
Over 100 Ft.	25 Ft.
75 To 100 Ft.	23 Ft.
50 To 74 Ft.	15 Ft.
Less Than 50 Ft.	10 Ft.

FIGURE 113 20E
MINIMUM PERIPHERAL TAXILANE
(FIXED WING AIRCRAFT)

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116 AIRFIELD PAVEMENTS - OTHER

Included in this basic category are airfield pavements, other than runways, taxiways, and aprons, such as washracks, rinse facilities, compass calibration pads, arming/de-arming pads, GCA pads, blast protective pavement, line vehicle parking, towways, ordnance handling pads, fire and rescue vehicle alert pads, and tactical support van pads.

116 10 AIRCRAFT WASHRACK PAVEMENT (SY)

Aircraft washracks are provided at all air installations for cleaning of aircraft in conjunction with periodic maintenance. For criteria for an aircraft freshwater rinse facility, see Category Code 116 15. A minimum of one washrack is required at each NAS, NAF, and equivalent Marine Corps facilities. The total number required at an installation depends on numbers and types of on-board aircraft.

Type A. An 803 square-yard washrack (Type A) can service 80 VA/VF or similar size aircraft or 40 rotary wing aircraft, or a combination of both. The number of combined aircraft that can be serviced on a Type A pad can be determined from the following equation: The number of VA/VF (or similar size) aircraft plus two times the number of helicopters equals 80.

EXAMPLE: 40 VA/VF plus 20 helicopters as 40 plus 2(20) does not exceed 80.

Type B. An 1,822 square-yard washrack (Type B) can service 20 VF aircraft or 80 cargo transport aircraft, or a combination of both. The number of combined aircraft that can be serviced on a Type B pad can be determined from the following equation: four times the number of patrol aircraft (VP) plus the number of cargo aircraft equals 80.

EXAMPLE: 18 VP and 8 cargo as 4(18) plus 8 does not exceed 80.

The normal location of the washracks is adjacent to the hangar with access pavement provided as required. Utilities and an antipollution drainage system are provided.

A utilities control building with a gross area of approximately 630 square feet is planned with each washrack. It houses detergent metering equipment, air compressor, detergent mixing tank, water heater, utility controls, sanitary facilities for personnel, if required, and storage space for cleaning equipment. A detergent storage tank is located outside of the utilities control center and may be below ground.

For layout and design criteria for washracks, see NAVFAC DM-21 and NAVFAC P-272.

116 15 AIRCRAFT RINSE FACILITY (SY)

An aircraft rinse facility provides an unattended taxi-through, treadle operated, freshwater deluge system to rinse aircraft. The aircraft rinse facility is required at each Navy and Marine Corps air installation having

aircraft subject to accelerated corrosion due to low-level over-water operations or a corrosive atmosphere at the installation. A facility of appropriate type is planned for each type of aircraft normally stationed at the airfield.

Type 1 is for rotary wing aircraft and has a gross area of 910 SY
Type 2 is for VP type aircraft and has a gross area of 1,710 SY
Type 3 is for VF or VA type aircraft and has a gross area of 910 SY

Access taxiways (Code 112 10) and vehicle roads (Code 851 10) are programmed with the rinse facility as required. The facility should be located in proximity to the most frequently used taxiway and as near to the hangar area as possible. A water supply and drainage area are required.

See NAVFAC P-272 and NAVFAC DM-21 for design criteria.

116 20 AIRCRAFT COMPASS CALIBRATION PAD (SY)

An aircraft compass calibration pad is a paved area in a magnetically quiet zone where the compass in the aircraft is calibrated. There are two types of calibration pads:

Type I is used with the magnetic compass calibration set.
Type II pad includes a compass rose and turntable and may be used either with or without the compass calibration set.

Either pad handles one aircraft at a time. A minimum of one pad is provided at each station, however, additional pads may be required based on local demand. The time required to calibrate one aircraft compass using the magnetic compass calibration set is 2 hours. When using a Type II compass calibration pad without the magnetic compass calibration set, approximately 1 hour is required.

Existing paved areas located where earth's magnetic field is uniform are suitable for use as compass calibration pads. New Type II pads with compass rose and turntable are planned only where required for aircraft not adaptable to the magnetic compass calibration set.

Minimum distances from potential magnetic interference structures to the center of the pad are: 275 feet to the centerline of the nearest taxiway or towway; 225 feet to underground metal conduits and piping; 275 feet to the edge of aircraft and vehicle parking areas; 500 feet to underground powerline; 600 feet to overhead steam lines, a.c. power lines and/or equipment, nearest edge of railroad tracks, nearest portion of building containing any magnetic material; 1,000 feet to d.c. power lines and/or equipment.

The access taxiway to the calibration pad is oriented to facilitate moving the aircraft onto the pad, headed toward magnetic north. Each pad requires a target placed at a known but arbitrary bearing at a distance of approximately one-half mile from the pad and visible from both the aircraft and the compass calibration set. The gross area required for a compass calibration pad exclusive of access taxiway is 1,600 square yards.

For design criteria, see NAVFAC DM-21.

116 35 ARMING AND DE-ARMING PAD (SY)

This pad provides a paved area for activating or deactivating weapons systems on-board aircraft. It is utilized at all Navy and Marine Corps air installations where gunnery, rocketry, and/or missile firing are conducted. The average time for arming an aircraft is 20 minutes, and for de-arming an aircraft, 30 minutes. All aircraft on the pad may be either armed or de-armed simultaneously; however, arming and de-arming cannot occur simultaneously on the same pad. The number of pads at an installation depends upon the demand at that installation. The pads are sited at either end of the primary runway and, if additional pads are required, at either end of the crosswind runways.

Type A. The gross area of the Type A pad is 3,910 square yards. The Type A pad will accommodate simultaneously four UHIE or four OVIOA aircraft.

Type B. The gross area of the Type B pad is 8,400 square yards. The Type B pad will accommodate simultaneously four VA or four VF aircraft.

Type C. The gross area of the Type C pad is 10,900 square yards. The Type C pad will accommodate simultaneously two VP aircraft.

Aircraft utilizing the pad normally park parallel to the runway but in any case they park headed in the direction providing the maximum length of undeveloped space along the extended longitudinal centerline of the aircraft. In no case is arming or de-arming of propelled armament conducted when the aircraft is headed towards inhabited areas on or near the air installation.

For design criteria, see NAVFAC DM-21. A waiver to airspace clearance criteria is not required when the arming and de-arming pad is sited as shown in DM-21.

116 40 GROUND CONTROLLED APPROACH PAD (SY)

The ground controlled approach pad is a paved hardstand provided to support the GCA equipment in operating position. The hardstand must be a minimum of 40 by 80 feet with the long dimension perpendicular to the runway centerline. The number of hardstands required depends on the number of approach directions necessary to provide instrument landings in all weather conditions. Technical manuals for the respective equipment describe acceptable locations for the pad.

116 42 BLAST PROTECTIVE PAVEMENT (SY)

Blast protective pavement is provided adjacent to the runway threshold and end turnoff for all runways except those at basic training propeller aircraft fields. The width of the blast pavement is 100 feet except for master jet air stations where the width shall be 125 feet. See NAVFAC DM-21 for design criteria.

116 45 LINE VEHICLE PARKING (SY)

Line vehicle parking spaces contiguous to taxiway and parking aprons are allocated to mobile equipment assigned for flight line use. See Table 116-45 for space requirements.

TABLE 116-45
Line Vehicle Parking

Equipment	Area (Sq. Yds.)
Tow tractor	20
Refueling truck	47
Refueling trailer	70
Mobile electric power plant	12
Oxygen trailer	8
Utility jeep	11
Bomb truck	20
Bomb trailer	14
Industrial flatbed truck	9
Industrial platform truck	9

Parking for aircraft fire and rescue vehicles are provided separately. See Category Code 141 20, Fire and Rescue Station and 116 60, Fire and Rescue Vehicle Alert Pad.

Parking areas shall be selected to permit optimum efficiency in the use of equipment (for example, squadron vehicles will normally be assigned space close to the squadron maintenance hangar) and to conform to lateral safety clearances for existing and projected airfield pavements. Where weather requires and the clearances permit, shelter for line vehicles may be provided.

See NAVFAC DM-21 for typical layout, clearances, and shelters.

116 50 TOWWAY (SY)

A towway is a paved roadway used for towing fixed or rotary wing aircraft from one area to another. It differs from a taxiway in that aircraft do not move on it under their own power. Towways may be authorized at air installations where it is necessary to tow aircraft from one operational area to another and in some instances, particularly at air installations with jet aircraft, to minimize noise conditions. Towway pavement is normally provided at industrial seaport air installations where carrier berthing facilities include those for unloading and loading of aircraft. Pavement marking, particularly centerline, should be provided, and lighting provided if operations are to be conducted at night. In some cases, towways will be on existing streets and roads or abandoned runways and taxiways which may be tailored for this use.

Such modification will include reconstruction or strengthening of listing facilities to support the maximum aircraft loading that will be superim-

posed at each location, as well as provision for adequate horizontal and vertical clearances. Jet blast criteria and shoulder specification need not be considered.

Towways are planned for air installations based upon the installation mission and type aircraft to be moved.

For towway widths and clearances, see NAVFAC DM-21.

116 55 ORDNANCE HANDLING PAD (SY)

An ordnance handling pad is provided for air installations where there is a requirement for loading or off-loading explosives from cargo aircraft and where no apron is available for use without violating explosive safety distance criteria. The pads are designed for use by cargo aircraft and will generally vary in size depending on the type of ordnance being handled and the number and type of aircraft to be loaded/unloaded simultaneously. However, where an ordnance handling pad is required to support either the C-5, C-141, or Boeing 747 aircraft, an 8,600 square yard pad is required. (See Figure 116 55.)

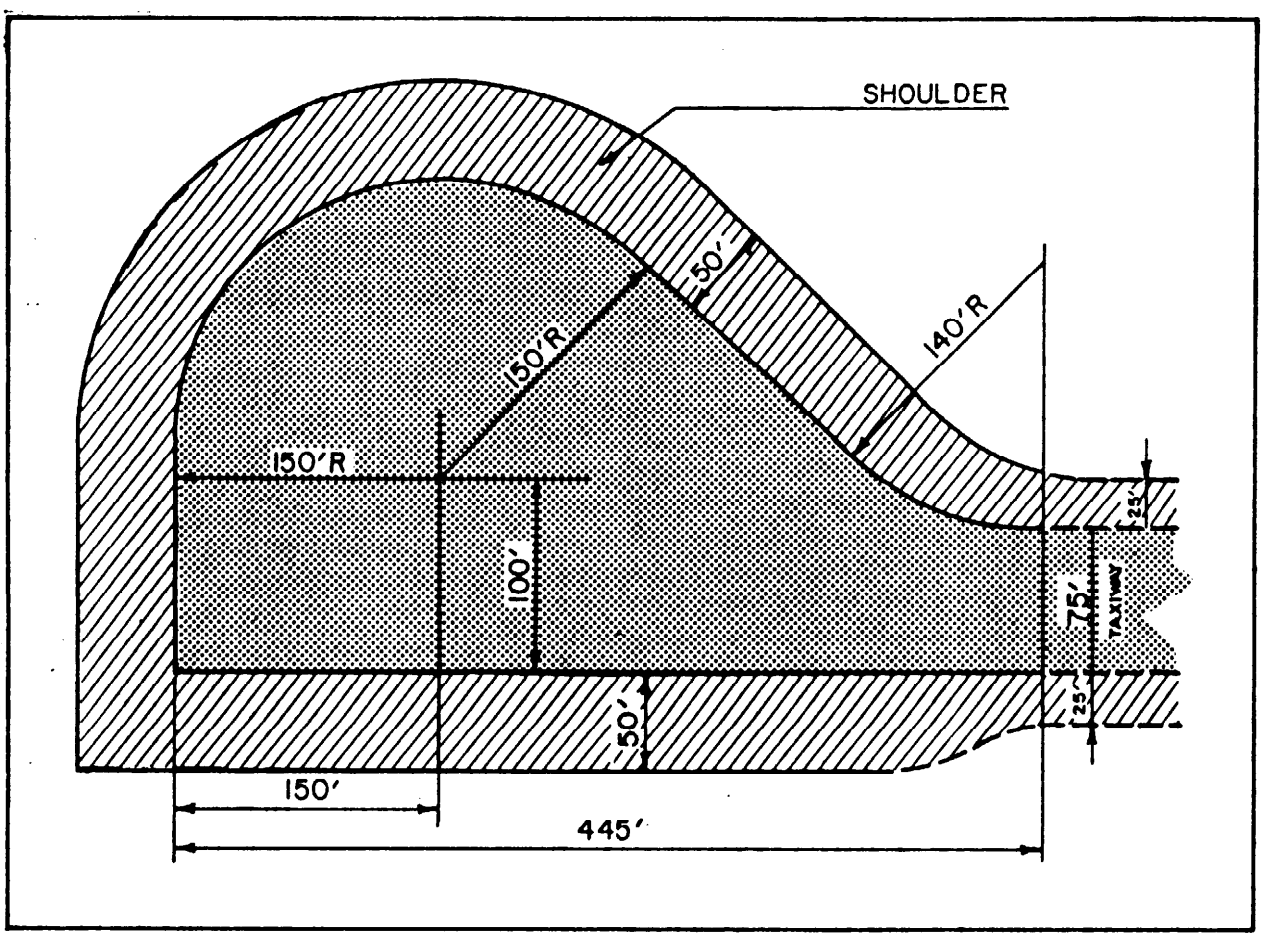

FIGURE 116 55
Ordnance Handling Pad
(For C-5, C-141, and Boeing 747)

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posed at each location, as well as provision for adequate horizontal and vertical clearances. Jet blast criteria and shoulder specification need not be considered.

Towways are planned for air installations based upon the installation mission and type aircraft to be moved.

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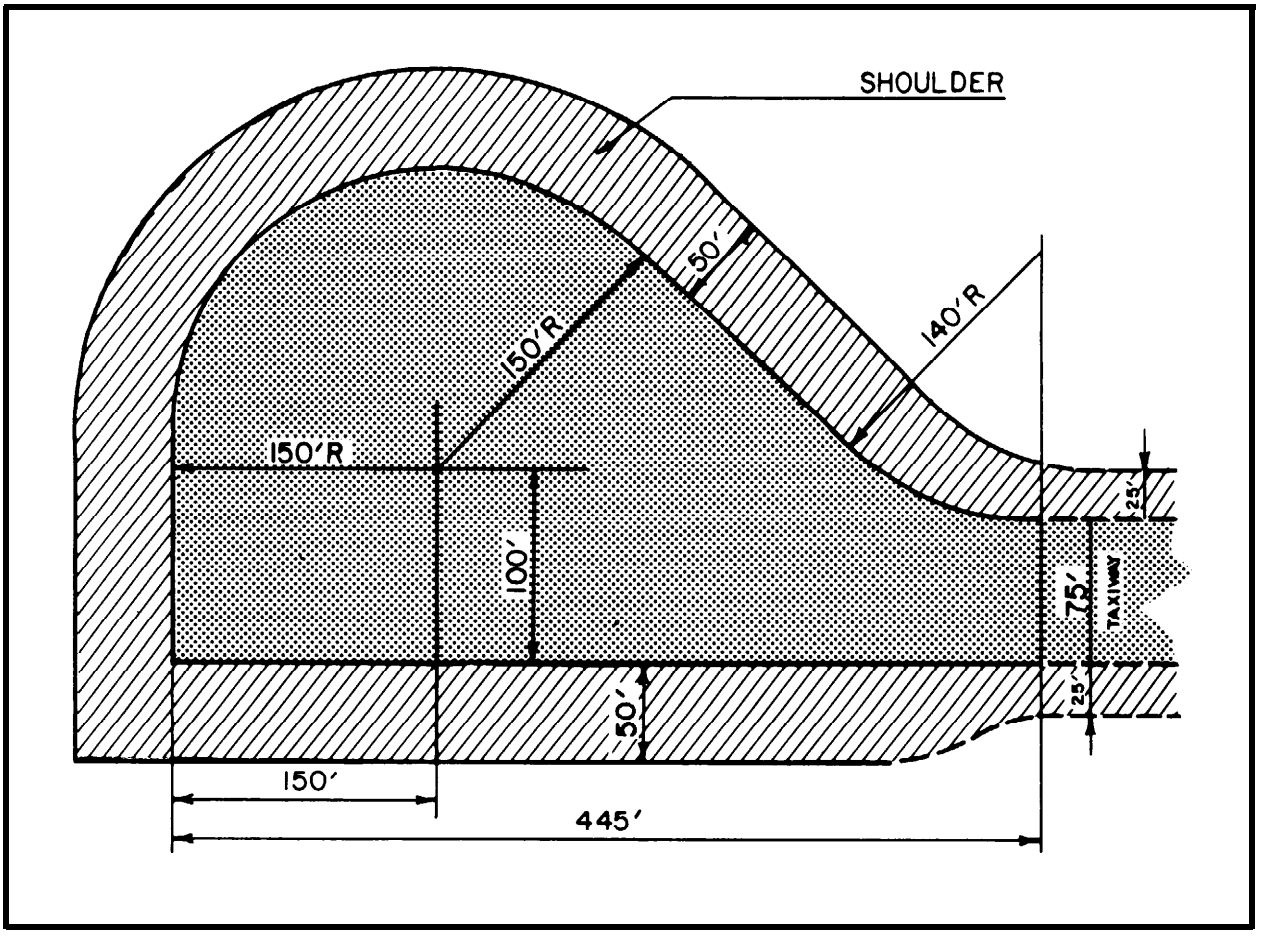

FIGURE 116 55
Ordnance Handling Pad
(For C-5, C-141, and Boeing 747)

The ordnance handling pad shall be sited in accordance with the airfield explosive prohibited areas and quantity distance standards published in NAVORD OP-5 - Volume I, latest revision (Ammunition Ashore Handling, Stowing and Shipping). Also, the ordnance pad should be located SO as not to violate the primary surface extending 750 feet on each side of the runway centerline, the 7:l lateral transition slope, or other pertinent airfield flight safety criteria. Barricades shall be provided where required by quantity distance criteria or where their installation will produce a net reduction in construction and land acquisition costs.

Consideration should be given to utilizing an existing arming/de-arming pad (Category Code 116 35) for ordnance handling provided the arming/de-arming pad is sited in accordance with the guidelines stated above.

For design criteria, see NAVFAC DM-21.

116 56 COMBAT AIRCRAFT ORDNANCE LOADING AREA (SY)

Description. The combat aircraft ordnance loading area is primarily an apron where explosives are loaded/off-loaded from combat aircraft departing and/or returning from weapons training flights. This area is required where there is not space available on the parking apron for loading mass-detonating ordnance which will meet the explosive quantity-distance requirements specified in NAVSEA OP-5, Volume I (Ammunition and Explosives Ashore-Safety Regulations for Handling, Storing, Production, Renovation and Shipping). The weapons are not armed on this apron, see Category Code 115 35, Arming and De-arming Pad.

Policy. Due to the ordnance handling taking place on this apron, its location with respect to other facilities shall be determined using the quantity-distance requirements and explosive prohibited areas specified in NAVSEA OP-5, Volume I. The apron shall be separated from any inhabited building by the inhabited building distance based on the total quantity of explosives (Net Explosive Weight) to be handled on the apron at one time. In addition, the airfield safety clearances specified in NAVFAC P-80.3, Airfield Safety Clearances apply and:

a. The apron must be outside of the runway primary surface
b. Parked aircraft shall not penetrate any transitional surface
c. No objects shall be sited within 100 feet of the edge of this apron

Criteria. There is no standard size for a combat aircraft ordnance loading area. The area required is a function of the number of aircraft to be simultaneously loaded/unloaded and the class and net explosive weight of the ordnance to be carried by each aircraft. Aircraft on the apron shall be separated from each other by the above ground magazine (unbarricaded, K=11) distances specified in OP-5, Volume I. The greater the net explosive weight on the aircraft, the greater the required separation. However, as a minimum, the aircraft spaces shall be separated by not less than the A, B, C, and D dimensions specified for parking aprons, Category Code 113 20. Peripheral taxilanes shall be provided as required to provide safe access to parking spaces. For aircraft with less than 70 foot

wingspan, a 75 foot wide peripheral taxilane will provide sufficient wing-tip clearance for a single aircraft to taxi past parked aircraft (assumes a ten foot clearance between outermost tire of the taxiing aircraft and the edge of pavement). For aircraft with a wingspan of 70 feet or greater, the peripheral taxilane width shall be determined using the clearance criteria shown in Figure 113 20E, Category Code 113 20. The minimum peripheral taxilane width shall be 75 feet.

The apron most likely will have to be sized to accommodate several loading situations. For example, parking locations could be spaced such that twelve aircraft could each be loaded with 500 lbs net explosive weight or six aircraft, parked in alternate spaces, could each be loaded with 5000 lbs net explosive weight. The maximum net explosive weight to be on the apron at one time shall be used in determining the explosive quantity distance arcs for the apron. These arcs shall be measured from the edge of the apron pavement, including the peripheral taxilanes. Justification shall be provided for the number of aircraft and the net explosive weight per aircraft chosen for sizing the apron.

Strong consideration shall be given to providing a joint use apron for ordnance handling from cargo aircraft, Category Code 116 55, and the combat aircraft ordnance area if these operations can be scheduled on a non-concurrent basis. If supporting facilities such as an ordnance operations building, or fixed point utility system are required, they shall be individually justified.

116 60 FIRE AND RESCUE VEHICLE ALERT PAD (SY)

This facility provides parking area for Immediate Response Alert Vehicle. The purpose of the Immediate Response Alert is to:

(1) Observe all landings and take-offs.

(2) Respond immediately to any aircraft accident.

(3) Provide timely rescue of personnel involved in emergencies.

The pad should be large enough to park one P-4A truck and should be located no closer than 150 feet from the runway edge. The pad should not include a protective shelter or any other structure, which would violate airfield safety clearance criteria. See NAVFAC P-80.3, Airfield Safety Clearances, for guidance. The pad should be connected to the runway by a 16 foot wide access roadway. If there is no access to the alert pad other than from the runway, the parking space should be widened as required to allow the truck sufficient space to turn around.

P-4A CRASH TRUCK DIMENSIONS

Weight	=	46,600	pounds
Width	=	9	feet
Length	=	30	feet
Inside turning radius	=	50	feet

Normally there will be one alert pad per air station. However, multiple alert pads will be required when more than one runway is in use and operations cannot be observed from a single vantage point. The optimum location is on either side of the runway and near the middle of the airfield, but may vary depending upon the best observation of the runway. Consideration should be given to maximum utilization of existing abandoned pavements prior to construction of an Alert Pad.

Normally electrical power is not provided to the Alert Pad. However, when power is required to charge the truck batteries, requirements must be individually justified. For additional information see NAVAIR 00-80R-14 Aircraft Firefighting and Rescue NATOPS Manual.

116 65 TACTICAL SUPPORT VAN PAD (SY)

This facility consists of a hardstand with utilities to accommodate relocatable Tactical Support Center Vans. The Tactical Support Centers normally consist of 10 to 15 modular vans (9' wide x 8' high x 32' long) arranged in groups of 3-5 vans which are connected by corridors. The Tactical Support Center is an automated shore base facility in support of P-3 and S-3 Anti-Submarine missions. This facility will be programmed only upon specific direction from NAVAIRSYSCOM.

120 LIQUID FUELING AND DISPENSING FACILITIES

Liquid fueling and dispensing facilities provide adequate flow, pressure, and types of fuel for aircraft, land vehicles, ships, and small craft at naval installations. Included in this category group are the following facilities:

Group 121 Aircraft Fueling/Dispensing Facility
Group 122 Marine Fuel Dispensing
Group 123 Land Vehicle Fueling/Dispensing Facilities
Group 124 Operating Fuel Storage
Group 125 POL Pipeline
Group 126 Other Liquid Fueling and Dispensing

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121 AIRFIELD FUEL DISPENSING

121 10 AIRCRAFT DIRECT FUELING STATION (GM)

Description. Aircraft direct fueling stations provide outlets where aircraft can be fueled from a closed circuit fuel system as opposed to refueler trucks.

Policy. Refueler trucks are the preferred method to fuel aircraft. However, direct fueling stations may be considered for: (1) carrier aircraft, including helicopters, when the mission dictates a continuing need for rapid turnaround without shutting engines down, (2) cargo/transport aircraft with prescribed short ground times or (3) patrol aircraft which require an average refueling of 2500 gallons or more. Aircraft direct fueling stations shall be installed only when authorized by NAVFACENGCOM HQ and NAVALRSYSCOM HQ. NAVFACENGCOM HQ (Code 04) and NAVAIRSYSCOM HQ (Code 4106) will provide technical assistance for the determination of the type and number of fueling station.

Criteria. Aircraft direct systems utilize multi-arm pantographs with closed circuit type nozzle assemblies. Cargo/transport aircraft may also be refueled from flush type direct fueling stations located in the apron in conjunction with hose/pantograph trailers or trucks. However, flush fueling stations should only be used where taxi patterns preclude the parking of aircraft in spaces which can be reached by apron edge fueling stations with fully extended (135 foot maximum reach) five arm pantographs.

The number of fueling outlets required must be determined by an engineering analysis. Where aircraft require quick turnaround, (i.e., transport aircraft with minimum ground time, tactical aircraft returning to the dir without shutting down engines, or patrol aircraft on ready alert status), the number of fueling outlets required is a function of the number of aircraft that must be refueled within the specified time frame. NAVFAC Design Manual (DM-22) provides guidance on the minimum number of outlets, fuel flow per outlet and total fuel flow required in the system. Systems are designed such that the flow in the system is less than the sum of the maximum outlet capacities. Three or four outlets each capable of delivering 600 gallons per minute (GPM) can be adequately served by a system with a capacity of 1200 GYM.

When determining the number of outlets required for simultaneous refueling of aircraft, the average rate at which the aircraft can receive fuel shall be used rather than the maximum GPM capacity of the outlet. For example, if the average fuel receiving rate for an aircraft is 250 GPM (the actual rate varies during filling), and the aircraft normally requires 2000 gallons of fuel, the fill up time equals 2000/250 or 8 minutes. Al lowing 7 minutes for other functions such as brake check, taxiing, hook-up, paper work etc., one aircraft can refuel every 15 minutes. In this case each outlet could fuel 4 aircraft per hour. If the mission requirement is to turnaround 8 aircraft per hour, two outlets would be required. NAVFAC DM-22 specified d minimum of 2 outlets per fueling system.

Siting Requirements. The location of fueling stations at an activity depends on the aircraft mission and configuration of runways, taxiways and aprons. The fueling stations may be located adjacent to through taxiways, parking aprons or dedicated fueling taxiways. See NAVFAC P-272, Drawing 1403986, for the layout of a fueling station with dedicated taxiways. Where direct fueling is used to hot fuel tactical aircraft, fueling stations shall be located to allow quick return to the a runway. For cargo/ transport aircraft, the fueling stations shall normally be located adjacent to where the aircraft are loaded/unloaded so that fueling may be done simultaneously with other logistic operations. Patrol aircraft may be fueled at their parking spaces or at some point enroute to the runway.

Direct fueling stations shall be sited outside the runway or helipad primary surface and such that fueling equipment and the aircraft to be refueled do not penetrate the transitional surface as defined in NAVFAC P-80.3. Direct fueling stations shall not be sited beneath the approach-departure clearance surface. Fueling stations with dedicated access taxiways shall be located a minimum 100 feet from the edge of a parking apron and 150 feet from the centerline of a through taxiway. The size and spacing of fueling lanes shall be in accordance with NAVFAC P-272, Definitive Drawing 1403986. Normally, when fueling stations are proposed adjacent to parking aprons or through taxiways, an airfield safety waiver from NAVAIRSYSCOM would be required prior to construction. However, in this case no formal waiver is required provided NAVPACENGCOM and NAVAIRSYSCOM have approved overall-planning for the project. Aircraft direct fueling stations shall not be sited within 200 feet of an inhabited building. Siting of fuel dispensing facilities must consider the effects of electromagnetic radiation, see NAVFAC DM-22 for guidelines.

121 20 AIRCRAFT TRUCK FUELING FACILITY (GM)

Description. An aircraft truck fueling facility is used to transfer fuel to aircraft refueler trucks. The fueling equipment is located on concrete islands which are designed to provide fuel from one side only. Where more than one island (one fueling outlet per island) is required, they shall be arranged parallel to each other with 15 feet between adjacent sides. The pavement between islands is sloped to a drain or catch basin which is connected to d containment area is case of a fuel spill. See NAVFAC P-272, Drawing 14039987 for a sketch of a typical refueler truck fill stand and NAVFAC DM-22 for design criteria.

Policy. The use of refueler trucks is the preferred method to fuel aircraft. However, see category code 121-10 to determine when a direct fueling system may be considered. When direct fueling is provided, it always is in conjunction with truck fueling. An aircraft truck fueling facility supplied from a spur of the direct fueling system usually reduces nonproductive truck time and is less costly than a separate truck fueling facility because the filter/separator and fuel monitor would be omitted. Also, depending upon the spurs' location in the system, a relaxation chamber may not be required. See NAVFAC definitive drawing 1403985 and NAVFAC design Manual DM-22, Chapter 3, Section 4. The determination of number of grades of fuel to be handled and the number of outlets required for each grade shall be made in conjunction with NAVPACENGCOM HQ (Code 04) and NAVAIRSYSCOM HQ (Code 4106).

Criteria. The number of outlets required must be determined by an engineering analysis. The maximum capacity of each outlet is 600 gallons per minute (GPM) Factors to be considered in the engineering analysis include:

(a) The number of grades of fuel to be provided. Each grade requires a separate outlet.

(b) The number of aircraft that must be refueled during peak periods of recovery and launch.

(c) The rate at which the fueling facility can fill refueler trucks. Refueler trucks can accept up to 600 GPM, however, a figure of 450 gpm is more typical of rates achieved. Standard Navy refueler trucks can hold 5000 gallons of fuel. The capacity of refueler trucks in contract refueling operations vary and 8000 gallons is not uncommon.

(d) The rate refueler trucks can fuel aircraft. While refueler trucks can dispense fuel at approximately 250 GPM, only the larger and more modern jet aircraft can accept fuel at that rate and then only during the initial refueling phase. For planning purposes, the average aircraft fueling rates should be 200 GPM for large jet aircraft (Patrol/transport), 150 gpm for tactical jet aircraft and 100 GPM or less for rotary wing jets and all reciprocating engineer aircraft using aviation gasoline (AVGAS). Some larger aircraft can simultaneously take on fuel from two trucks in which case a combined average flow of 400 GPM can be use.

(e) The distance the refueler trucks have to transit between the fueling stand and the aircraft. The distance should be minimized to reduce transit times.

The analysis should consider that aircraft can be refueled overnight for morning departures. Peak demand for the truck fueling facility will normally occur at mid-morning or mid-afternoon when high rates of aircraft recovery are experienced.

Siting. Aircraft truck fueling facilities shall not be sited within the primary surface or under the approach/departure clearance surface of any runway or helipad. The facilities shall be sited so that no part of the fueling stand, equipment or refueler truck penetrates the imaginary surfaces specified in NAVFAC P-80.3 or the airfield safety clearances published in NAVFAC P-80 (see criteria for runways, helipads, taxiways and aprons). The fueling facility shall be at least 100 feet from any building, public road or above ground fuel storage tank. See NAVFAC DM-22 for additional siting restrictions with respect to electromagnetic radiation.

121 30 AIRCRAFT DEFUELING FACILITY (GM)

This category code shall be used for inventory of existing facilities only. Aircraft shall be defueled into tank trucks designated for that purpose.

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122 MARINE FUEL DISPENSING (Covers all ships and small boats. When located on pier, it is not to be coded as part of pier.)

122 10 MARINE FUELING FACILITY (GM)

A marine fueling facility is designed for small vessels and capital ships and should be able to refuel the largest ship that can dock at the station waterfront. The facility may have the outlets located on a combined cargo and fueling pier or on a separate fueling pier, depending on station mission, logistics, and base location.

In addition to the pier outlets, the facility has a piping approach trestle, a pumping station, security fencing, hose racks, access roads, fire protection and ready marine fuel storage tanks. Surge storage tanks, if required, are categorized under code 124-70 and bulk marine fuel storage tanks are categorized under code 411-10, Ship Fuel Storage. Fuel piers or wharves will vary greatly according to the services required. Some may be of the simple type, having one ship berth and a minimum-size dock platform, to the more elaborate pier head or finger-type having two or three ship berths, all provided with fuel bunkering connection.

There should be 1,800 feet between tankage and the nearest station structure or boundary fence. Consideration must be given to safe distances from other buildings and facilities.

For design criteria, see NAVFAC DM-22

122 20 SMALL CRAFT FUELING STATION (GM)

A small craft fueling station is used to refuel such small craft as crash boats and administrative boats. It shall include dispensing pedestal-type commercial pumps, piping, tanks, hoses, floodlights and grounding devices, electrical power, and fire protection.

There will be at least one separate pump for each grade of fuel used and each shall have a minimum backup storage of 5,000 gallons. The station will normally dispense a minimum of two grades of gasoline and diesel fuel and shall have sufficient capacity to service three boats simultaneously. This may be modified to conform to the type and number of small craft serviced.

The small craft fueling station, except for the storage tanks, is a apart of the Small Craft Berthing facility. The fuel storage tanks may be located in a remote area. The spacing of these tanks will be in accordance with criteria set forth in Code 124.

For design criteria, see NAVFAC DM-25 and NAVFAC P-272.

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123 LAND VEHICLE FUELING/DISPENSING FACILITIES

This category code group is for facilities serving official vehicles and equipment. For private vehicle dispensing facilities, see Category Code 740 series.

123 10 FILLING STATION (OL)

A filling station is a fueling facility for official vehicles on Navy and Marine Corps installations. As a facility, a filling station will include fuel dispensing pumps, access roads, tanks, area lighting, shelter, and fire protection. The 6- by 6-foot shelter should be enclosed in the event of inclement weather. There shall be three pump operated dispensing outlets for each 250 gasoline engine vehicles in the official motor pool. There shall be at least one pump operated outlet for each type of grade of fuel. Each pump shall be connected to a buried 5,000-gallon storage tank. The facility should be located in the vicinity of the motor pool or vehicle maintenance shop. The total amount of storage capacity in each station should be approximately twice the capacity of all fuel tanks of vehicles assigned to an activity.

In addition to an administrative shelter which should be approximately 6 by 6 feet, each pump will require a minimum of 400 square feet of fueling space. This does not include space for maneuvering and/or parking. The storage capacity of this facility will not be included as part of category code 124 50, Vehicle Ready Fuel Storage.

123 15 FILLING STATION BUILDING (SF)

This code is to be used for reporting administrative shelters associated with a filling station.

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124 OPERATING FUEL STORAGE

This basic category includes all of the immediate backup fuel storage for supplying the dispensing facilities at airfields and other land and marine installations. For bulk-type storage, see Category Group 410. Fire protection and safety clearance requirements will be considered for each individual installation. The types, sizes, and spacing of storage tanks are determined by considerations of safety, economics, locality, and intended service.

1. Tank-Spacing of Surface Tanks. The objective in spacing of surface tanks in a fuel facility is dispersion. In no case should the distance between the shells of adjacent tanks be less than the diameter of the largest tank. The distance from the outside of surface tanks to the adjoining property line or the nearest building, where an approved type of fire extinguishing system exists, shall be a follows:

	Capacity of tanks	Distance from property lines or buildings (ft)
Horizontal tanks (gallons)	750 or less	5
	751 to 1,100	10
	1,101 to 3,000	20
	3,001 to 21,000	25
	21,001 to 50,000	50
Vertical tanks (barrels)	750	30
	1,000	40
	1,500	50
	3,000	60
	5,000	75
	7,500	85
	10,000	100
	13,500	125
	27,000	175
	55,000	200
	100,000	200

2. Tank Spacing of Vertical Subsurface Tanks. The objectives in the spacing of subsurface tanks are dispersion and concealment. To obtain adequate dispersion of the vertical subsurface tanks the clear distance between the outside of the shells of adjacent tanks of the larger capacities shall not be less than the following;

Capacity (bbl)	Distance apart (ft)
13,500	125 (200 where available land permits)
27,000	175 (200 where available land permits)
Over 27,000	200

Where it is impracticable to avoid locating more than two tanks in line, distances between tanks shall be at least four tank diameters of the larger tank.

3. Tank Spacing of Horizontal Subsurface Tanks. The minimum clearance between shells of adjacent horizontal underground tanks should be 3 feet and the minimum clearance between aboveground horizontal tanks with capacities 40,000 gallons or under should be as follows:

(1) Tanks should be arranged in pairs with a minimum of 5 feet between tanks in each pair and 10 feet between adjacent tanks of two pairs in the same row.

(2) Adjacent groups of more than two pairs in a single row should be spaced 20 feet between the nearest tanks of the groups.

(3) Minimum end-to end spacing between tanks in longitudinal rows should be 20 feet.

See NAVFAC DM-22 for design criteria.

124 20 DRUM AND CAN READY FUEL STORAGE (GA)

A drum and can ready storage tank may be provided to store 1arge quantities of fuel shipped to the station in drums and cans.

The ready avlube storage tank will be equal to 2.0 percent of the avgas storage tankage, for the equivalent period. A ready tank for lube for fighter aircraft is not required. Vehicle lube and grease requirements are small and will be stored in drums and cans as received. Alcohol used as a fuel additive will be stored in drums and cans as received unless the monthly consumption exceeds 4,000 gallons.

The normal storage for CONUS would be a IO-day supply and for an overseas station, a 30-day supply. The size and number of drum and can ready fuel storage tanks depend on the type and quantity of liquids used, the logistics of supply, and the station mission.

The quantity of fuel stored at a fuel facility will depend on the service required of the facility. See Code 124 for tank spacing and safety distances.

See NAVFAC DM-22 for design criteria.

124 30 AIRCRAFT READY FUEL STORAGE (GA)

Description. Aircraft ready fuel storage provides an operating and reserve supply of aviation gasoline and jet fuel. At air installations all aviation fuel storage shall be categorized as ready fuel storage as opposed to depot storage, 411 category code series. Aircraft ready fuel storage may be classified as local or remote. The remote area, usually designated as the station fuel farm, provides the majority of the storage capacity. Local storage are those storage tanks located close to a fuel dispensing facility. Local storage tanks can be refilled overnight thereby permitting the use of a smaller diameter pipeline from the remote ranks to the local storage and dispensing area. The greater the distance

between the remote storage area and the dispensing facility, the more likely it will be cost effective to provide local storage tanks.

Criteria. The fuel storage requirement must be determined by an engineering analysis. The requirement is a function of: the number and type of aircraft supported, aircraft fuel consumption rates and the number of hours flown. At CONUS installations, a ten day supply is normally provided. At installations outside of CONUS a thirty day supply may be provided. The above days of supply requirements are guidelines and may be modified to reflect restricted or unpredictable fuel delivery schedules. When both local and remote storage are provided, the remote storage capacity requirements shall be reduced by 50 percent of tank capacity provided for local storage:

For Example; Given: (1) CONUS 10 day requirement equals 500,000 gallons
(2) 50,000 gallons of (local storage) are being provided

Remote Storage = 500,000 - 50% (local storage)
= 500,000 - .50 (50,000)
= 475,000 gallons

Total (124-30) Requirement = local + remote
= 50,000 + 475,000
= 525,000 gallons

Siting. Fuel storage tanks must be separated from each other and from buildings, property lines, roads, railroad tracks and powerlines. The separations required depend on the type of tank, type of fuel and the tank capacity. See NAVFAC DM-22 for siting criteria.

124 40 SMALL CRAFT READY FUEL STORAGE (GA)

A marine ready fuel storage tank is the ready issue operating storage of a particular grade of fuel for small boats and yard craft.

The size and number of the marine ready fuel storage tanks will be determined by the number and types of boats required to serve the station and the logistic support involved. The minimum ready fuel storage will be one 5,000-gallon gasoline tank for each octane grade and one 5,000 gallon diesel fuel tank. The tanks will include piping, pumps, security fencing, fire protection, and access for a complete and usable project.

The quantity of fuel stored at this facility will depend on the service required of the facility. Spacing of tanks will be in accordance with criteria set forth in Code 124.

See NAVFAC DM-22 for design criteria.

124 50 VEHICLE READY FUEL STORAGE (GA)

A vehicle ready fuel storage tank contains the immediate backup fuel for vehicles and equipment. There are three grades of vehicular fuel that include both a leaded and a unleaded gasoline and a diesel fuel. The size and number of tanks will depend on the station mission and the number of vehicles maintained. There should be a 10-day total storage capacity for CONUS bases and a 30-day total storage capacity for overseas bases. The quantity of fuel stored at a fuel facility will depend on the service required of the facility. Therefore, past records would best indicate the rate of consumption and accordingly the storage requirements. If records are not available, provide 32 gallons per vehicle for each type of fuel used at overseas bases. Spacing of the tanks will be in accordance with criteria set forth in code 124. The storage capacity of this facility will not include the storage capacity of category code 123 10, Filling Station.

124 70 SURGE STORAGE (GA)

If fuel facilities receiving fuel from tankers require surge tanks, a tank will be provided for each type and grade of fuel received. Surge tanks are required whenever tanker unloading rates exceed rates of shore pumping system. If the tanker can discharge 100,000 barrels in 36 hours, or at the rate of approximately 2,780 barrels per hour, and the port facility can only receive at two-thirds this rate of flow, then a surge tank or tanks of approximately 33,000 barrel capacity will be required. The use of a surge tank insures the shore pumps of a constant supply of oil and allows for surges at the rate of tanker discharge. The size of surge tanks will be determined by the size of tankers unloading at the facility and the capacity of shore booster pumps.

125 POL PIPELINE

This category code is for pipelines and accessory equipment between tank farms and operating fuel storage facilities and intermediate point.

125 10 POL PIPELINE (MI)

Aboveground Pipelines. Aboveground POL pipelines will usually be limited to parts of the system which cannot be laid underground, such as fuel piers or wharves, and booster pump stations. A separate pipeline will be provided at the facility for each kind of fuel specified for storage.

Underground Pipelines. All POL pipelines shall be laid underground whenever practicable. This eliminates the thermo-solar effects and provides additional protection against fire and other damages.

Distribution Pipeline--Subaqueous. Under certain conditions of terrain, it will be necessary to run a portion of a fuel distribution line under water, as for a harbor crossing, through a marsh, etc. While the general design is somewhat analogous to that of the submarine pipeline used for offshore fueling it follows more closely the design for underground piping. The selection of pipe size, storage, and pumps will be based on the length of the pipeline, the station mission, fuel flow capacities desired, the kind of fuel to be transferred, and the sea water temperature.

Submarine Pipelines. To receive or issue fuel from offshore moorings one or more submarine pipelines are laid to the ship mooring point. The general layout of the submarine pipe lines should be set up so that the lines fan out to present connections in line with the side of a ship moored in the fueling berth. Where fuel oil, diesel oil, and gasoline lines are provided, locate the fuel oil line in the center, with the gasoline line toward the bow moorings and the diesel oil line toward the stern mooring. The selected size of pipe for each fuel facility will dependent upon the length of the pipeline, oil flow capacities desired, the kind of fuel to be transferred, and the sea water temperature. Difficulty may be encountered with submarine transfer of fuel oil where the temperature of the sea water is 28°F or lower.

General Planning Notes. The capacity and size of the pipeline will have a direct bearing on the rate of flow of the fuel being carried. In distributing fuel oil, large pipelines are generally more desirable than small ones. The rate of flow should not be less than that listed in Table 125-10.

Wherever it is necessary to run distribution pipelines over private property there will be an are, known as the maintenance area, paralleling the pipelines. This area will be not less than 16 feet in width.

125 16 MISCELLANEOUS POL PIPELINE FACILITIES (CM)

This category code includes pumping stations and associated appurtenances for moving fuels through pipes, such as controls, ventilation, gages, meter, lighting, and fire protection, Pumping stations may be established

aboveground or underground in cases where aboveground installation is objectionable for reasons of aircraft operations clearances, security, or camouflage. Buildings enclosing aboveground pumping stations will be reported under Code 125 20. Pumping rates are set forth in Table 125-10.

125 20 SHED/SHELTER FOR MISCELLANEOUS POL PIPELINE FACILITIES (SF)

This code is for buildings or structures housing pumping stations or other associated appurtenances reported under code 125 16.

TABLE 125-10
Fuel Transfer Flow Rates

Service	Fuel oils	Diesel fuel oils	Jet engine fuels	Gasoline
Between super tanker and storage (bbl/hr)	24,000	24,000	24,000	24,000
Between regular tanker and storage (bbl/hr)	8,000	8,000	8,000	8,000
Between barge and storage (bbl/hr)	2,500	2,500	2,500	2,500
To fleet oilers (gpm)	6,000 to 12,000	2,000	3,000	3,165
To carriers (except super class) (gpm)	6,000		6,000	1,585
To average cruisers (gpm)	6,000	165		
To average destroyer (gpm)	4,000	165		
Between storage tanks (bbl/hr)	2,500	2,500	2,500	2,500
Tank car unloading to storage (gpm per car)		400 to 800	400 to 800	400 to 800
Tank truck unloading to storage (gpm per truck)		400	400	400
Storage to tank truck loading (gpm per car)		1,000	1,000	1,000
Storage to tank truck loading (gpm per loading arm)		250-600	250-600	250-600
Clarifying (gpm per clarifier)		225		
Delivery from duplex refueling island (gpm)			800	
Delivery from refueler truck to airplane			As specified	

Storage tank sump pumps, 50 to 100 gpm for all fuels. At dockside, deliveries from tankers should be assumed to be at a pressure of 90 to 100 psig--to tankers to be at 60 psig. Rates to other ships are maximums based on fueling at sea capacities. Lesser rates for fueling at piers may be used if more practicable. Rates are based on 40 psig at ship connections.

126 OTHER LIQUID FUELING AND DISPENSING

Ready liquid fuel storage and dispensing facilities other than those covered by Codes 121-123 inclusive. For bulk storage, see Code 410.

126 10 DRUM AND CAN LOADING FACILITY (OL)

A fuel facility equipped with a drum reconditioning plant shall also be provided with facilities for filling the drums with fuel oil, diesel fuel oil, kerosene, jet engine fuel, motor gasoline, aviation gasoline, and lubricating oils, or such of these products as are required to be drummed. The drum filling facility should be located in the vicinity of the empty drum storage area and the filled drum storage area. The drums are of 55-gallon capacity.

Jet engine fuel and gasoline stored in drums shall be stored outside when practicable. If stored indoors, special construction is required. Outside storage, when handling a large volume of drums, shall consist of several groups, each group containing 5,000 drums for products having a flash point of 100°F or less, and 10,000 drums for products having a flash point above 100°F.

For the purpose of filling drums, a work platform, covered with an open shed, shall be provided. Pipe lines shall connect pump stations to the platform for each product. A fuel pipe manifold, 4 inches in diameter, shall be run the length of the platform, with 2-inch valved outlets for hose connections spaced at lo-foot intervals and in number as required. A mechanical drum conveyor shall be provided to carry drums to and from the filling stand.

126 30 TANK TRUCK TANK CAR LOADING FACILITY (OL)

Tank Truck Loading Facility. Under this code item a tank truck loading facility is a truck fill stand, or stands that dispense fuels other than aircraft fuels to delivery trucks. (See Code 121 20 for information on an aircraft truck fueling facility.) Each stand has one dual outlet, a meter, static line, platform, roadway, strainer and necessary valves, piping, pump, and electrical controls.

A tank truck loading facility is required at those installations without contract refueling or heating and automotive ready fuel storage facilities. There shall be at least one outlet for each grade of fuel, capable of dispensing fuel at the rate of 250 to 600 gallons per minute. The total number of outlets will vary with the station population, mission, and the number of fuels used. A tank truck loading island is 38 feet 9 inches long by 6 feet 0 inches wide.

Tank Car Loading Facility. Facilities for issue of fuel by tank car shall be provided when specified by NAVFAC. The fuel normally issued will be jet engine fuel and gasoline, but diesel fuel oil and other fuel oils may be included. Separate pipe lines shall be provided from the storage tanks for each type of fuel.

The normal installation will provide for a railroad siding to each side of the loading island with a length to accommodate six cars on each side. A tank car issuing facility may also be used for disposal of sludge form storage tanks, and for this purpose special pipe lines to the facility shall be provided for sludge transfer.

Tank cars are generally of 8,000- and 10,000-gallon capacity. However, there are some tank cars of 12,000-gallon capacity. The rate at which facilities will provide for receipt of fuel is given in Table 125-10.

For design criteria, see NAVFAC DM-22 and NAVFAC P-277.

126 40 TANK TRUCK/TANK CAR UNLOADING FACILITY (OL)

Tank Car Unloading Facility. A tank car unloading facility unloads liquid products from tank cars. Each facility has static lines, strainer, access road, security fencing, lighting, necessary valves, piping, pump, electrical controls, and a shelter structure for use of accounting and/or control house.

The number of cars to be accommodated at an unloading facility shall be determined by a survey. There will be one unloading connection for each car. The tank car unloading facility will provide 400- to 800-gallon fuel transfer rate between each tank car and storage.

Tank Truck Unloading Facility. Tank truck unloading facilities shall be determined by a survey. Facilities should be capable of handling the entire daily fuel requirements in 8 hours. Where unloading facilities by railroad tank cars are available, paved aprons should be provided adjacent to sidings so pumping facilities may serve both tank cars and tank truck.

For design criteria, see NAVFAC DM-22 and NAVFAC P-272.

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

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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 43 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.

133 NAVIGATION AND TRAFFIC AIDS-BUILDINGS (NON-SHIP RELATED)

This code group applies to buildings for housing air traffic control and navigation aids. For complete systems, such as Radar Air Traffic Control Centers (RATCC), use this (133) basic group. However, the elements of RATCC are in basic groups 133, 134 or 135 as appropriate.

133 15 RAWIN BUILDING (SF)

A RAWIN building (Radar Wind Sounding) is a specialized weather reporting facility. It houses tracking equipment used in conjunction with balloon-borne radiosonde transmitters. The RAWIN building is planned only with specific authorization by the Chief of Naval Operations. A standard RAWIN building is shown in Definitive Designs, NAVFAC P-272. The gross area of the building is 820 square feet.

133 25 TACAN BUILDING (SF)

The Tactical Air Navigation (TACAN) Building houses UHF transmitting equipment which provides omnidirectional azimuth and distance information to aircraft in flight. TACAN is primarily a military short-range (200 mile) navigational aid which is generally planned for each Navy and Marine Corps air station. See OPNAVINST 3721.1 (latest revision) for list of required navigational and land aids. It is not required at those air stations which can be serviced by a TACAN or VORTAC of a nearby airfield, either military or civilian. A gross area of 454 square feet is provided for the electronic equipment, monitoring and test equipment, and emergency generator. A vehicle access road is required. The TACAN building with typically roof mounted antenna is sited in accordance with local conditions and Naval Electronics Systems Command criteria.

For design criteria, see NAVFAC DM-23 and NAVFAC P-272.

133 35 UHF HOMER BUILDING (SF)

This facility, known as an "H" or homing facility, houses equipment which emits an omnidirectional radio signal to provide homing and radio fix assistance to aircraft equipped with automatic direction finder (ADF) equipment. The facility is required at all Navy and Marine Corps air stations unless other navigational aid facilities obviate the need. See latest revision of OPNAVINST 3720.1 for a list of required navigational and landing aids. It may be located either on or off the station with specific siting satisfactory to NAVAIRSYSCOM an NAVELEXSYSCOM. The building area is 120 gross SF and requires an antenna support. For design criteria, see NAVFAC DM-23.

133 65 AIR NAVIGATION BUILDING (SF)

This is a specialized facility for providing a readily available source of operational and aeronautical intelligence information, storage and issue

of aeronautical maps and charts, and secure storage of classified material up to TOP SECRET documents. There are two types of air navigation buildings:

Type A building requires a gross area of 4,487 SF and is planned for flight support air stations having an area command mission.

Type B building requires a gross area of 10,863 SF and is planned for those stations having logistics support for a major area command such as COMNAVAIRLANT or COMNAVAIRPAC.

Secure storage areas are provided in conformance with OPNAVINST 5510.1 (latest revision).

For design criteria, see NAVFAC DM-23

133 72 RATCC CENTER (SF)

A Radar Air Traffic Control Center (RATCC) is used to control air traffic to provide safe, expeditious, and orderly movement of aircraft under all weather conditions. Justification for a RATCC is established by the Chief of Naval Operations. OPNAVINST 3721.1 series (latest revision) promulgates policies affecting the establishment and operation of a RATCC system and its component radar facilities. These consist of the air surveillance radar which is housed in the Air Surveillance Radar (ASR) Building (Category Code 133 75) and the precision approach radar (PAR) of the Ground Control Approach System (Category Code 134 40) located on a turntable. Video information from each of these radars is transmitted to remote monitors in the RATCC and control tower cab by underground cable or microwave relay.

The nerve center of the RATCC is the control room in which are located the radar monitors and communications modules. A radar and communications terminal equipment room houses the audio tape recorders as well as the terminal equipment. An office for the FAA liaison officer at jointly operated (Navy/FAA) facilities in the RATCC is required. A training classroom, a ready room for the radar controllers on work breaks, a RATCC watch office, administrative office and officer-in-charge's office are also provided.

Wherever practicable it is highly desirable that the RATCC, the Control Tower (Category Code 141 70), and the Aircraft Operations Building (Category Code 141 40) be located together as an integral unit. Where airfield conditions require the control tower to be located independently of the aircraft operations building, the RATCC is located with the control tower in order to maintain an integrated air traffic control facility. The RATCC requires a gross area of 6,447 square feet.

For design criteria, see NAVFAC P-272 and NAVFAC DM-23.

133 75 AIR SURVEILLANCE RADAR BUILDING (SF)

The Air Surveillance Radar (ASR) is a component of the RATCC system (Category Code 133 72). ASR is the standard terminal air traffic control

surveillance radar for the Navy, Air Force, and FAA. It is, however, a separate facility and is planned as such. The ASR building houses radar transmitting, receiving, and monitoring equipment and maintenance personnel to provide detection and identification of aircraft transiting the area or executing an instrument approach or departure. The building and its associated antenna tower are located in a remote area of the airfield. Information derived from ASR is transmitted to the RATCC by underground cable or a microwave link, and the ASR is, in turn, remotely controlled from the RATCC. The ASR building has a gross area of 2,036 square feet.

See NAVFAC DM-23 for design criteria.

133 80 WHEELS WATCH BOOTH (SF)

An 8 foot by 8 foot portable wheels watch booth is provided with the runway wheels-up/wave off lighting system, category code 136 45. The booth, preferably on wheels to move when not in use, is located approximately 990 feet from the runway threshold near the wheels-up lights. Due to its location, the booth is an obstruction to airfield safety criteria, therefore a waiver is required from NAVAIRSYSCOM prior to its installation. Normally this requirement will be satisfied by portable equipment, Class III Property. However, this code may be used for planning purposes.

See NAVFAC DM-23 and NAVFAC P-272 for design and siting criteria.

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134 NAVIGATION AND TRAFFIC AIDS-OTHER (NON-SHIP RELATED)

This code group applies to structures which function as aircraft navigation/traffic aids.

134 10 ANTENNA - NAVIGATION (EA)

An antenna system for navigation aid will vary with the type and purpose of the navigational aid. No specific planning factors are applicable. This category code shall be used to indicate entire antenna systems.

134 20 BEACON - AIRCRAFT (EA)

An aircraft beacon is an internationally recognized rotating or flashing illuminated beacon operated as a visual aid to air navigation to assist pilots in locating and identifying airports and hazards or obstructions to flight operations. Basic criteria on usage of airport beacons may be found in National Standard for Aeronautical Beacons, AGA-NS-6.

Three functional types of aircraft beacons are: (1) airport rotating, (2) identification or code, and (3) hazard or obstruction beacons. Requirements for each type are as follows:

(1) An airport rotating beacon is required for each airfield except that two adjacent airfields may have a common beacon. A. lighted military airport is identified by a beacon showing alternating flashes of two white and one green light. An unlighted military airport is identified by white flashes only.

(2) An identification or code beacon is required when the airport beacon is more than 5,000 feet from the nearest point of the usable landing area or where two or more adjacent airfields use one common airport beacon. The identification or code beacon is nonrotating and flashes a signal, the code and color of which identify the field. Where a helipad is not part of an airfield and an operational requirement has been established, an identification beacon is required.

(3) A hazard or obstruction beacon is a nonrotating beacon with a flashing red light used where special warning is required to identify a hazard to air navigation. See Obstruction Lighting - Aircraft, Category Code 134 50.

For design criteria and technical requirements of aircraft beacons, see NAVFAC DM-23.

134 40 GROUND CONTROL APPROACH SYSTEM (EA)

A Ground Control Approach (GCA) System provides guidance to aircraft approaching and landing at airfields under all weather conditions. The system employs electronic equipments which will land aircraft automatically, will display signals in the aircraft allowing the pilot to fly the aircraft to the minimums in effect, or will display information for an approach controller on the ground who will talk the pilot in. Equipments used include precision approach radar (PAR), instrument landing system,

and automated control and landing system, independently or in combination. The technical manuals for the respective equipment describe the siting of the equipment, its supporting utilities, and its relationship with other locations and equipments on the airfield. The equipments are remotely controlled and furnish information for metering, monitoring, recording, and control by underground cables.

PAR equipment usually is placed on turntables near the designated instrument runways; site selection depends upon the number and orientation of runways, local operational requirements, and local weather conditions. Access to the site is programmed with the facility.

For design criteria, see NAVFAC DM-23.

134 50 OBSTRUCTION LIGHTING - AIRCRAFT (EA)

Obstruction lighting is a system of lights which define the vertical and horizontal limits of a hazard to aircraft operations. Hazardous conditions exist when any obstruction encroaches on the standard airfield clearance surfaces or an unsafe condition, such as construction, on the airfield exists. Obstruction lighting includes flashing beacons and steady burning lights, both of which are aviation red in color. One or more flashing beacons are displayed in each case where an early or special warning is needed. It is necessary to provide lighting on all obstructions so that visibility of the lighting is assured from any normal angle of approach and from any direction.

Standards for determining obstructions to air navigation have been established by the Department of Defense and are published in Federal Aviation Regulations, Part 77, which covers "Objects Affecting Navigable Airspace." For design criteria, see NAVFAC DM-23.

134 55 VISUAL APPROACH SLOPE INDICATOR (EA)

The Visual Approach Slope Indicator is an unattended system which provides visual glide slope guidance to pilots of aircraft during the final landing approach. The system consists of two rows of light boxes spaced along the runway about 500 and 1,200 feet from the threshold. By observing the color of light emitted from the boxes, the pilot can tell whether his glide path is proper.

The system is intended for use during Visual Flight Rules (VFR) conditions in deceptive approach areas where the topography in the approach zone does not provide an adequate reference for approach to the runway. It is normally installed only on runways which are not equipped for precision approach. Examples of deceptive approaches are embankments, open water, featureless terrain, or dense growth adjacent to the runway threshold. It is also employed where obstructions make pilot judgment of clearance difficult.

The full Visual Approach Slope Indicator (VASI) system (12 light boxes, six on each side of the runway) is the standard installation. The abbreviated (AVASI) system (four light boxes on left side of the runway) is installed only on minor runways where the environmental conditions and air traffic of the particular airfield do not justify the full VASI system.

For design criteria, see NAVFAC DM-23.

134 60 OPTICAL LANDING SYSTEM (EA)

An Optical Landing System (OLS) is a land runway duplication of the arrangement of lights and mirror-reflective apparatus which provide visual aid to pilots when landing aircraft on carrier decks. It is required for runways designated for Field Mirror Landing Practice (FMLP) and may be used as a visual landing aid on other runways. Two Optical Landing System installations are generally planned at each air installation where mirror landing practice is conducted.

Two principal types of optical landing systems used are the Fresnel Lens Optical Landing System (FLOLS) and the Mirror Optical Landing Systems (MOLS). The Mirror system can be provided as a trailer-mounted portable system or constructed as a fixed installation. See NAVFAC DM-23 and P-272 for specific design information.

Auxiliary equipment, Manually Operated Visual Landing Aid System (MOVLAS), can also be provided for use as an emergency backup system for FLOLS or MOLS. This equipment can be installed independently of the primary system with its own datum, wave-off, and cut lights.

134 62 WIND DIRECTION INDICATOR (EA)

A Wind Direction Indicator is rotating structure which serves as a continuous day and night indicator of wind direction to pilots making an orientation approach to an airfield. The "wind tee" is a "T" shaped rotating structure used at Navy and Marine Corps air installations as a navigational aid. It is positioned on the ground where it will be visible from all directions of approach and centrally located for identification and orientation from the air. The "wind tee" is outlined with green lights which when lit, give it the appearance of a single green "T" when viewed from above. When the lights are not lit, it appears as a single stroke yellow "T". A background of crushed stone, gravel, or similar material that will retard the growth of vegetation and provide sharp contrast to the "wind tee" colors is provided.

For design criteria, see NAVFAC DM-23.

134 64 RUNWAY DISTANCE MARKERS (EA)

distance markers are planned for all runways located at Navy and Marine Corps air installations.

For design criteria, see NAVFAC DM-23 and NAVFAC P-272.

134 66 VOR/TACAN CHECK SIGN (EA)

A VOR/TACAN check sign is a visual identification marker erected in the area adjacent to the aircraft holding point at the taxiway access to runway ends. It provides pilots with operational check information on the navigation equipment of the aircraft. Check signs are planned for all runway ends at each air installation equipped with a tactical air navigation or visual omnidirectional range installations.

For design criteria, see NAVFAC DM-23.

134 70 RADAR TOWER (EA)

Radar tower s must be planned on an individual basis. Planning criteria are not presently available.

135 COMMUNICATION LINES

135 10 COMMUNICATION LINES OTHER THAN TELEPHONE (MI)

Communication lines provide circuits between the various activities on or off the station. The communications net may include trunk line service cable, feeder lines, and direct circuits depending on the complexity of the system. The number and type of communications lines are computed by contract specialists who will normally install a leased system.

135 20 TELEPHONE LINES (PI)

No specific criteria are available.

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136 AIR FIELD PAVEMENT LlGHTING

Airfield pavement lighting includes facilities for lighting all airfield pavements and approaches thereto. The various lighting systems are planned with due regard to other airfield facilities so that integrated control is achieved and the resultant overall lighting system is compatible with the operational mission of the air installation. Based on missions assigned by CNO, lighting facilities are developed to meet visual flight rules (VFR) or instrument flight rules (IFR) conditions as shown in Table 136-00. See OPNAVINST 3721.1 (latest revision) for definitions of naval airfield categories for instrument flight rules (IFR) operating capability.

TABLE 136-00
Airfield Lighting Systems

Lighting System		VFR Conditions	IFR Category			
Code	Title		D	C	B	A
136 30	Runway edge	X	X			
136 60	Threshold	X	X	X	X	X
136 50	Taxiway edge	X	X	X	X	X
136 20	Parking/service area	X	X	X	X	X
136 30	Runway edge (high intensity)			X	X	X
136 10	Approach (Cat. I) (1)			X		
	(Cat. II) (1)				X	X
136 35	Runway centerline				R	X
136 55	Touchdown zone				R	X

X = System required; R = System recommended.

(1) For description of approach lighting systems, see Code 136 10. Cat. I and II ALS are comparable with ICAO (Annex 14 to the Convention on International Civil Aviation, Precision Approach Category I and II Lighting Systems.

The following other airfield lighting requirements are determined by individual airfield needs as described under the referenced category code:

Lighting	Category Code
Circling guidance	136 30
Simulated carrier deck	136 36
Wheels-up wave--off	136 45
Taxiway centerline, hold lights and guidance signs	136 50
Displaced threshold and runway end identification	136 50
Helipad	136 65

Obstruction lighting, beacons, and other visual navigation and traffic aids are discussed under basic Category 134. For airfield perimeter lighting, street lighting, and other general illumination, see Basic Category 812.

136 10 APPROACH LIGHTING (LF)

Approach lighting enhances the pilot's ability to acquire the runway environment visually when making an approach for landing during periods of reduced visibility. Visual cues for directional and roll guidance are provided to the pilot for- operations at night and in marginal weather conditions by day. The system includes both approach lights and sequenced flashers.

Approach lighting is provided for primary instrument approach runways. Planning of Category I or Category II approach lighting systems is accomplished in accordance with mission requirements as listed in Basic Category 136. With sufficient justification approach lighting may also be authorized for other runways. Factors to be considered in the justification of any approach lighting system include, but are not limited to:

(1) Existing and desired precision approach minimal.
(2) Number of actual instrument approaches.
(3) Climatology.
(4) Surface features, obstructions and feasibility of construction.

A. Approach Lighting System with Sequenced Flashing Lights, Category I (ALS/SFL CAT I) Configuration.

The approach lights in this configuration are barrettes of white lights placed perpendicular to the extended runway centerline and spaced for d distance of 3,000 feet from the runway threshold. In addition to the approach lights, sequenced flashing lights are provided at each station from the 1,000 foot crossbar to the end of the system (3,000 feet). Operational considerations or factors, such as real estate limitations or natural barriers, may indicate that a shortened ALS/SFL CAT I configura- t ion is acceptable. Normally, 1,500 feet is the minimum length that will be approved by NAVAIRSYSCOM.

B. Approach Lighting System with Sequenced Flashing Lights, Category II (ALS/SFL CAT II) Configuration.

For planning purposes, this configuration is the same as ALS/SFL CAT I. It varies by the addition of one center barrette and 14 side barrettes in the area between the threshold and the 1,000 foot bar. CAT II lighting extends 3,000 Et from the threshold along the runway centerline extended.

For design criteria, see NAVFAC P-272 and NAVFAC DM-23.

136 20 PARKING AND SERVICE AREA LIGHTING (LF)

Parking and service area lighting enables a pilot to guide his aircraft into position for loading, servicing, or parking and provides illumination to perform such functions as fueling, maintenance, loading, and unloading.

Lighting of the parking and service areas is accomplished by a combination of high- and surface-mounted floodlights and roadway luminaries. Parking and service area lighting is provided at all air installations where night or all-weather operations are conducted. The overall lighting scheme is developed after a study of the functions to be performed and the physical layout of pavements and structures of the particular airfield. The minimum lighting requirements for each area are set forth in NAVFAC DM-23.

136 30 RUNWAY EDGE LIGHTING (LF)

Runway edge lighting is a system of lights defining the lateral limits of the usable runway surface. Included in this category are the circling guidance lights which enable the pilot to locate the runway, while off to the side of the runway, and establish the proper traffic pattern.

Runway edge lights are white lights on each side of the runway at nominal ZOO-foot intervals. Runway edge lighting is planned for all-weather and night operations. High-intensity lighting is required for certain IFR categories as noted in Basic Category 136. Requirements are expressed in feet of runway length; that is, runway lights programmed for a runway 10,500 feet long will be shown as 10,500 feet of runway lights.

Circling guidance lights have a nominal l,000-foot spacing and are placed outboard of the runway edge in line with Runway Distance Markers (Category Code 134 64). They are white lights with the beam emited perpendicular to and away from the runway centerline. They are used only for visual flight operations where conditions around the air installation, such as a metropolitan area or smog, confuse or obscure the runway when viewed from a circling aircraft. The need for circling guidance lights at a given air installation is determined by the particular airfield environment. Circling guidance lights requirements are also expressed in feet of runway length.

For design criteria, see NAVFAC P-272 and NAVFAC DM-23.

136 35 RUNWAY CENTERLINE LIGHTING (LF)

Runway centerline lighting provides visual aid to assist the pilot in keeping the aircraft centered on the runway during take-off and after landing at night or in reduced visibility conditions. It is a supplement to runway edge lights. White in-pavement lights are placed along the runway centerline at nominal 25-foot spacings. Runway centerline lighting is planned in accordance with mission requirements as listed in Basic Category 136. Requirements are expressed in feet of runway length.

For design criteria, see NAVFAC P-272 and NAVFAC DM-23.

136 36 SIMULATED CARRIER DECK LIGHTING (EA)

A simulated carrier deck is used to train pilots ashore for landing aircraft under simulated conditions of a carrier at sea. Simulated carrier deck lighting permits training at night and during adverse visibility conditions.

The carrier deck lighting consists of centerline lights, edge lights, and athwartship lights. The edge lights form a 70-foot by 748 foot rectangle outlining the simulated carrier deck which is on the left side of the runway, as seen from landing aircraft, and approximately 320 feet beyond the runway threshold.

Simulated carrier deck lighting is required at all air installations designed by the Chief of Naval Operations for fleet mirror landing practice (FMLP). Normally, two sets are installed, one at each end of the runway selected for FMLP.

For design criteria, se NAVFAC DM-23 and NAVFAC P-272.

136 45 WHEELS-UP/WAVE-OFF LIGHTING (EA)

Wheel watches are posted in the approach zone of the duty runway when the majority of flight operations involves single-piloted aircraft or during periods of high-density traffic. The wheels-up/wave-off lighting system is an aid in preventing the landing of an aircraft when the landing gear has not been lowered. It consists of two lighting systems, wheels-up lighting, and runway wave-off lighting.

Wheels-up lighting illuminates the underside of the aircraft for observation by the wheel watch. A row of white floodlights is located in the approach zone 980 feet in front of the runway threshold and on the same side of the runway as the control tower. The lights are aimed upward and toward the threshold, away from approaching aircraft.

Runway wave-off lighting signals the pilot to execute a missed approach. Wave-off lights are placed at six locations (three on each side of the runway), each having a triangular cluster of three red floodlights. The lights are aimed in the direction of approaching aircraft and flash when actuated. Where an Optical Landing System (OLS), Category Code 134 60 is also installed, the OLS wave-off lights are operated simultaneously with the runway wave-off lights.

A portable shelter for the wheels watch booth is made available for each lighting site. It is located adjacent to the wheels watch handhole. For criteria see category code 133-80.

For design criteria, see NAVFAC DM-23 and NAVFAC P-272.

136 50 TAXIWAY LIGHTING (LF)

Taxiway lighting defines the lateral limits and direction of a taxiway to guide aircraft movement between the runway operational area and the aircraft parking area during night operations or conditions of poor visibility. Taxiway lighting requirements are expressed in feet of lighted taxiway length, not length of lighting circuit. Included in this category code, in addition to taxiway edge and centerline lights, are hold lights and guidance signs.

Taxiway edge lights are blue lights located on each side of the taxiway at sufficiently frequent intervals, as set forth in NAVFAC DM-23, to guide the aircraft. Taxiway edge lighting is planned for all air installations conducted all-weather or night operations.

Taxiway centerline lights are green lights placed in the pavement on the centerline of the taxiway. They are used to add the directional guidance required at high speed taxiway exits. They are also used to supplement edge lights wherever more positive guidance of aircraft is necessary, such as at complex taxiway intersections or large ramp areas where pilot confusion might occur.

Hold lights (yellow) are used for night marking of the painted hold positions. Hold lights are installed whenever taxiway centerline systems are installed and separately at other hold positions as determined by operational requirements.

Taxiway guidance signs are internally lighted signs used to supplement taxiway lighting systems. They are placed at intersections of runways, taxiways with runways, taxiways with aprons, taxiways with taxiways, and at refueling stations and generally where direction or location information is required. The number of signs is based on the particular airfield requirements and is kept to a minimum.

The use of runways as taxiways should be avoided; however, where the existing airfield layout requires the use of the runway as a taxipath, separate taxfway fixtures and circuits, in addition to the runway lighting system, are used.

For design criteria, see NAVFAC P-272 and NAVFAC DM-23.

136 55 TOUCHDOWN ZONE LIGHTING (EA)

Touchdown zone lighting delineates the touchdown zone on the runway and provides directional and roll guidance for aircraft approaching the threshold. The lighting consists of bars of white lights in the pavement on each side of the runway centerline. Thirty pairs of bars are spaced along the runway at 100-foot intervals beginning at the threshold for a total distance of 3,000 feet. Touchdown zone lighting is planned in accordance with mission requirements as listed in Basic Category 136. A set of lights is required only on the end of the runway with approach lighting.

For design criteria, see NAVFAC DM-23.

136 60 THRESHOLD LIGHTING (EA)

Threshold lighting is a system of lights defining the ends of the usable runway surface. The threshold lights are displaced from the extremity of the runway when a portion is unavailable for normal operations. Runway end identification lights enable a pilot positively to identify the ends of the runway from a distance during night-non-precision approach operations.

Threshold lighting consists of two groups of lights located symmetrically about and perpendicular to the runway centerline at each end of the runway, both inboard and outboard of the line of the runway edge lights. The lights show green toward the approach zone and, if at the extremity, red toward the runway. Threshold lights are planned for all lighted runways, but more lights are required where an approach lighting system is used.

Displaced threshold lighting is used only if a portion of the end of the runway is unusable for landing but is available for rollout and takeoff. When this condition exists because of obstructions or other reasons, the lighting is modified to delineate the extent of runway which is available to aircraft approaching from either direction. This is accomplished by displacing and changing the threshold lights to indicate the new threshold location for landing aircraft and equipping the intervening runway edge lights with filters.

Runway end identification lights are single rotating lights mounted in line with the threshold lights but outboard of the runway edge lights, for a total of two lights per runway end. The need for runway end identification lights is determined by the particular air installation environment. Runway end identification lights are effective for overriding surrounding lighting that might cause pilot confusion; for example:

(a) A general preponderance of metropolitan or other lighting located within two miles of the circling approach to the runway.

(b) A configuration of nonaviation lighting, such as a boulevard, expressway, or railroad yard, which presents a false or misleading runway identification.

For design criteria, see NAVFAC DM-23.

136 65 HELIPORT PAD LIGHTING (LF)

Heliport lighting is a system of lights arranged to clearly define the helicopter landing pad for operations at night and during periods of poor visibility. Lighting in this category code is limited to single heliports. Criteria for lighting of helicopter runways is under development.

The basic heliport lighting requirement is perimeter lighting and landing direction lights. Approach direction lights and depth perception lighting may also be required. Perimeter lighting and landing direction lights are planned for all helicopter pads designated for night or all-weather operations and when authorized as an operational requirement at a specific location. Landing direction lights are used to indicate a preferred

landing direction and to give side orientation as wing bars. Approach direction lights are added if additional approach guidance is required. The need for depth perception lighting (pad inset lights and/or flood lights) is determined by-heliport location, steepness of approach, and prevailing environmental conditions.

For design criteria, see NAVFAC DM-23.

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1 3 7 SHIP NAVIGATION AND TRAFFIC AIDS-BUILDINGS

This code group applies to buildings for housing sea traffic control, navigation aids and navigation services.

137 10 METEOROLOGY AND OCEANOGRAPHY BUILDING (sq.m./SF)

A Meteorology and Oceanography building houses strategically located Naval Meteorology and Oceanography Centers (NAVMETOCCEN) and Naval Meteorology and Oceanography Facilities (NAVMETOCFAC). NAVMETOCCENs and NAVMETOCFACs provide the Naval Operating Forces and Shore Establishment with meteorological and oceanographic data for air, surface and subsurface operations. NAVMETOCCENs and NAVMETOCFACs are established by the Chief of Naval Operations in specifically designated areas and are assigned common and selected additional functions by the Commander, Naval Meteorology and Oceanography Command (COMNAVMETOCCOM).

Both NAVMETOCCENs and NAVMETOCFACs provide 24-hour operational support. The number of personnel per shift varies with the location and the assigned tasks of the activity. NAVMETOCCENs are assigned more extensive operational, scientific and geographic responsibilities than the NAVMETOCFACs. Additionally, NAVMETOCCENs coordinate with NAVMETOCFACs within their assigned area of responsibility to ensure quality and continuity of service. As a result of their more complex mission, NAVMETOCCENs have a larger space requirement than NAVMETOCFACs.

The functional areas of both the NAVMETOCCENs and NAVMETOCFACs include: administrative, meteorological and oceanographic operations, communications, computer, technical and professional hi, training, maintenance and storage. Electronic display equipment installed in the Meteorological and Oceanographic Operations space include the Tactical Environmental Support System (TESS (3)), Meteorological Satellite Data Receiver - Recorder (AN/SMQ-11), Next Generation Radar (NEXRAD), Joint Operations Tactical System (JOTS) and the Naval Satellite Display System-Geostationary (NSDS-G). “Centers and Facilities” may also be required to support an equipment maintenance shop. The assignment of a Mobile Environmental Team to a “Center” or “Facility” authorizes up to an additional 386 sq.m. (4,150 SF) of space to accommodate those functions.

Subordinate to Naval Meteorology and Oceanography Centers/Facilities are Naval Meteorology and Oceanography Detachments (NAVMETOC DET) whose space is normally included in the Air Operations Building at Naval Air Activities. See Category Code 141-40 for space requirement.

See Section 7 of MIL-HDBK-1024/1 Aviation Operational and Support Facilities of 15 Feb 94 for design criteria. Typical area requirements for the functions of a Naval Meteorology and Oceanography Center and Facility are listed in Table 137-10. Space requirements noted indicate maximum gross square footage allowances including mechanical equipment. Each activity’s space requirements are determined individually on the basis of assigned functions.

TABLE 137-10
METEOROLOGY AND OCEANOGRAPHY BUILDING
Typical Area Requirements

Functions	Facility		Center	
	sq.m.	SF	sq.m.	SF
Administrative, Including Regional, Conference, Library, Related Furnishings and Equipment	409	4,400	780	8,400
Operations, Including Related METOC Equipment	251	2,700	399	4,300
Electronic/ADP/AIS Systems and Related Support Equipment	102	1,100	344	3,700
Mobile Environmental Team, Including Storage	*279	*3,000	*386	*4,150
Optimum Track Ship Routing	----	----	37	400
Equipment Service, Maintenance and Storage	232	2,500	269	2,900
Exclusion Areas	----	----	139	1,500
Classified Communications (Includes Vault or * *SCIF)	111	1,200	111	1,200
Unclassified Communications	28	300	42	450
Total Gross Area	**1,412 sq.m.**	**15,200 SF**	**2,507 sq.m.**	**27,000 SF**
Rounded Total Gross Area	**1,410 sq.m.**	**15,200 SF**	**2,510 sq.m.**	**27,000 SF**

* Only When Assigned

* *Sensitive Compartmented Information Facility

137 20 LIGHTHOUSE (sq.m./SF)

A lighthouse is a structure that houses a navigation beacon that may emit light, sound, radio, radar, or a combination thereof. It may be onshore or offshore. Criteria are supplied by the U.S. Coast Guard. Construction is done overseas when appropriate by the Naval Facilities Engineering Command. See Communications, Navigational Aids and Airfield Lighting, NAVFAC DM-23.

1137 30 LORAN BUILDING (sq.m./SF)

Loran buildings house facilities which provide long-range navigational aid to ships. Loran facilities are under the cognizance of the U.S. Coast Guard. The Coast Guard provides criteria and design and contracts for construction. The Naval Facilities Engineering Command performs the construction occasionally by the contract at overseas locations. Two types of Loran are current and have criteria existing. These are:

LORAN A--This consists of a single structure known as the Signal Power Building. The building is approximately 30 x 200 feet, or 6,000 square feet

LORAN C--This is housed preferably in three buildings:

(1) Transmitter Building 30 x 60 feet, or 1,800 square feet.
(2) Signal Power Building 30 x 200 feet, or 1,800 square feet.
(3) Barracks and Subsistence Building. Size unspecified.

See Communication, Navigational Aids, and Airfield Lighting. NAVFAC DM-23.

137 32 DECCA BUILDING (SF)

137 33 NAVIGATION AID TEST CENTER (SF)

No criteria are currently available for Code 137 32 and 33.

137 40 SHIP MOVEMENTS OFFICE (SF)

This facility, which is under the cognizance of the officer in charge of port operations, provides the administrative space for the functions associated with the management of a naval port. The staff for this office will also include such members as the dispatcher, dock master and harbor master. Several of the functions performed are: coordinating logistic support and harbor services, coordinating all movement of ships within the port as well as those entering and leaving, assigning ship berthing spaces, and providing pilots, operating tugs, service craft and small boats. The space for the office proper is based on the number of administrative people assigned. (See category code 610-10 for space allowances).

In conjunction with the office space, a control tower with an unobstructed view of the entrance channel and berthing area may be provided. The tower space requirements should not exceed 600 gross square feet.

For support requirements, see corresponding category code 159-64, Waterfront Operations Support building.

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138 SHIP NAVIGATION AND TRAFFIC AIDS-OTHER THAN BUILDINGS

This code group applies to structures which function as sea traffic navigation/traffic aids.

138 10 BEACON - SHIP (EA)

The U.S. Coast Guard has specific jurisdiction over all aids to navigation (day beacons, buoys, foghorns, etc.,) in the continental United States and in all outlying territories and possessions, except that in the Panama Canal Zone, the Panama Canal Authority has jurisdiction. Day beacons are unlighted structures used to mark isolated dangers or channels, edges, or alignment. They are painted white, black, or red, either separately or in combination. Day beacons are reflectorized for night use. See Harbor and Coastal Facilities, NAVFAC DM-26 for technical information, and International Rules of Road and Inland Waterways, U.S. Coast Guard, for regulations.

138 15 METEOROLOGICAL FACILITY (EA)

No criteria are available for this code.

138 20 NAVIGATION AID TARGET (EA)

No criteria are available for this code.

138 25 ANTENNA-NAVIGATION (EA)

This category code is to be used for antennas or antenna systems which are a part of maritime navigational aids. These facilities are planned on an individual basis.

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140 LAND OPERATIONAL FACILITIES

Land operational facilities are building and structures used in support of land operational activities. The category group contains the following basic categories:

Group 141 Operational - Buildings
Group 142 Operational - Helium Plants and Storage
Group 143 Ship & Other Operational - Buildings
Group 148 Ship & Other Operational - Facilities other than Buildings
Group 149 Operational - Facilities other than Buildings

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141 11 AIR PASSENGER TERMINAL (SF)

The air passenger terminal provides facilities for processing authorized passengers and their baggage and for processing incidental freight. Space is provided in the terminal for the following functional areas: administrative space, baggage claim room, check-in counter, minor freight storage, information counter, and waiting lounge with food concessions. (For air cargo terminal, see Code 141 12.) The space to be planned is based on an analysis of the passenger traffic anticipated. A terminal is planned for those air stations where passenger traffic is projected to exceed 30 passengers during a typical peak hour.

Due to the irregular and often unpredictable passenger flow in military air terminals, the facility requirements must be justified in each individual case where a terminal is warranted. Supporting data must include historic passenger flow figures and mode in sufficient detail to permit validation of facility scope.

See P-272 for standard layout and typical components of an air passenger terminal.

141 12 AIR CARGO TERMINAL (SF)

An air cargo terminal is planned for air stations where cargo and freight handling exceeds 10,000 pounds per day. The air cargo terminal is separate from the air passenger terminal (Code 141 11) where only incidental freight is handled. Air cargo terminal functions include receipt of packages, control documentation, palletization, holding for shipment, aircraft loading and unloading, package sorting, and loading on trucks.

Space required for air cargo terminal operations is based on the weight of cargo to be handled as determined by station survey. Terminals are planned using the space allowances in Table 141-12.

TABLE 141-12
Space Allowances - Air Cargo Terminal

Average Daily Load(l) (pounds)	Air Cargo Terminal Type	Gross SF Area
10,000 - 20,000	Small, non-mechanical	7,720
20,000 - 40,000	Small, mechanical	32,500
40,000 - 100,000	Medium, mechanical	44,500
100,000 - 160,000	Large, mechanical	54,500

(1) Average Daily Load includes cargo originating, terminating, and being rehandled through the terminal.

Air cargo terminal facilities must be adjacent to the transient aircraft apron area but siting shall not violate aircraft pavement clearance criteria. Exterior pavement requirements include road access, access to aircraft apron, and non-organizational vehicle parking area (see Category Code 852 10).

141 20 AIRCRAFT FIRE AND RESCUE STATION (SF)

The aircraft fire and rescue station provides fire and emergency rescue protection for pilots and aircraft. When feasible, the aircraft fire and rescue station is combined with the structural fire station (Code 730 10) to form one complete emergency facility, Code 141 25, Combined Structural/ Aircraft Fire/Rescue Station.

The aircraft fire and rescue station provides space for aircraft fire and rescue vehicles, dispatchers tower and alarm room office, dormitories, training room, messing facilities, and maintenance and storage room. See NAVFAC P-272 for stations of standard design, and NAVFAC DM-24 for design criteria. The size of the facility is based on the number of fire and rescue vehicles assigned, which varies with the gross weight of the aircraft supported.

Covered space, either building or shed, is provided for all assigned fire and rescue vehicles and equipment. Generally the building houses the active MB vehicles required to protect the parent station. The shed houses the active foamer and crane, the active vehicles to support the outlying fields, and also the spare vehicles for maintenance and reserve for both parent and outlying fields. See Tables 141-20A and 141-20B for allowance and Figure 141-20 for a sample computation.

TABLE 141-20A
Space Allowance - Aircraft Fire and Rescue
Vehicles in Support of Parent Air Station

Largest A/C at the Parent Station Gross Weight	Area of Structure Sq. Ft.		Facility Class
Pounds	Bldg.	Shed	
up to 90,000	5,502	1,730(l)	A
Over 90,000	6,948	2,160(l)	B

(1) This shed area is adequate for the runway foamer/ water truck and the crane as well as the spares for maintenance and reserve for the parent air station only. Add space for fire and rescue vehicles for outlying fields. See Table 141-20B and sample computation in Figure 141-20.

TABLE 141-20B
Additional Shed Space at Parent Air Station
for Fire and Rescue Vehicles for Outlying Fields

Number of Outlying Fields	Total Shed Space, SF Gross, for Outlying Fields with Aircraft under 10,000#	Total Shed Space, SF Gross, for Outlying Fields with Aircraft 10,000# to 60,000#
1	432	1,296
2	1,296	2,160
3	2,160	2,592
4	2,592	3,456

The space shown for Code 141 20 on the Basic Facilities Requirements List for the parent station is the sum of the building and shed space. See sample computation in Figure 141-20. Pavement is provided adjacent to the station for 25 percent of the vehicles and for one vehicle wash rack. The Fire and Rescue Vehicles Alert Pad is computed separately under Category Code 116 60.

Assume an air station that has one or more cargo aircraft weighing more than 90,000 pounds, and squadrons of carrier aircraft in the weight range of 10,000 to 60,000 pounds. Further, the activities of the carrier aircraft require three outlying fields. The cargo aircraft establish the space allowance for the parent station. From Table 141-20A the structure will have 6,948 square feet of building and 2,160 square feet of shed. From Table 141-20B the three outlying fields require 2,592 square feet. The total building and shed space sum up as follows:

Activity	Building Area Sq. Ft.	Shed Area Sq. Ft.
Parent Station	6,948	2,160
Outlying Fields		2,592
Total	6,948 Sq. Ft.	4,752 Sq. Ft.

The total space to show on the BFRL is 6,948 + 4,752 = 11,700 s.f. gross for the parent air station. No space to house the vehicles is required at any of the outlying fields.

FIGURE 141-20
Sample Computation - Aircraft Fire and Rescue Station

141 25 COMBINED STRUCTURAL/AIRCRAFT FIRE/RESCUE STATION (SF)

A combined structural/aircraft fire/rescue station is planned under certain conditions to serve the function of a structural fire station (Code 730 10) and an aircraft fire and rescue station (Code 141 20). The combined facility is planned for a location that satisfies the response time and distance requirements for both the structural fire and the aircraft fire and rescue stations.

The station must provide adequate support of airfield activities and protection for all buildings and structures. The size of the building is planned to house the aircraft fire and rescue vehicles required plus the structural fire vehicles required. The computations are done as indicated in Codes 141 20, Aircraft Fire and Rescue Station, and 730 10, Fire Station. The sum of the areas required for the structural fire station and the aircraft fire and rescue station is the total building area for the combined station. Combined stations of standard design are shown in NAVFAC P-272.

Protection against structural fires may be provided in part or completely by community resources. The method for development of reciprocal agreements between Navy and a municipality for mutual fire protection may be found in NAVMATINST 11320.10.

141 30 AIRCRAFT LINE OPERATIONS BUILDING (SF)

The aircraft line operations building is a structure used to centralize ground operations of the flight line. The building is utilized in keeping of squadron daily flight books, aircraft status boards, and bulletin boards and as support for line operations personnel by providing shelter, a water cooler, and a chemical toilet. The aircraft line operations building is a standard 12- by 20-foot portable building with a building area of 240 square feet gross.

One line operations building may be planned for each hangar module when the distance between the squadron's parked aircraft and the hangar is greater than 1,000 feet.

NOTE: Criteria for this facility indicates that it is to be portable and therefore carried as collateral equipment, when acquired. Collateral equipment is not Class II real property and cannot be included in the real property inventory. However, this category code is being retained for real property inventory purposes since many of the existing facilities are not portable and accordingly must be reported in the RPI.

141 40 AIRCRAFT OPERATIONS BUILDING (SF)

An aircraft operations building is planned for all Navy air stations, auxiliary air stations, and air facilities. The building houses the administration of flight operational activities with all supporting functions including flight control, communications, and weather services. The operations building adjoins the airfield control tower and the radar

air traffic control center where siting requirements permit. See Table 141-40 for space allowances.

TABLE 141-40
Aircraft Operations Building

Installation	Gross Area Sq. Ft.
Air Station	12,637
Air Facility	9,760

141 41 MARINE AIR TRAFFIC CONTROL UNIT (MATCU) OPERATIONS BUILDING (SF)

The MATCU performs a combined function similar to that accomplished in Category Codes 134 40, Ground Control Approach (GCA) System; 133 25, TACAN Building; and 133 75, Air Surveillance Radar (ASR) Building. Depending on the level of aircraft operations, the MATCU operations building may provide the sole GCA support at an air installation or may supplement and be in addition to permanent ASR, TACAN, and GCA facilities. A MATCU operations building should not be planned without prior coordination with and approval of the Commandant of the Marine Corps (LFF-1).

When authorized, the MATCU operations building shall not exceed 9,130 gross square feet. For a typical layout, see RAVFAC P-272, Part Four.

141 42 AIR INTELLIGENCE SUPPORT CENTER (SF)

This facility is used to store and disseminate classified material for mission planning, pilot training and briefings in support of attack aircraft operations. The design and size of the center will be determined by the type and amount of equipment to be installed and the number of standard attack squadrons assigned to a station. Typical spaces include: administrative, library/chart storage, classroom, special security office, planning rooms, briefing rooms, photo intelligence interpretation room and storage. No specific planning criteria are currently available for this facility.

141 60 PHOTOGRAPHIC BUILDING (SF)

A photographic building is planned to support the photographic mission of an activity. It provides the laboratory complete with equipment and storage that applies to the specific mission.

The size of photographic laboratories will be determined by a study of t-he space required to support the equipment and activity.

Laboratories are established only where authorized by the office of the Chief of Naval Operations. Procedures for obtaining authorization are outlined in OPNAVINST 3150.6. A list of currently authorized photographic laboratories ashore is contained in OPNAVINST 3150.2.

141 65 FLEET RECONNAISSANCE PHOTOGRAPHIC LABORATORY (SF)

A fleet reconnaissance photographic laboratory is planned only where the station supports the mission of photographic reconnaissance squadrons and there is no photographic building (Category Code 141 60) to provide the support. Normally combined support for the station mission and that of the photographic reconnaissance squadrons is provided in a photographic building Class "Special." See OPNAVINST 3150.6. If there is no photographic building (Category Code 141 60) planned for the station and there are two or more photographic reconnaissance squadrons to be supported, a fleet reconnaissance photographic laboratory (Category Code 141 65) may be planned to a gross area of 22,330 SF. See P-272 for an approved building design. The workload, where there is only one squadron to be supported, is to be accommodated in other facilities as determined by the Chief of Naval Operations.

141 70 CONTROL TOWER (SF)

A control tower provides space for equipment and personnel to control aircraft traffic. It is an elevated structure having an 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. This category code is used for the control tower in all cases even though the tower may be an independent structure or combined with a RATCC or an aircraft operations building. If at all possible, the control tower should be an integral unit with the RATCC (Category Code 133 721, thus providing a complete, integrated air traffic control facility. A control tower is planned for each install&ion where aircraft are based. It is not planned for outlying fields and auxiliary landing fields unless specifically authorized by competent authority. The minimum installation is the basic tower containing an entrance level, intermediate levels, and the control tower cab. The area of floor space for a control tower of standard design with six floors plus the control room is 2,956 square feet gross. Towers of increased height can be provided by adding incremental levels. See NAVPAC P-272 for definitive design of control towers, operations building with control tower, and RATCC with control tower. See NAVFAC DM-24 for specific control tower design criteria.

141 81 GROUND CONTROL APPROACH CREW FACILITY (SF)

The ground control approach (GCA) crew facility provides a ready room for on duty personnel assigned to the GCA van. The facility consists of two (2) standard design skid-mounted shelters (each 12 feet by 20 feet). The crew facility is authorized whenever the mobile GCA unit is furnished.

NOTE: Criteria for this facility indicates that it is to be portable and therefore carried as collateral equipment, when acquired. Collateral equipment is not Class II real property and cannot be included in the real property inventory. However, this category code is being retained for real property inventory purposes since many of the existing facilities are not portable and accordingly must be reported in the RPI.

141 82 FULL PRESSURE SUIT FACILITY (SF)

Pressure suit maintenance is normally performed in the Parachute and Survival Equipment Shop (category code 211 34). Special justification is required to provide a separate facility for this purpose.

141 87 LIQUID OXYGEN/NITROGEN FACILITY (SF)

A liquid oxygen/nitrogen facility is required at each Navy and Marine Corps air station where 50 or more attack and fighter-type aircraft ate assigned. Smaller numbers of aircraft are provided with these gases by bottled gas from commercial suppliers. The facility provides for storage, vaporization, and transfer of nonindustrial oxygen and nitrogen and for test and repair of cryogenic equipment associated with aviator and aircraft support. Liquid and gaseous forms of both oxygen and nitrogen, as well as hot nitrogen gas for purging equipment, are handled. The facility includes liquid storage tanks, vaporizing units, transfer areas, cart and tank filling and storage areas, repair shops, and office space. Port land cement concrete driveways, loading ramps, and cart parking areas are required. A building with a gross area of 2,704 SF is adequate for all needs. NAVFAC P-272 shows a typical storage, transfer, and vaporizing facility of this size. The facility has a storage capacity of 4,000 gallons each of bulk liquid oxygen and nitrogen and 150 cylinders of each gas. The size of the transfer areas may be reduced if a station survey indicates a lesser requirement for cylinder storage.

For design criteria, see NAVFAC DM-24.

MARINE CORPS CRYOGENICS FACILITY. A Marine Corps cryogenics facility provides for operational support of a Marine Aircraft Group and accommodates in garrison the expeditionary liquid oxygen/nitrogen generating equipment assigned. A Marine Corps cryogenics facility does not supplant the liquid oxygen/nitrogen facility at a Marine Corps air station. Generally, two generators are assigned to each Group. The exceedingly high noise level of the turbine-powered expeditionary liquid oxygen/nitrogen generator necessitates locating the facility in a remote area. The facility consists of a generator area, a cylinder fill area, cylinder and cart storage shelter, and main building. The generator area has a concrete pad, an underground fuel tank, exterior lighting, electric power, water, and an out

building with a gross area of 246 square feet. Five hundred and ten square yards of concrete and 5,000 gallons of fuel storage are provided for a sing1 e generator; NAVFAC P-272 illustrates a layout providing 900 square yards of concrete and 10,000 gallons of fuel storage for two generators. One thousand feet from the nearest generator is a shelter of 1,258 square feet gross area where gas cylinders are filled and converters and liquid oxygen and liquid nitrogen carts and cylinders are stored.

The main building of the Marine Corps cryogenics facility has a gross area of 3,570 square feet and is located no closer than 100 feet from the shelter. The main building contains offices, toilets, classroom, maintenance shop, and repair parts storage. Because of the training mission conducted at this facility, normally only one generator is in production at a time. Hence, the storage shelter and the main building usually may be shared by all Groups utilizing this facility. The size of either the storage shelter or the main building may be modified if a survey indicates a different requirement.

For design criteria, see NAVFAC DM-24, and NAVFAC P-272.

141 88 HARDENED AIRCRAFT SHELTER (SF)

NO criteria is available for this code.

142 OPERATIONAL - HELIUM PLANTS

This basic category comprises facilities for the receipt, storage, processing and reprocessing, and dispensing of helium gas, including tanks, pipes, valves, valve chambers, and similar appurtenant equipment and facilities.

142 10 HELIUM PROCESSING PLANT BUILDING (SF)

See NAVFAC DM-24 for design data.

142 19 HELIUM STORAGE BUILDING (SF)

No criteria are currently available for this code.

142 20 HELIUM STORAGE FACILITY (EA)

See NAVFAC DM-24 for design data.

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143 SHIP AND OTHER OPERATIONAL-BUILDINGS

143 10 EMERGENCY VEHICLE GARAGE (SF)

This is a shelter for official emergency and alert vehicles on call, such as ambulances and the like. It is planned where required and specifically justified to keep the vehicles available for immediate response. Shelter for structural and aircraft fire and rescue vehicles are provided for under Codes 141 20, 141 25 and 730 10. The shelter protects the alert vehicle from extremes of weather to improve operational availability. It provides only shelter for the vehicle. Vehicle service, personnel accommodations, and the like are provided elsewhere.

Ambulance Shelters. Ambulance shelters in the form of a garage or carport are authorized as part of a military hospital complex. The following criteria apply at Navy/Marine Corps installations:

A garage may be provided where the heating design temperature on 97-1/2 percent basis is less than 11°F dry bulb.

A carport may be provided where the air conditioning design temperature on the 10 percent basis exceeds 87°F dry bulb.

All design temperatures shall be obtained from NAVFAC P-89.

Both the garage and carport will be limited to 700 net square feet (will accommodate two ambulances). Should more than a two ambulance shelter be required, special justification will be submitted with preliminary study for approval by DOD.

The garage will normally be detached from the hospital proper.

Official Emergency and Alert Vehicles (Except Ambulances). For planning purposes provide:

430 square feet gross for a single vehicle garage.

660 square feet for a two-vehicle garage.

The size of the garage is determined by the vehicle area plus nominal clearances surrounding the vehicle.

143 11 OPERATIONAL VEHICLE GARAGE (SF)

An operational vehicle garage is used for the storage of vehicles which are not utilized on a daily basis and which are exposed to adverse weather conditions that would have a detrimental effect upon them if stored out in the open. Accordingly, the type of vehicle stored, frequency of use and climatic conditions, will determine whether this type of facility is warranted. Written authorization must be obtained from the Naval Facilities Engineering Command Headquarters, Code 1202, Transportation Division, Equipment Operations and Maintenance Branch, prior to programming a requirement for this facility. Sufficient data must be submitted with the request that would provide adequate information to determine whether the construction of this type of facility is justified at the activity requested.

Examples that would warrant this type of facility are: the requirement to protect earthmoving equipment at those activities located in the Pacific which are exposed to salt air, or snow removal equipment located in the northern area of CONUS, which are used only during a small portion of the year.

The total gross area for this facility can be determined when the number and type of each vehicle is known. This can be calculated by adding four feet to the length and width of each vehicle, multiplying these dimensions to determine the area required for each vehicle, and adding these areas to arrive at the total area required for the storage of all vehicles. If an existing facility is converted to this use, an increase of fifteen percent may be added to the total area in order to compensate for incompatible column spacing, wall, etc.

In those instances when the dimensions of vehicles are not available, or are subject to drastic change, Table 143-11 may be used as broad planning guidance for use in determining the gross square footage requirement for this facility, which is based upon the number and types of vehicles to be stored.

In all situations, a "JAM", i.e., first in, last out, type of storage is to be provided since one of the requirements for this type of facility is that the vehicles are stored only during those periods when they are inactive for a long period of time or portion of the year. The following are examples of the types of vehicles stored: (a) Construction Equipment such as road graders, bulldozers, paving equipment, dump trucks, (CESE Allied Equipment) etc., and (b) Special Purpose Vehicles such as snow plows, portable generators, etc.

TABLE 143-11
Storage Space Allowances (SF) Per Vehicle

Type of Equipment	Total SF Allowance Per Vehicle
Special Purpose Vehicles	350
Construction Equipment	410

143 15 RANGE OPERATIONS CENTER (SF)

A range operations center is the control point for testing torpedoes, calibrating ships' firing systems, and training pilots and testing aircraft on gunnery and bombing ranges. The center will vary with the equipment and control areas required. Standard planning factors for a center are not available. Its size must be planned to support the equipment and control areas to be housed.

143 17 SPACE SURVEILLANCE FACILITY (SF)

Currently, criteria is not available.

143 20 ORDNANCE OPERATIONS BUILDING (SF)

An ordnance operations building is authorized where there is a need to control an ordnance operation. Ordnance operations are those involving ammunition storage, handling or disposal.

AMMUNITION STORAGE OR HANDLING ACTIVITY BUILDING. In an ammunition storage or handling activity, such as an ammunition depot, the authorized building space is 150 gross SF per person for administrative personnel and 50 gross SF per person for operating personnel (ammunition handlers, etc.). This-provides space for an office, assembly and briefing room for ammunition handlers, locker room, and storage space for ammunition handling tools and equipment.

EXPLOSIVE ORDNANCE DISPOSAL TEAM FACILITIES. There are three basic types of EOD facilities. One type is operated by the Marine Corps and the other two types are operated by the Navy and are classified as "Single Detachment" and "Expanded Detachment". In addition to the EOD Team building proper, there are three supporting facilities which are located in a separate bermed area and are required to be sited in accordance with the explosive safety criteria as published in NAVSEA, OP 5, Volume 1, Fourth Revision, "Ammunition and Explosives Ashore". One facility is a 12 ft. x 17 ft. workshop/storage building which will also house petroleum products, corrosives, and paints. This building should be located as close to the EOD team building as safety standards permit. The two other facilities are a 6 ft. x 6 ft. ready service magazines and are classified under category code 421-35, "Ready Magazines". A description and size of each type of EOD facility is as follows:

Marine Corps EOD Team Facility: This facility provides support for EOD operations on Marine Corps bases and air stations. One team is generally assigned to each base or air station and one team is assigned to each Marine Air Group. The EOD team facility building includes administrative area, security area for document storage, workshop and maintenance area, equipment storage area, personnel and classroom spaces. Accordingly, the space requirements for a Marine Corps EOD Team facility are:

EOD Team Building = 3,600 gross square feet.
EOD Workshop/Storage Building = 204 gross square feet.
EOD Ready Service Magazine (2 required) = 2 (6 ft. x 6 ft.) = 72 gross SF.

Navy EOD Team Facility: The two types of Navy EOD Team facilities are classified as "Single Detachment", which has five to six personnel, and the "Expanded Detachment", which has ten or more personnel. Both types of detachments provide support for EOD operations on naval bases, air stations, weapons stations, naval magazines, submarine bases and RDT&E activities. The EOD detachment facilities include administrative spaces, classified publication strongroom, workshop/maintenance, classrooms, equipment storage, personal locker area, a diving locker with associated support gear (i.e., air compressors, gas transfer pump, changing/storage racks, fresh water washdown area with deep sink, a drying area, and a climate controlled equipment storage area for specific equipment storage.

In addition to this, the Single Detachment facility will house two emergency response vehicles, one twenty four ft. workboat (trailer mounted and two eight ft. by ten ft. response trailers. The Expanded Detachment facility will house four vehicles, two workboats and four trailers.

Selected detachments may also be assigned a specific MCM mission and therefore require an additional 500 gross square feet for the storage of special equipment not normally assigned to a Navy EOD detachment.

Selected Navy detachments that are designated as parachute insertion capable and as such require a parachute loft for drying, packing, storage and maintenance equipment. An additional 1,500 gross square feet should be provided to perform this function. The area dedicated to this function should be assigned category code 211-75, Parachute Survival Equipment Shop.

Therefore, the space requirements for the Navy EOD Team facilities are as follows:

Navy Single Detachment EOD Team Facility:

EOD Team Building = 4,750 gross SF. (Add 140 GSF for mezzanine storage).
EOD Workshop/Storage Building = 204 gross SF.
EOD Magazines (2 required) = 2 (6 ft. x 6 ft.) = 72 gross SF. (Use category code 421-35).

Navy Expanded Detachment EOD Team Facility:

EOD Team Building = 8,370 gross SF. (Add 640 GSF for mezzanine storage).
EOD Workshop/Storage Building = 204 gross SF.
EOD Magazine (2 required) = 2 (6 ft. x 6 ft.) = 72 gross SF. (Use category code 421-35).

The following facilities are to be provided for only at selected activities:

EOD MCM Equipment Storage = 500 gross square feet (Use category code 143-20).

EOD Parachute Survival Equipment Shop = 1,500 gross square feet. (Use category code 211-75).

See NAVFAC P-272, Definitive Designs for Marine Corps Facilities for a plan of the Marine Corps EOD facility. Note: The original category code for this facility was 141-55.

143 25 UNDERWATER DEMOLITION TEAM BUILDING (SF)

No criteria are currently available for this code.

143 30 FLEET MOTION PICTURE EXCHANGE (SF)

Navy Motion Picture Exchanges (NMPXS) are established or disestablished as directed by Commander, Naval Military Command, Washington, DC and receive technical direction from the Navy Motion Picture Service (NMPS) Brooklyn, New York. NMPXS are the primary distribution points for motion pictures for fleet use and are supplementary distribution points for CONUS and overseas shore commands. Locations of NMPXS are listed in the current NMPS manual spaces allocated for NMPS operations should be adequate for administrative functions, film inspection and repair, film issue and receipt desks, film library storage, and screening of films. The classification and space requirements for NMPXS are determined by the average quantity of issues per month. Table 143-30 indicates area requirements for various classes of NMPXS.

TABLE 143-30
Navy Motion Picture Exchange

CLASS	AVERAGE MAX ISSUES/MO	SQUARE FEET
A1	500	600
A2	800	800
A3	1100	1000
A4	1400	1200
B1	1700	1400
B2	2000	1600
B3	2400	1800
B4	2800	2000
C1	3200	2200
C2	3600	2400
C3	4000	2600
C4	4500	2800
BT		

143 35 REGISTERED PUBLICATIONS ISSUING OFFICE (SF)

A Registered Publications Issuing Office (RPIO) has a primary mission of supporting communications operations of the fleet, naval aviation, U.S. Marine Corps, and U.S. Coast Guard. RPIO’s receive, store, issue, account for, and-officiate during the destruction of highly classified crypto publications, equipment, and devices circulating in the Registered Publications System (RPS). An RPIO has three major space areas: Storage, Receive/Issue, and Administration. The storage area of the RPIO must be constructed to meet the criteria of a Class A vault as defined in KAG-1D. The size of an RPIO can generally be related to the number of RPS items handled yearly. RPS items are such things as publications, magnetic tapes, films, crypto equipment, spare parts, cards, and other key material. A definitive drawing of a registered publications issuing office is shown in NAVFAC P-272, Drawing No. 895064, listed under the previous code number 610 90-A. See Table 143-35 for planning factors.

TABLE 143-35
Space Allowances - Registered Publications Issuing Office

RPS Items Handled Per Year (Thousands)	Gross Area (SF) (Admin, Receive/Issue, Vault)
100 - 500	7,500
501 - 750	12,500
751 - 1,250	14,000
1,251 - 2,500	16,000

143 40 COMPUTER PROGRAMMING OPERATIONS CENTER (SF)
143 41 AMPHIBIOUS OPERATIONS BUILDING (SF)

No criteria are currently available for these code.

143 45 ARMORY (SF)

A Navy installation armory provides space for storage and routing maintenance of small arms and emergency gear. The materials stored will provide for emergencies and for training of selected personnel in the handling of station emergencies, civil disorders, and area disasters. See Table 143-45A for space allowance. See NAVFAC P-272.

TABLE 143-45A
Armory

Installation Military Strength	Building Gross Area
up to 2,000	576
2,001 - 4,000	880
4,001 - 7,500	1,200
7,501 - 10,000	1,508
Over 10,000 - add 0.1 sq ft per person	

Fleet Marine Force Armory (SF)

An armory for Fleet Marine Force air and ground units provides a humidity controlled, air conditioned, and secure space for storing and maintaining weapons assigned to personnel (individual or crew-served) while in garrison. Maximum emphasis should be directed toward consolidation of unit armories, provided such action is compatible with mission requirements, responsiveness and accessibility.

Unit armory requirements are determined by multiplying the quantity of each Table of Authorized Material (TAM) item by the square foot per item. The result is the net requirement. See Table 143-45B for square foot per item space requirement.

Table 143-45B
FLEET MARINE FORCE ARMORY

TAM ITEM	SF PER	TAM ITEM	SF PER	TAM ITEM	SF PER
E 0111	0.11	E 1090	0.42	E 1250	0.50
E 0113	43.00	E 1120	3.00	E 1440	0.75
E 0143	4.03	E 1126	4.00	E 1441	0.75
E 0180	1.00	E 1151	1.50	E 1460	4.30
E 0915	0.18	E 1153	0.50	E 1760	0.75
E 0960	7.77	E 1155	2.50	E 1780	0.25
E 0980	0.02	E 1157	6.50	E 1900	1.00
E 0990	1.25	E 1158	2.50	E 1983	1.25
E 6021	.50	E 1159	2.50	E 2525	0.50
E 0994	5.50	E 1165	0.05	E 3175	0.05
E 0995	1.25	E 1180	0.50	E 3250	0.21
E 1045	0.38	E 1460	4.30	9155/TSQ	11.00
E 1065	0.25	E 1240	0.50		
AN/TAS-4A	11.00	AN/TSM-152	12.00		

Additionally:

a. A covered cleaning area may be provided at 1.0 gross square foot/individual assigned.

b. 150 square feet per armorer assigned to the armory will be added to the net square footage requirement.

c. A gross to net square footage ratio of 1.2 is considered adequate.

143 46 MARINE BARRACKS - GENERAL PURPOSE BUILDING (SF)

The criteria contained herein is applicable to CNO commanded Marine Barracks. The purpose of the Marine Barracks is to provide such security as approved by the Chief of Naval Operations, in coordination with the Commandant of the Marine Corps, and to perform such additional functions as directed by CMC.

The criteria for Marine Barracks covers general purpose functions only (for example, administration/operational, general instruction, armory and supply). Requirements for specific functions such as shop space, specialized storage, etc., should be developed from criteria of the category code for the specific function. This criteria does not include BEQ or community support facility requirements. Planning factor criteria for BEQ and community support facilities necessary to support the Marine Barracks personnel are contained in the 700 category group. However, under normal conditions, the host activity would be expected to provide all community type support.

The following shall be utilized for broad planning purposes when there is an absence of a detailed analysis of functional requirements and a close approximation is considered adequate:

TABLE 143-46

Military Strength	Gross SF/MN
1-50	75
51-100	65
101-150	55
151-200	45
201 - For every man over 200, add 30 gross square feet per man	

Provisions for parking (852-10), and small arms pyrotechnic magazine (421-48) should be provided for by applying the criteria for each appropriate category code.

143 47 ALERT FORCE BUILDING (SF)

An Alert Force Building is programmed in conjunction with an Air/Underwater Weapons Shop, Category Code 216 55, when required to meet the Alert Force response times established for the shop. The Alert Force Building provides barracks facilities, including limited messing facilities necessary to accommodate the guard of the day for an AUW Shop. It also contains a duty office, provision for weapons storage and an alarm repeater panel.

When an Alert Force Building is authorized, the standard Alert Force Building of 1,910 square feet as shown in NAVFAC P-272 is programmed.

143 55 TRANSIT SHED (SF)

A transit shed is planned to support the rapid and orderly transfer of truck and rail freight in shipment from one carrier to another with minimum storage. For a waterfront transit shed, see Category Code 156-10. The transit shed is of the minimum design that will protect the freight from the weather and provide any security necessary. It may be a roofed shed with open sides or completely enclosed space built to the minimum specifications to provide the required protection. Plan at the rate of 250 square feet gross per short ton of throughput per day for a peak day.

143 60 EXPLOSIVES, SHIPPING/TRANSFER DEPOT (SF)

An explosives transfer depot is a facility provided as a holding area for ammunition and explosives in transit. The transfer depot may be in close proximity to a loading platform, a flight line, or a truck or rail center. The combined weight of explosives and ammunition in a transfer depot at any one time shall not exceed that prescribed by the intraplant quantity-distance tables for safety distances. This facility is required only at installations which expend or transship the ordnance materials in large quantities. No planning factors are available. This code is not to be used for containerized ordnance; for containerized ordnance, use Category Code 148 40 Container Transfer Facility (Ordnance).

143 65 OPCON CENTER FOR FLEET OPERATIONS (SF)

An operational control center is a facility in which combat intelligence is gathered and assessed; and by which assigned tactical forces are controlled. An OPCON center will be authorized only at stations designated by CNO. The design and size will be determined by the type and amount of equipment to be installed.

143 70 RADIATION INSTRUMENT CALIBRATION FACILITY (SF)

A health physics calibration building contains facilities required for calibration of health physics survey instruments and area monitoring devices. These devices are used to protect personnel against ionizing radiation from x-rays, atomic particles, and the like. The size of the building will depend upon the type and number of instruments being calibrated.

143 75 POL OPERATIONS/SAMPLING/TESTING BUILDING (SF)

The POL Operations Building provides space required for quality control and administration of a fuel activity. Space is provided in the building for an administrative office and for a fuels testing laboratory. Physical operation and control of the fuel system will be accomplished elsewhere: for example, in a pump house. A POL Operations Building may be planned for an area of 1,600 square feet gross.

143 77 OPERATIONAL STORAGE (MISC.) (SF)

Storage facilities for miscellaneous equipment related to operational facilities will be provided only where it can be individually justified, There are no criteria for this type of facility. General information on normal stacking heights, SF per measurement ton requirements, and other parameters are provided in Category Code 440 series.

143 78 OPERATIONAL HAZARDOUS/FLAMMABLE STORAGE (SF)

143 80 NAVAL SECURITY GROUP REGIONAL REPORTING CENTER

This facility is an analysis and reporting center for the Naval Security Group. The size of a typical facility is 18,000 gross square feet and supports administration, operations, and ADP functions.

The facilities associated with this operation consist of the Reporting Center Operations Building itself, a 2,000 gross square foot standby diesel generator building, with an associated 30 day fuel storage tank and three radomes. The operational facility is enclosed within one large closed loop security fence. Other security measures, such as lighting, dosed circuit TV cameras etc., are necessary. For a detailed description of security requirements, see DIA Manual 50-3, Physical Security Standards for Sensitive Compartmented Information Facilities.

148 SHIP AND OTHER OPERATIONAL FACILITIES-OTHER THAN BUILDINGS

This category group contains facilities and structures which support tactical or organizational ship and other land operations in which do not fall readily into another category. For facilities supporting aircraft operations, use category group 149.

148 10 NUCLEAR PROPULSION SUPPORT FACILITY (EA)

Planning and programming for this facility requires concurrence and planning guidance by NAVSEA Code 08 (Nuclear Power Directorate).

148 15 NUCLEAR WEAPONS HANDLING FACILITY (EA)

No planning factors are available. Each facility requires individual justification.

148 17 SPACE SURVEILLANCE ANTENNA (EA)

Currently, criteria is not available.

148 20 ORDNANCE DISPOSAL AREA (EA)

This category code is for real property inventory purposes; see Category Code 143 20 for a description of a bermed demolition area.

148 25 EXPLOSIVE TRUCK HOLDING YARD (EA)

This is a barricaded area for the temporary holding of trucks and trailers loaded with explosives. Each facility requires individual justification. This code is not to be used for containerized ordnance; for containerized ordnance, use Category Code 148 35, Container Holding Yard.

148 30 EXPLOSIVES RAILROAD CAR HOLDING YARD (EA)

This is a barricaded area for the temporary holding of railcars loaded with explosives. Each facility requires individual justification. This code is not to be used for containerized ordnance; for containerized ordnance, use Category Code 184 35, Container Holding Yard.

148 35 CONTAINER HOLDING YARD (EA)

This is an open area which provides a temporary holding area for containers loaded with explosive ordnance. Containers with explosive ordnance class (12)1.2, (18)1.2, and 1.1 require barricaded areas in accordance with appropriate tables in NAVORD OP-5, Volume 1, Chapter 5. Loaded containers can be stacked two high or singly on chassis or flat bed trailers. The size and capacity of the yards holding class (12)1.2, (18)1.2, and 1.1 ordnance is indicated in Table 148 35. For inert and class 1.4, 1.3(4)1.2, and (8)1.2 ordnance there is no limit on the size of the yard.

Present loading of ammunition in a container is limited to 12,800 pounds of net explosive content (NEC). This is determined by regulations which allow an 8 by 8 by 20 foot container to be loaded only to 80 percent of maximum gross weight: .80 x 40,000 lbs. = 32,000 lbs. Maximum explosive content of a container is 40 percent: .40 x 32,000 lbs. = 12,000 lbs. NEC. The cubic carrying capacity of an 8 by 8 by 20 foot container with ammunition will usually weigh out before it cubes out. Minimum holding capacity of all holding yards should approximate one shipload of containers or the equivalent of 24 hours of sustained outloading for the particular terminal operation. (se Figure 148 35 for a typical class 1.1 holding yard.) Size of other holding yards can be extrapolated from this basic yard.

TABLE 148-35
Yards Holding Class (121)1.2, (18)1.2 and 1.1 Ordnance

Ordnance Class 1.1		Ordnance Class (12)1.2 and (18)1.2	
Max. No. Containers	Size of Yard	Max. No. Containers	Size of Yard
40	1,716 SY	80	2,682 SY

148 40 CONTAINER TRANSFER FACILITY (ORDNANCE) (EA)

A container transfer facility is used to transfer containers between rail flatcars and truck flatbeds or chassis, in a barricaded paved hardstand area, by means of a bridge crane. The size of the facility should be capable of handling a sustained maximum outloading for the number of container piers served in a 24 hour period. The maximum physical capacity of a transfer area is 10 rail cars and 20 trucks for a total of 250,000 pounds high explosives (or the maximum amount allowable by site restrictions but not to exceed the limit of 500,000 pounds high explosives). The standard transfer yard has a capability of 30 transfers per hour with one bridge crane. The mix of arrivals and departures of containers on rail or truck requiring transfer determines the number of bridge cranes necessary to sustain the maximum outloading. The area of paved hardstand and parking in this container transfer facility is 4,812 SY. The control and service building of 204 SF provides office space, toilet facilities, etc. for employees. The barricades are 35,546 CY. (See Figure 148-40).

148 45 RAIL/TRUCK RECEIVING STATION (ORDNANCE) (EA)

A rail/truck receiving station weighs and inspects all incoming shipments of containerized ammunition arriving by rail or truck and also a percentage of the outgoing shipments. Also, this station can be used as a short term storage facility limited to overnight and weekend periods and as an

interchange storage facility limited to overnight and weekend periods and as an interchange yard between common carrier and station. The capacity of the receiving, inspecting, and weighing facility is based on expected maximum truck and rail arrivals and departures during a sustained out-loading. The facility can process 20 rail cars per hour and 20 trucks per hour and provide for a 40-truck parking area and 100 rail car siding. It contains two rail inspection pits and two truck inspection pits, scales, lighting, and 2,432 SF of administrative space. (See Figure 148-45.)

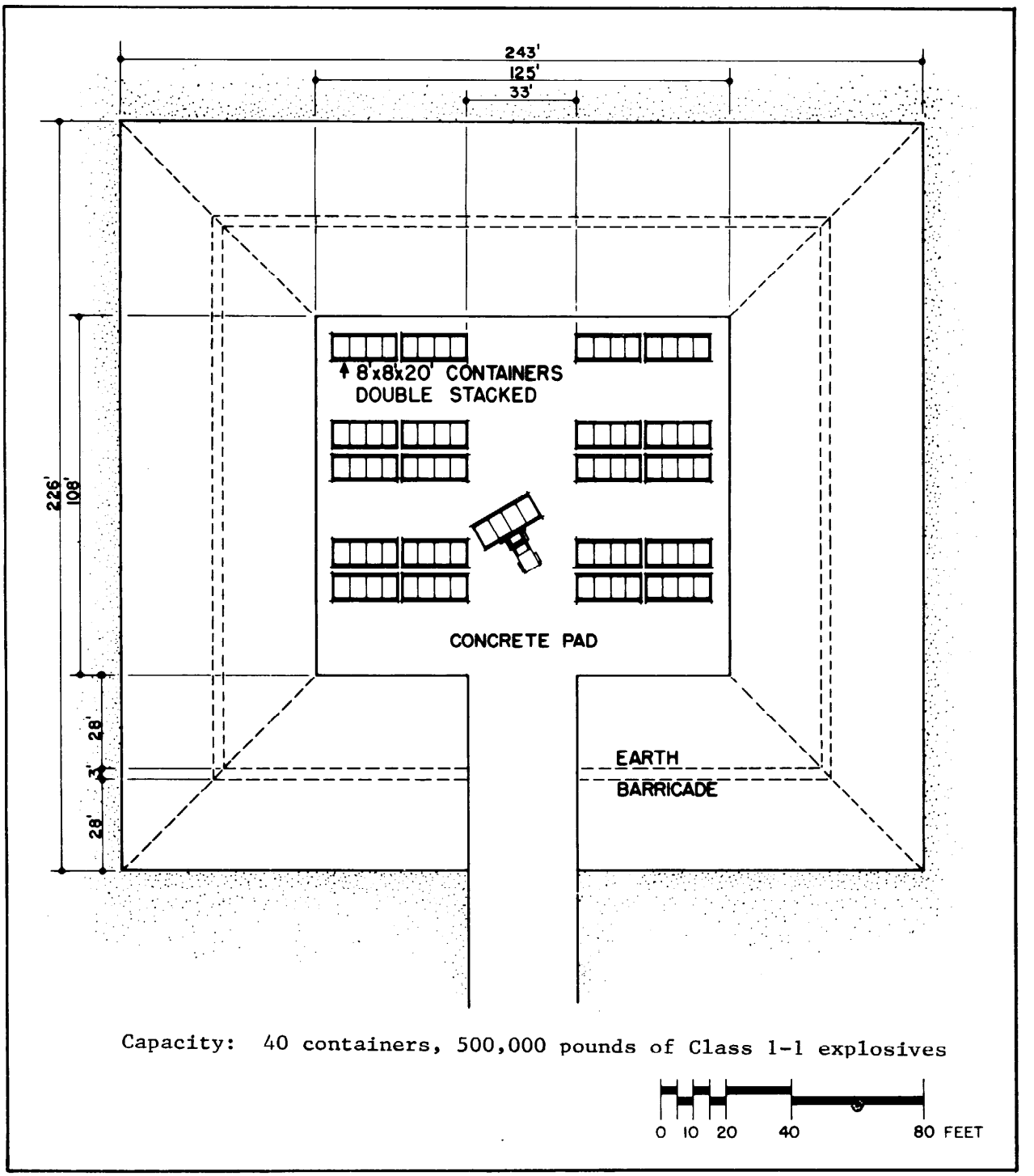

FIGURE 148 35
Container Holding Yard (Loaded)

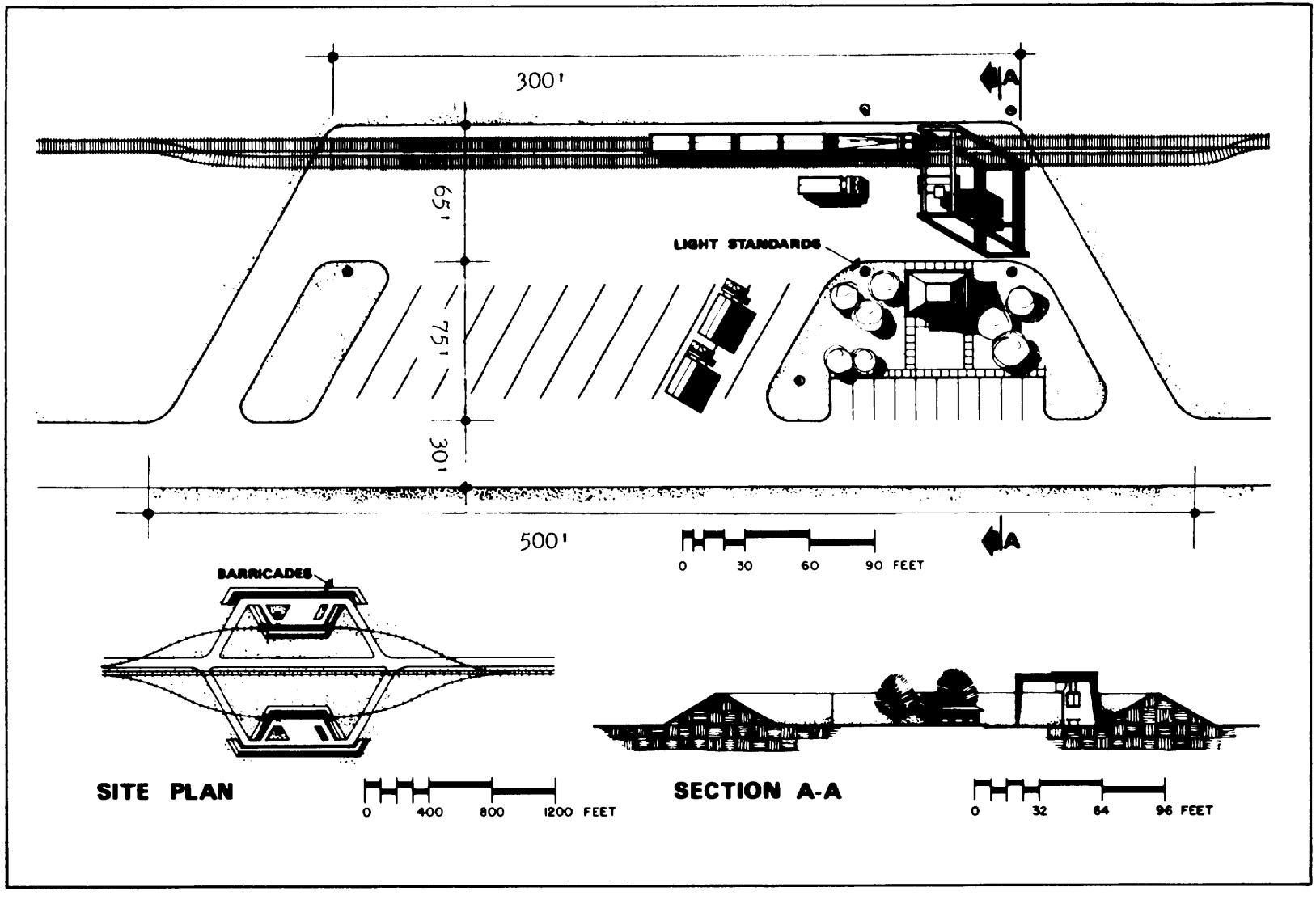

FIGURE 148 40
Container Transfer Facility (Ordnance)

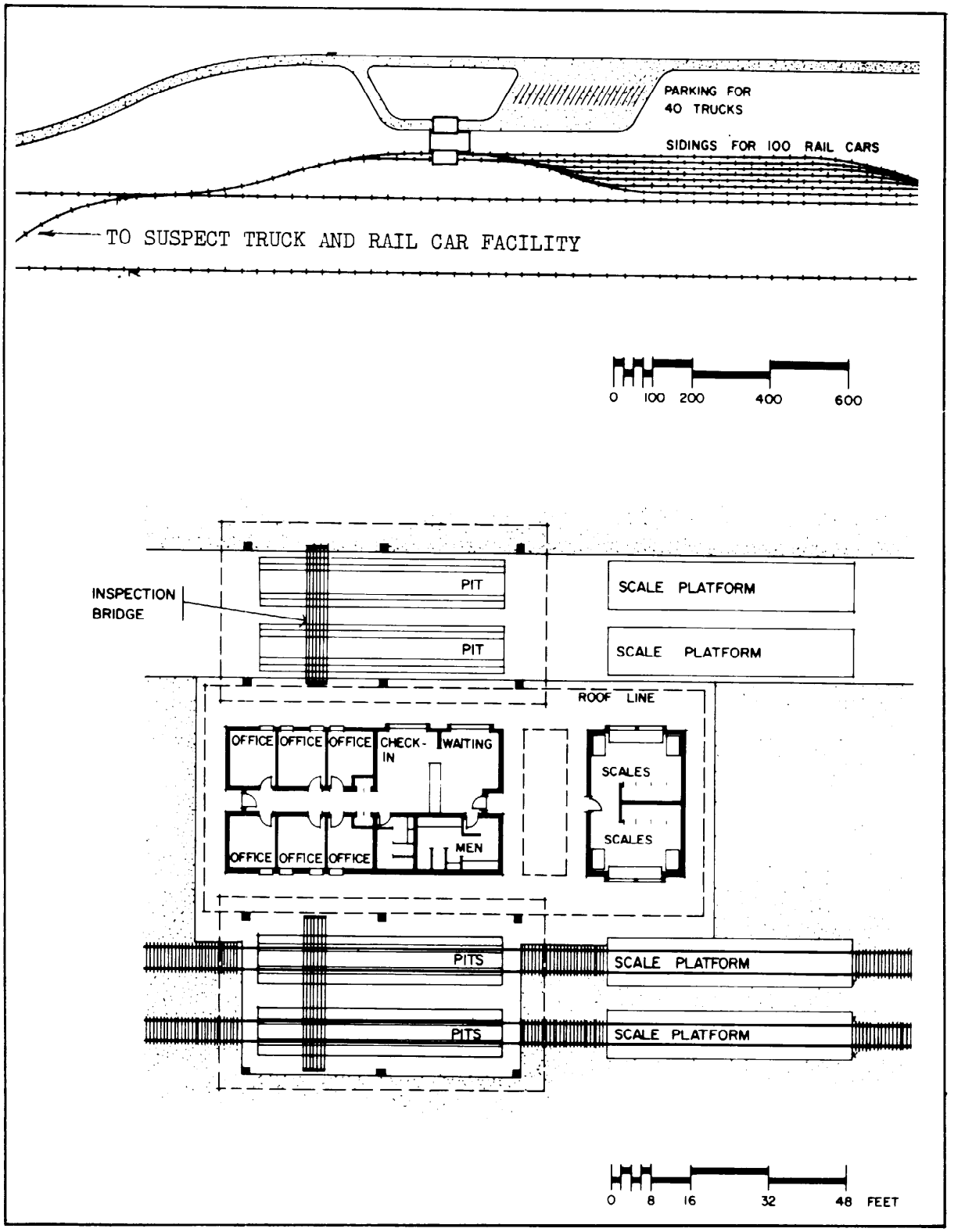

FIGURE 148 45
Rail/Truck Receiving Station (Ordnance)

149 OPERATIONAL FACILITIES-OTHER THAN BUILDINGS

This category group contains facilities such as towers and structures which support tactical or organizational aircraft related operations and which do not fall readily into another category. It includes protective construction.

149 10 AIRCRAFT REVETMENT (EA)

Aircraft revetments are constructed only for emergencies or in combat zones for the protection of aircraft against fire, blast, or enemy action. For planning purposes, the unit of measure is Each; that is, the number of protected aircraft sites.

149 15 FIXED AIRCRAFT START SYSTEM (EA)

This is a fixed system consisting of aircraft service points providing electrical power and compressed air or other gas for starting aircraft on aircraft parking aprons. Each facility requires individual justification.

149 20 AIRCRAFT CATAPULT (EA)

This is a facility to be planned for air installations where training or research is performed on catapult takeoffs. Individual justification is required. See NAVFAC DM-24 for design data.

149 30 AIRCRAFT ARRESTING GEAR (EA)

Aircraft arresting gear is designed to bring an aircraft to a stop in case of an aborted takeoff or an emergency landing.

The Model E-28 rotary hydraulic arresting gear is the current standard high-performance arresting gear and will accommodate a maximum aircraft weight of 78,000 pounds and a maximum aircraft engaging speed of 160 knots. Aircraft engaging the Model E-28 arresting gear are stopped within a runout distance of approximately 1,000 feet. Engagement can be made from either runway direction and at points up to 40 feet on either side of the runway centerline. The high performance (Model E-28) type of arresting gear is planned for both primary and secondary (crosswind) runways. Normally, two sets of arresting gear are required for each operative runway; one at each end between 900 feet and 1,500 feet inboard from the runway threshold. Midpoint arresting gear may be included on the station BFR when justified by runway or operational conditions and when approved through appropriate channels.

Chain-type arresting gear may be planned for airfields where arrestments are minimal and would not justify the operating cost of high-performance arresting gear.

See NAVFAC DM-24 for design criteria.

149 45 MISSILE LAUNCH FACILITY (EA)

This category code is provided for inventory purposes only.

149 50 BLAST DEFLECTOR FENCE (EA)

Blast deflector fences are structures that direct the exhaust from jet engines upward. They are used in congested areas and parking and maintenance areas to protect personnel, equipment, structures, aircraft, and other vehicles from the blast effect of jet engine exhaust. Blast fences are also used to prevent erosion of paved and unpaved areas and to provide protection from flying debris. Their siting and length must be based on the study of individual station requirements. Blast deflector fences may be purchased or constructed in sections to permit moving them from one position to another as protection requirements change. Careful selection of location is necessary to prevent creating an obstacle to taxiing aircraft.

For design criteria, see NAVFAC DM-24.

149 85 EXPEDITIONARY AIR CONTROL SITE - MATCU, MACS AND MASS (EA)

These are Marine Corps facilities required to accommodate, in-garrison, the equipment used for expeditionary aircraft command and control. These facilities are assigned to specialized Marine Corps squadrons, and the expeditionary equipment used in conjunction with these facilities is normally squadron property. The Marine Air Control Squadron (MACS) and the Marine Air Support Squadron (MASS) are squadrons in the Marine Aircraft Wing and are directly responsible for air defense and air control. The Marine Air Traffic Control Unit (MATCU) is responsible for terminal air traffic control. For design criteria for MACS, MASS and MATCU facilities, see NAVFAC DM-24; for typical layouts, see NAVFAC P-272.

A Marine Air Control Squadron (MACS) exercises control over aircraft within a designated operational area while expeditionary and also in-garrison. In-garrison requirements for a MACS consist of special site preparation, access roads, pads, and utilities to accommodate expeditionary equipment. A minimum of one MACS facility is provided per Marine Corps air station or auxiliary air station. The pad requirement is approximately 3,446 square yards, depending upon siting and type of equipment. Electric power requirements are 150 kilowatts at 400 Hertz, approximately. The MACS site development does not eliminate the requirement for permanent air surveillance radar (Category Code 133 75) at the installation.

A Marine Air Support Squadron (MASS) provides control of aircraft conducting offensive operations in support of a Marine Division in an expeditionary configuration. In-garrison requirements for a MASS consist of special site preparation, access roads, pads, and utilities to accommodate expeditionary equipment. A minimum of one MASS facility is required per Marine Corps air station or auxiliary air station. The pad requirement is approximately 292 square yards, depending upon the siting of equipment assigned to the squadron. Electric power requirements are 125 kilowatts

at 60 Hertz, and 250 kilowatts at 400 Hertz, approximately. The MASS site development for training and exercise of equipment, does not eliminate the requirement for permanent air traffic control facilities at the installation.

The Marine Air Traffic control Unit (MATCU) performs a combined function similar to that accomplished in Category Code 134 40, Ground Control Approach System; Category Code 133 25, TACAN Building; and Category Code 133 75, Air Surveillance Radar Building. The equipment may be expeditionary, and the in-garrison facility requirements consist of pads and utilities only. The pad requirement is approximately 515 square yards. However, during long-term airfield support, a permanent MATCU operations building may be required (see Category Code 141 41). The electric power requirement is 125 KW at 400 Hertz. There is a minimum of one MATCU site development required at each Marine Corps air station or auxiliary air station. When in an expeditionary configuration, the MATCU facility is located at a runway, other than the primary instrument runway. The MATCU site development does not eliminate the requirement for conventional ASR, TACAN, or GCA on the instrument runways.

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150 WATERFRONT OPERATIONAL FACILITIES

These facilities include piers, wharves, cargo handling facilities, bulkheads, seawalls, quaywalls, aircraft docking facilities, degaussing facilities, deperming facilities, fleet landings, ferry slips, small craft berthing and miscellaneous facilities. The pier or wharf complex should provide the following conveniences and facilities:

(1) Berth capacities of sufficient depths and widths to allow safe vessel approach and departure.
(2) Sufficient mooring devices (bollards, bitts, cleats) to safely secure vessel.
(3) Access for railroad and truck facilities.
(4) Storage space for open or covered cargoes.
(5) Cargo handling equipment.
(6) Office space.
(7) Hotel and service utilities.
(8) Sanitary facilities.
(9) Passenger traffic conveniences (waiting rooms, baggage rooms, and facilities for immigration and customs inspection).
(10) Fender system.
(11) Camels or struts.
(12) Fire protection in accordance with National Fire Protection Association (NFPA) Standard No. 87, Piers and Wharves.
(13) Firefighting equipment.

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151 PIERS

A pier is a structure that extends out from shore into navigable water and is designed for the berthing of vessels for repair, fueling, and other essential services, such as fresh water, electric power, compressed air, waste disposal and communications facilities. A pier is oriented either perpendicular to or at an angle with the shore and normally accommodates berthing on both sides for its entire length although there are instances where only one side is used because of site conditions or because there is no need for additional berthing space. Code 151 includes all piers regardless of function served, protective dolphins at pier heads, original dredging performed specifically for the purpose of providing the pier facility, all trackage on the pier, and all supporting utilities and services.

Piers provide a transfer point for cargoes and/or passengers between water carriers and land transport. Separate facilities should be maintained where service involves large volumes of both cargo and passengers. Where one service is subsidiary to another, consideration should be given to the feasibility of accommodating both services at one facility.

In countries outside the United States, a pier is often referred to as a jetty, or a mole when of solid fill construction, and a wharf is referred to as a quay or a jetty. In the United States, the term jetty refers to a solid fill structure, located on an open seacoast at the mouth of a river or tidal inlet, designed to prevent shoaling of a channel by littoral materials and to direct and confine stream or tidal flow.

For original dredging not directly related to the construction of the pier, such as channel and turning basin dredging, see category code 165-10. For utilities and services landward of the inboard end of the pier, see NAVPAC DM-25. For crane and railroad trackage on shore, see Civil Engineering and Utilities, NAVFAC DM-5. For transit sheds on piers, see category code 156-10; and for fixed crane structures, see category code 213-40.

Piers are classified according t o their primary function and are described under their respective category codes.

BERTHING. Piers are used to provide either multipurpose berths or special purpose berths. Piers providing multipurpose berthing are used to service several classes of vessels so that ships will have the option of utilizing any one of several berthing facilities at a port. Berth selection depends upon the need to match available space, utilities and support services with the requirements of an incoming ship. It is not economically feasible to develop a single facility to accommodate and service all classes of Vessels. Special berths are provided when berthing arrangements and/or locations are required fur fueling vessels, berthing vessels carrying explosives, or for cleaning ship’s bilges.

REQUIRED FEATURES. The following list gives appurtenances and facilities generally provided at piers. The facilities to be provided depend on functional requirements which often determine the classification of the pier.

1. Berths having sufficient depths and widths to allow for efficient servicing of the ship and safe vessel approach and departure.

2. Sufficient mooring devices (bollards, bitts, cleats) to safely secure vessel.

3. Access facilities for railroad cars and trucks.

4. Covered and open storage space for cargoes; fenced where required, for control of pilferage,

5. Cargo handling equipment.

6. Office space.

7. Hotel and ship service facilities.

8. Sanitary facilities.

9. Support building at the dock to house general purpose tooling and administrative areas when main shipyard complex is distant from the waterfront.

10. Fender systems.

11. Camels or struts.

12. Medical facilities.

13. Firefighting equipment.

14. Cranes and trackage.

LOCATION AND ALIGNMENT. The location and alignment of piers in a harbor should consider factors such as ease of entering and leaving berth, required quayage, harbor line restrictions, foundation conditions and isolation requirements. For further information and criteria, see Harbors, NAVPAC DM-26.1.

PIER DIMENSIONS AND CLEARANCES. The dimensions of a pier are based primarily on the lengths of the vessels, present or contemplated, that it is to accommodate. The length of the pier is dependent upon the type of ship, and the width is dependent upon the type of service to be provided. Pier measurements and allowances for single-length and multiple-length berths are based upon either accommodating known vessels or known types of vessels, where types but not specific ships are known. The dimensions for both types are determined as follows:

1. Pier Length.

a. Sinqle-Length Berth shall equal the overall length of the largest vessel to be accommodated, plus an allowance of 50 feet at each end of the vessel. For aircraft carriers, the allowance at each end of the vessel should be increased to 100 feet. See Figure 151-10 for berthing diagram and Table 151-10 for ship’s dimensions.

b. Multiple-Length Berths shall equal the total overall length of the largest vessels simultaneously accommodated, plus allowances of 100 feet between vessels and 50 feet beyond outermost moored vessels. See Figure 151-10 for berthing diagram and Table 151-10 for ship’s dimensions.

2. Pier and Wharf Width. The width of a pier or wharf is determined on the basis of functional requirements, space availability and site conditions such as water depths, subsurface conditions and clearances. The widths of piers and wharves, as discussed hereinafter, refer to the dimensions determined for specific function classifications. These dimensions should not be less than the widths determined by geotechnical and structural considerations. Factors to be considered in the determination of pier and wharf widths are as follows:

a. Berths Provided on Outboard Face of Pier. Because pier widths are determined on the basis of the requirements of the main berths, the outboard face of a pier may be used only for vessels whose overall length does not exceed the width of pier and where bow and stern clearances conform to established criteria.

b. Berths Provided Alongside Pier or Wharf. Total structure width depends upon size of shed, if any, type of crane service provided, number of railroad tracks and truck lanes furnished and requirements for work space and open storage areas. At wharf facilities, open storage areas are contiguous to the apron and shed, but at pier facilities open storage areas are generally located off the pier and thus do not affect the determination of total pier width. Table 151-11, indicating minimum pier widths, is furnished as a guide.

c. Berths for Carriers. Camels specifically designed to breast off aircraft carriers should be provided at designated carrier berths. Alternatively, the provision of additional pier width may be considered to provide clearances for overhangs of flight decks and sponsors.

d. Services Requiring Additional Width. Adequate width should be provided to accommodate railroad tracks, truck lanes, craneways and fuel handling equipment when furnished.

3. Slip width.

a. General Considerations. The clear distance between piers, or slip width, should be adequate to permit the safe docking and undocking of the maximum size vessels that are to be accommodated in the slip. The size of slip should also permit the safe maneuvering and working of tugboats, barges, lighters and floating cranes. At multiple berth piers, where vessels are docked either one per berth, two abreast per berth or more, sufficient clearance should be available to permit the docking and undocking of vessels at the inboard berth without interfering with vessels at the outboard berth. Because the size of a slip is affected by docking and undocking maneuvers, consideration should be given to the advice of local pilots who are familiar with the ships to be handled and with prevailing environmental conditions such as winds, waves, swells and currents. The width should be reviewed with specific functional requirements of the individual installation before a final determination is made.

b. Minimum Width of Slip for Active Berthing.

(1) Minimum widths should be as shown on Figure 151-10. widths are defined as a factor times the beam of the largest vessel to be accommodated. The minimum width should not be less than 300 feet. The recommended criteria are applicable only if vessels are turned outside the slip area.

Refer to Table 151-10 for the beam of typical vessel types. At submarine slips, width requirements should be increased by at least four vessels beam and more, as required, to account for camels and separators, to provide for ships' vulnerability if their safety is involved, to provide for special maneuvering requirements of other ships during berthing or passing and to provide for special environmental conditions such as currents, waves and winds.

(2) The requirements discussed above apply where vessels are berthed on both sides of a slip. Where vessels are berthed on only one side of a slip, the width may be reduced.

(3) Referring to Figure 151-10, when more than 2 abreast berthing is employed, the width of slip should be increased by one ship beam for each additional ship added in order to maintain adequate clearances between moored ships during berthing and unberthing maneuvers. Thus, for 3 abreast berthing on both sides of a slip, the slip width for single berth piers would be equal to 10 times ship beam and the slip width for multiple berth piers would be equal to 11 times ship beam.

C. Minimum Width of Slip for Inactive Berthing.

(1) At slips containing inactive berths where vessels are stored for long periods of time on inactive status, in nests of two, three or more, clear distances between moored vessels and slip width may be reduced by one or two vessels beam to reflect the reduction in the frequency of berthing maneuvers and the decrease in activities of small boats and floating equipment.

4. Water Depth in Slips.

a. Minimum Depth of Water. In a sheltered harbor and where the harbor bottom consists of soft material, water depth in a slip, measured from mean low water level (M.L.W.) should be equal to the maximum loaded draft of the vessels to be accommodated plus a minimum clearance of 4 feet which includes an allowance of 1 foot fur vessel trim in loading, 2 feet for underkeel clearance and an allowance of 1 foot for tidal variations. For the loaded draft of typical vessel types, refer to Table 151-10 and DM-26.6. Specified water- depths should be maintained as close to the fender line of the structure as is practicable considering the accessibility of dredging equipment used during maintenance dredging operations.

b. Other Considerat ions. Minimum keel clearance of 4 feet should be increased if any of the following conditions prevail:

(1) Harbor bottom consists of a hard material such as rock.

(2) Excessive silting (one foot per year or more) occurs.

(3) Slip area is exposed to waves, swells and winds.

(4) Extreme low water (one foot or more) occurs.

(5) Investigation indicates probable fouling of condensers.

(6) Aircraft carriers have had situations where they suck up bottom sediments and marine organisms through their intakes, clog up condenser

coils and cause undue wear on machinery. In model tests it has been determined that one part of the solution to these situations is to increase the depth below the keel. Therefore, the water depth at carrier berths and anchorages shall be 50 ft. from MLW or MLLW datum for new construction. Water depth at existing facilities shall be increased to 50 ft. where feasible. Depths for BB's and AOE's may be increased for similar reasons. However, special studies at specific locations are required.

c. Vessel Characteristics. Table 151-10 is a comprehensive listing of pertinent data for vessels in the Naval fleet at the time of publication. The following is a list of footnotes which applies to this table:

(1) Vessels in class were established from the hull prototype number. Two or more hull prototype numbers possessing the same or nearly the same dimensions and other characteristics were combined in the same class.

(2) Ordinarily, extreme breadth is the maximum width of vessel. Fur submarines, the value given is the maximum diameter or width of the hull structure and is not necessarily the maximum width which may occur at the horizontal stabilizer plans and is so noted. Canted aircraft carrier flight decks may not be dimensionally symmetrical about the longitudinal centerline of the vessel, marking the extreme breath value for aircraft carriers unsuitable for determining berthing camel width at piers and wharves with gantry crane service.

(3) Maximum navigational draft is the minimum depth of water required to prevent grounding of a vessel due to appendages projecting below the vessel's base line or keel. Such appendages may be sonar domes, propellers, rudders, hydrofoils, vertical submarine control planes, etc. Many vessels also possess a decided trim to the bow or stern in fully loaded condition or in the case of submarines, a trim to the stern in surfaced condition,

(4) Water depth at carrier berths and anchorages is 50 ft. from MLW or MLLW datum for new construction. Water depth at existing facilities will be increased to 50 ft. where feasible. Depths for BB's and AOE's may also be increased if justified.

151 10 AMMUNITION PIER (FB)

Ammunition piers are designed for use in the receipt of ammunition for storage and for the outloading of ammunition onto barges and ships. In many cases outgoing ammunition is first loaded from the ammunition pier onto barges for transfer to ships moored offshore or in a roadstead. The services and facilities provided for ammunition piers include lighting, telephone and fire alarm systems, and salt water for firefighting. Railroad tracks are normally provided unless the established method of handling ammunition is by truck. Freshwater is provided if a supply is readily available. For dimensional and other pertinent information, see Code 151. For quantity-distant standards for pier and wharf facilities handling explosives and ammunition, see NAVORD OP-5, Volume 1, Chapter 15. This pier is for break bulk load/off-load of ammunition. For containerized load/off-load of ammunition, use Category Code 151 70, Ordnance Container Handling Pier.

TABLE 151-10

Ship Characteristics

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	BREADTHS IN FEET (2) AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
AD	14,15,17-19	DESTROYER TENDER	531.0	73.0	73.0	AD 14,19-26.0; AD 15-28.0; AD 17,18-29.0
AD	24,26,36	SAME	492.0	70.0	70.0	AD 24,29.0; AD 26,36-28.0
AD	37,38	SAME	645.0	85.0	85.0	30.0
AD	41-44	SAME	643.0	85.0	85.0	AD-41,24.0;AD-42, 23.0;
AE	21-25	AMMUNITION SHIP	511.0	72.0	72.0	AE 21,23,25-29.0;AE 22-34.0; AE 24-32.0
AE	26-29,32-35	SAME	564.0	81.0	81.0	AE 35-28.0; AE 28,29-30.0; AE 32,33-30.0; AE 26,27,34-31.0
AF	58	STORE SHIP	502.0	72.0	72.0	27.3
AFS	1-7	COMBAT STORE SHIP	581.0	79.0	79.0	28.0
AG	153,154	MISCELLANEOUS	564.0	76.0	76.0	28.0
AG	164	SAME	455.0	66.0	66.0	24.3
AGDS	2	AUXILLIARY DEEP SUBMERGENCE SUPPORT SHIP	466.0	74.0	72.0	24.1

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
AGER	2	ENVIRONMENTAL RESEARCH	177.0	32.0	32.0	10.0
AGF	3	MIS COMMAND SHIP	522.0	100.0	84.0	23.0
AGFF	1	FRIGATE RESEARCH SHIP	416.0	44.0	43.0	24.0
AGM	8	MISSILE RANGE INSTRUMENTATION SHIP	455.0	62.0	62.0	--
AGM	9,10	SAME	520.0	72.0	72.0	--
AGM	19,20	SAME	595.0	75.0	75.0	30.5
AGM	22	SAME	455.0	62.0	62.0	27.0
AGM	23	SAME	564.0	76.0	76.0	28.0
AGOR	7,12,13	OCEANOGRAPHIC RESEARCH	209.0	40.0	39.0	20.0
AGOR	11	SAME	266.0	52.0	51.0	20.8
AGOR	16	SAME	246.0	75.0	75.0	22.9
AGOS	1-3	OCEAN SURVEILLANCE SHIP	--	--	--	--
AGS	21,22	SURVEYING SHIP	455.0	62.0	62.0	28.2

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
AGS	26,27,33,34,38	SURVEYING SHIP	285.0	48.0	48.0	18.8
AGS	29,32	SAME	394.0	54.0	54.0	16.0
AGSS	555	AUXILIARY SUBMARINE	165.0	18.0	16.0	17.9
AGSS	569	SAME	205.0	27.0	25.0	22.0
AH	17	HOSPITAL SHIP	519.0	72.0	72.0	26.0
AK	237,240,242, 254,274	CARGO SHIP	455.0	62.0	62.0	29.0
AK	255,267	SAME	520.0	72.0	72.0	33.0
AK	271	SAME	266.0	52.0	51.0	--
AK	277	SAME	478.0	66.0	66.0	30.0
AK	280-283	SAME	459.0	63.0	63.0	28.5
AKR	7	VEHICLE CARGO SHIP	499.0	78.0	78.0	27.1
AKR	9	SAME	540.0	83.0	83.0	29.1
AO	57,62	OILER	553.0	75.0	75.0	34.0
AO	51,98,99	SAME	644.0	75.0	75.0	39.0
AO	105-109	SAME	664.0	75.0	75.0	35.8

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	BREADTHS IN FEET (2) AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
AO	143-148	VEHICLE CARGO SHIP	655.0	86.0	86.0	36.7 NAV. DRAFT 40.0 FT FOR AO 146 & 148
AO	177-180,186	SAME	592.0	88.0	88.0	--
AOE	1-4	FAST COMBAT SUPPORT SHIP	796.0	107.0	107.0	41.0
AOG	58	GASOLINE TANKER	311.0	49.0	49.0	16.0
AOG	77-79	SAME	325.0	48.0	48.0	19.0
AOG	81,82	SAME	302.0	61.0	61.0	22.2
AOR	1-7	REPLENISHMENT OILER	659.0	96.0	96.0	36.5 AOR 6 ONLY-39.0
AOT	50,67,73,75, 76,78,134	TRANSPORT OILER	524.0	68.0	68.0	30.0 AOT 50 ONLY-33.0
AOT	149,151,152	SAME	620.0	84.0	84.0	33.6
AOT	165	SAME	615.0	80.0	80.0	36.0
AOT	168-176	SAME	587.0	84.0	84.0	34.5
AOT	181	SAME	620.0	84.0	84.0	33.7
AOT	182-185	SAME	672.0	89.0	89.0	36.2

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	BREADTHS IN FEET (2) AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
AP	110-117,119	TRANSPORT	623.0	76.0	76.0	26.0
AP	122,123,125-127	SAME	609.0	76.0	76.0	29.1
AP	197,198	SAME	534.0	73.0	73.0	27.0
APL	2,4,5,15,18,19, 29,31,32,34,42, 43,47,50,53,54, 57,58	BARRACKS CRAFT NSP	261.0	49.0	49.0	11.0
AR	5-8	REPAIR SHIP	530.0	73.0	73.0	26.0 AR 7 ONLY 28.0
ARC	2,6	CABLE REPAIRING SHIP	374.0	47.0	47.0	29.4
ARC	3	SAME	439.0	58.0	58.0	18.6
ARC	7	SAME	--	--	--	--
ARL	24	LANDING CRAFT REPAIR SHIP	328.0	50.0	50.0	14.0
ARS *	6,8,21,38-43 SEE END OF TABLE	SALVAGE SHIP FOR SHIPS	214.0	43.0	43.0	15.1
AS	11,12,15-18	SUBMARINE TENDER	531.0	73.0	73.0	26.0
AS	19	SAME	574.0	73.0	73.0	26.0
AS	31,32	SAME	599.0	83.0	83.0	27.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
AS	33,34	SUBMARINE TENDER	644.0	85.0	85.0	30.0
AS	36,37	SAME	644.0	85.0	85.0	30.0
AS	39-41	SAME	644.0	85.0	85.0	30.0
ASR	9,13-15	SUBMARINE RESCUE SHIP	252.0	44.0	42.0	ASR 9&13 20.0 ASR 14, 17.0 & ASR 15, 23.0
ASR	21,22	SAME	251.0	93.0	86.0	24.9
ATA	181,193,213	AUXILIARY OCEAN TUG	143.0	34.0	34.0	15.0
ATF	76,85,91,105, 110,113,149, 158-160 & 162	FLEET OCEAN TUG	205.0	39.0	39.0	18.0
ATF	166-172	SAME	--	--	--	--
ATS	1-3	SALVAGE & RESCUE TUG	283.0	50.0	50.0	18.0
AVM	1	GUIDED MISSILE SHIP	540.0	72.0	71.0	27.3
AVT	16	AUXILIARY AIRCRAFT TRANSPORT	910.0	189.0	103.0	31.0
BB	61-64	BATTLESHIP	888.0	109.0	108.0	38.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	BREADTHS IN FEET (2) AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
CA	134,139	HEAVY CRUISER	717.0	77.0	75.0	26.0
CG	10,11	GUIDED MISSILE CRUISER	675.0	71.0	69.0	30.0
CG	16-24	SAME	533.0	55.0	54.0	26.0
CG	26-34		547.0	55.0	54.0	CG27 27.5; CG 28, 33 & 34, 28.5; CG 29-32, 29.5 & CG 26, 30.5
CG	47,48	SAME	--	--	--	--
CGN	9	GUIDED MISSILE CRUISER NUCLEAR	721.0	73.0	72.0	31.0
CGN	25	SAME	565.0	58.0	57.0	26.0
CGN	35	SAME	564.0	58.0	57.0	30.5
CGN	36,37	SAME	596.0	61.0	60.0	31.0
CGN	38-41	SAME	586.0	63.0	61.0	32.6
CV	34	AIRCRAFT CARRIER	911.0	107.0	103.0	33.0
CV	41,43	SAME	1001.0	CV 41 183.0 CV 43 156.0	121.0	36.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
CV	59-62	AIRCRAFT CARRIER	1040.0	CV 59 & 60 253.0 CV 62 263.0 & CV 61 270.0	130.0	--
CV	63,64,66	SAME	1048-1073	CV 66 252.0; CV 63 & 64 282.0	130.0	CV 63,37.0; CV 64,40.0 & CV 66,38.0.
CV	67	SAME	1073.0	252.0	130.0	37.0
CVA	31	ATTACK AIRCRAFT CARRIER	872.0	172.0	103.0	31.0
CVN	65	AIRCRAFT CARRIER NUCLEAR PROPULSION	1088.0	248.0	133.0	39.0
CVN	68-71	SAME	1088-1115	CVN 68 257.0, CVN 69 252.0 & CVN 70	134.0	CVN 68,41.0; CVN 69,39.0 & CVN 70,
CVS	11,12,20,38	ASW AIRCRAFT	889-899	172.0	103.0 CV 12 & 20 ONLY 101.0	31.0
DD	743,763,784, 785,817,821, 822,825,827, 842,862-864, 866,871,873, 876,880,883, 886	DESTROYER	391.0	41.0	40.0	19.0-22.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	BREADTHS IN FEET (2) AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
DD	931,942,944-946,948,950,951	DESTROYER	418.0	45.0	44.0	21.0
DD	933,937,938,940,941,943	SAME	418.0 DD933 ONLY 424 FT.	45.0	44.0	20.0 DD933 ONLY 22 FT.
DD	963-992,997	SAME	564.0	55.0	55.0	30.0
DDG	2-24	GUIDED MISSILE DESTROYER	437.0	47.0	46.0	ALL 21.0 EXCEPT DDG 8,12,17,19 22.0; DDG 4,5,7, 23.0; DDG 2,3,10 24.0; DDG 6,20 25.0
DDG	31-34	SAME	418.0	45.0	44.0	22.0 EXCEPT DDG 34,23.0
DDG	37-46	SAME	513.0	52.0 EXCEPT DDG 37 & 46, 53.0.	52.0	ALL 25.0 EXCEPT DDG 37,27.0.
DDG	47	SAME	568.0	55.0	55.0	31.6
DDG	993-996,	SAME	--	--	--	--
FF	1037,1038	FRIGATE	372.0	41.5	41.0	24.0
FF	1040,1041,1043-1045,1047-1051	SAME	415.0	44.0	44.0	ALL 24.0 EXCEPT FF 1045,1047,1049, 25.0; FF 1041 26.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	BREADTHS IN FEET (2) AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
FF	1052-1097	FRIGATE	438.0	47.0	47.0	ALL 26.5 EXCEPT FF 1054,27.5
FF	1098	SAME	416.0	44.0	43.0	24.0
FFG	1-6	GUIDED MISSILE FRIGATE	415.0	44.0	44.0	26.0
FFG	7-49	SAME	445.0	47.0	38.0	24.9
LCC	19,20	AMPHIBIOUS COMMAND SHIP	620.0	LCC 19,108.0; LCC 20 102.0	82.0	30.0
LHA	1-5	AMPHIBIOUS ASSAULT SHIP GENERAL PURPOSE	820.0	118.0	106.0	26.0
LKA	112	AMPHIBIOUS CARGO SHIP	564.0	76.0	76.0	28.0
LKA	113-117	SAME	576.0	82.0	82.0	28.0
LPA	249	AMPHIBIOUS TRANSPORT	564.0	76.0	76.0	28.0
LPD	1-2	AMPHIBIOUS TRANSPORT DOCK	522.0	100.0	84.0	LPD 1,23.0; LPD 2,25.0
LPD	4-15	SAME	570.0	LPD 12-14,100; LPD 4,105.0; LPD 5-8,10,11, 15,108.0; LPD 9,115.0	84.0	ALL 23.0 EXCEPT LPD 9,27.0; LPD 6,29.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
LPH	2,3,7,9-12	AMPHIBIOUS ASSAULT SHIP	592-602	84.0	84.0	ALL 30.0; EXCEPT LPH 10,28.0; LPH 2,9,29.0; LPH 3,31.0
LSD	28-35	DOCK LANDING SHIP	510.0	ALL 84.0 EXCEPT LSD 28, 90.0	84.0	ALL 19.0 EXCEPT LSD 28 20.0
LSD	36-40		553-562	84.0	84.0	20.0
LST	1173,1177,1178	TANK LANDING SHIP	445.0	62.0	62.0	18.0
LST	1179-1198	SAME	565.0	70.0	70.0	ALL 20.0 EXCEPT LST 1198 21.0
MSO	427,428-431, 433,437-443, 446,448,449, 455,456,464, 488,489,490, 492,509,511	MINESWEEPER OCEAN NONMAGNETIC	173.0	35.0	35.0	12.0-14.0
PG	92,93,99,101	PATROL COMBATANT	165.0	24.0	22.0	10.0
PHM	1-6	PATROL COMBATANT MISSILE HYDROFOIL	147.0 WITH FOILS RAISED	29.0	25.0	24.0
SS	565	SUBMARINE	293.0	27.0	24.0	17.3
SS	574	SAME	334.0	30.0	25.0	19.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
SS	576	SUBMARINE	283.0	27.0	25.0	17.3
SS	580-582	SAME	219.0	29.0	27.0	25.1
SSAG	567	AUXILIARY SUBMARINE	293.0	27.0	24.0	17.3
SSBN	598-602	FLEET BALLISTIC MISSILE SUBMARINE NUCLEAR	382.0	33.0	25.0	29.0
SSBN	608-611,618	SAME	411.0	33.0, 40.5 BREADTH AT STERN PLANES	26.5	31.1
SSBN	616,617,619, 620,622-636, 640-645,654-659	SAME	421.0	33.0, 41.0 BREADTH AT STERN PLANES	25.0	32.0
SSBN	726-733	SAME	559.3	42.0	30.0	36.3
SSN	571	SUBMARINE NUCLEAR	324.0	28.0	23.0	25.9
SSN	575	SAME	376.0	28.0	22.0	23.8
SSN	578,579,583, 584	SAME	263.0	25.0	20.0	21.4
SSN	585	SAME	249.0	32.0	28.0	28.2
SSN	586	SAME	448.0	37.0	34.0	24.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	BREADTHS IN FEET (2) AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
SSN	587	SUBMARINE NUCLEAR	350.0	26.0	24.0	21.0
SSN	588,590-592	SAME	249.0	32.0	25.0	27.7
SSN	594-596,603-607,612-615, 621	SAME	279-297	32.0	27.0	29.0
SSN	597	SAME	273	23.0	19.0	21.0
SSN	637-639,646-653,660-670, 672-684,686, 687	SAME	289-303	32.0 41.0 BREADTH AT STERN PLANES	25.0	ALL 29.0 EXCEPT SSN 661,30.0; SSN 672-684 & 686, 687,26.0
SSN	671	SAME	315.0	33.0 42.5 BREADTH AT PUFF BLISTERS ON STABILIZERS	25.0	30.5
SSN	685	SAME	365.0	32.0 42.0 BREADTH AT STERN PLANES	25.0	30.9
SSN	688-722	SAME	361.0	33.0 40.0 BREADTH AT STERN PLANES	29.0	30.5
DSRV	1,2	DEEP SUBMERGENCE RESCUE VESSEL	49.0	8.0	--	THIS VESSEL IS NOT MOORED AS IT IS STOWED ABOARD ANOTHER VESSEL

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	BREADTHS IN FEET (2) AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
DSV	1-5	DEEP SUBMERGENCE	83.0 DIMENSIONS INDICATED ARE FOR DSV 1 ONLY DSV 2-5 ARE MUCH SMALLER VEHICLES (22.5 to 25.0 FT. LONG	18.0	10.0	20.0
1X	306-308,310	UNCLASSIFIED MISCELLANEOUS	177.0	32.0	32.0	11.0
1X	501	SAME	250.0	66.0	51.0	13.8
1X	502-504	SAME	328.0	50.0	50.0	14.0
1X	506,507	SAME	125.0	36.0	--	--
NR	1	SUBMERSIBLE RE-SEARCH VEHICLE	136.0	16.0	16.0	15.1
YAG	61	MISCELLANEOUS AUXILIARY	194.0	33.0	33.0	16.0 DRAFTS ESTIMATED FROM SHIP'S PLANS

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
YC	306,360,699, 705,709,712, 713,721,724, 725,728,752, 754,756,757, 760,764,769, 772,775,781, 783,787,789, 813,821,823-826,828-833, 972,979,980, 983,984,1056, 1058-1060,1062, 1065,1068-1071, 1073-1077,1080, 1081,1084-1092, 1107,1112,1116-1121,1366-1368, 1371-1373,1375-1383,1385,1386, 1394,1395,1399, 1408-1411,1419, 1446	OPEN LIGHTER	110.0	35.0	34.0	8.0
YC	688,746,794, 799,800,802-805,1406,1407, 1413,1417	SAME	110.0	31.0	30.0	4.0
YC	695	SAME	140.0	50.0	49.0	--
YC	981,983,984	SAME	142.0	40.0	39.0	7.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
YC	1027,1029	OPEN LIGHTER	150.0	40.0	39.0	7.0
YC	1273,1275	SAME	100.0	40.0	39.0	6.0
YC	1321,1323, 1324,1327, 1328	SAME	125.0	34.0	33.0	6.0
YC	1333,1334	SAME	112.0	53.0	48.0	6.0
YC	1351,1352, 1360,1400-1402	SAME	81.0	27.0	26.0	4.0
YC	1389,1391	SAME	160.0	51.0	50.0	8.0
YC	1430-1434, 1435,1438-1440,1442-1445,1450, 1458,1461, 1464-1468	SAME	120.0	33.0	33.0	8.0
YC	1469-1497, 1499,1500-1504	SAME	110.0	32.0	32.0	8.0
YC	1447-1449	SAME	130.0	30.0	30.0	6.0
YC	1451	SAME	--	--	--	--

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
YC	1509-1515	OPEN LIGHTER	--	--	--	--
YC	1523-1545	SAME	--	--	--	
YCF	16	CAR FLOAT	150.0	34.0	34.0	4.0
YCV	8-11,15,16	AIRCRAFT TRANSPORTATION LIGHTER	200.0	65.0	65.0	8.0
YDT	10	DIVING TENDER	81.0	27.0	26.0	3.0
YDT	14,15	SAME	133.0	31.0	30.0	8.0
YDT	16	SAME	261.0	48.0	48.0	--
YF	862,866,885	COVERED LIGHTER	133.0	31.0	30.0	10.0
YFB	83	FERRYBOAT OR LAUNCH	180.0	46.0	45.0	--
YFB	87-91	SAME	162.0	59.0	45.0	--
UFN	260,262,263, 266,274,276, 278,279,283, 284,299,305-308,640-642, 644-652,654, 656-659,691, 692,694,697, 704,705,707, 717,792-798,	COVERED LIGHTER NSP	110.0	35.0	34.0	8.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	BREADTHS IN FEET (2) AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
	800-803,806, 814-816,818, 820,821,901, 902,905-907, 910-911,917, 934,941,945, 946,949,952-956,958,959, 962-966,968, 970,972,973, 978-981,983, 984,988,991, 992,1154-1156, 1158,1159,1163	COVERED LIGHTER NSP				
YFN	272,311,313, 362,364,367-372,375,413, 414,540,1178, 1180,1183,1187-1190,1195	SAME	110.0	31.0	30.0	--
YFN	1126,1128-1130	SAME	126.0	34.0	34.0	6.0
YFN	1173-1177,1191, 1194,1196-1200, 1202-1206,1208, 1211-1214,1217-1223,1239-1243, 1250-1253	SAME	110.0	34.0	34.0	8.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
YFN	1237,1238	COVERED LIGHTER NSP	127.0	35.0	35.0	7.0
YFNB	4-6,8,13,19, 25,30-32,34-37,39,41,42	LARGE COVERED LIGHTER	261.0	48.0	48.0	9.5
YFND	5,27,29	DRYDOCK COMPANION CRAFT	111.0	34.0	34.0	8.0
YFNX	4	LIGHTER SPECIAL PURPOSE	110.0	35.0	34.0	8.0
YFNX	7	SAME	--	--	--	--
YFNX	15	SAME	--	--	--	--
YFNX	19	SAME	110.0	35.0	34.0	7.0
YFNX	20	SAME	110.0	31.0	30.0	4.0
YFNX	22-26,30-34	LIGHTER SPECIAL PURPOSE	110-126	32-34	32-34	4.0-8.0
YFP	3,11,12,14	FLOATING POWER BARGE	110.0	32-34	32-34	7.0-8.0
YFR	888,890	REFRIGERATED COVERED LIGHTER SP	133.0	30.0	30.0	10.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
YFRN	385,412,997, 1235,1256,1257	REFRIGERATED COVERED LIGHTER SP	150-153	35.0	34.0	7.0-10.0
YFRT	287,418,451, 520,522,523	COVERED LIGHTER SP	133.0	30.0	30.0	9.0
YFU	50	HARBOR UTILITY CRAFT	119.0	35.0	34.0	6.0
YFU	71-77,79,81,83	SAME	125.0	36.0	--	--
YFU	91,94,97,98, 100-102	SAME	--	--	--	--
YGN	69,70,73	GARBAGE LIGHTER NSP	120.0	35.0	34.0	9.0
YGN	80-83	SAME	124.0	35.0	35.0	--
YHLC	1,2	SALVAGE LIFT CRAFT, HEAVY	124.0	35.0	35.0	--
YNG	11,17	GATE CRAFT	110.0	34.0	34.0	4.0
YO	47	FUEL OIL BARGE SP	235.0	37.0	37.0	15.0
YO	106,129,171, 174,194,200, 202,203,220, 223-225,228, 230,241,257, 264	SAME	174.0	33.0	32.0	13.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
YO	153	FUEL OIL BARGE SP	156.0	30.0	30.0	12.0
YOG	58,68,78,79, 87,88,93,196	GASOLINE BARGE SP	174.0	33.0	32.0	13.0
YOGN	8-10,26	GASOLINE BARGE NSP	165.0	35.0	35.0	8.0
YOGN	110,111,113-115, 122-125	SAME	165.0	42.0	42.0	8.0
YON	1,2	FUEL OIL BARGE NSP	87.0	28.0	27.0	7.0
YON	80,81,84-88	SAME	174.0	40.0	39.0	8.0
YON	90,91,96-98, 100-102,235	SAME	165.0	35.0	35.0	8.0
YON	239	SAME	100.0	40.0	40.0	7.0
YON	255,256	SAME	120.0	33.0	--	--
YON	258,260-262, 265,269,271-275,280-295	SAME	165.0	40.0	40.0	8.0
YON	305,306	SAME	--	--	--	--
YOS	8,10-12,15-17,	OIL STORAGE BARGE	80.0	34.0	32.0	5.0
YOS	21,23,24,28,33	SAME	110.0	34.0	34.0	9.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
YOS	34	FUEL OIL BARGE	--	--	--	--
YP	654-672	PATROL CRAFT	81.0	18.0	17.0	5.0
YP	673-675	PATROL CRAFT	--	--	--	--
YPD	32,37,41,42,46	FLOATING PILE DRIVER	104-111	31-46	31-46	8.0
YR	9	FLOATING WORKSHOP	261.0	48.0	48.0	9.0
YR	25-27,29,35,36, 38,44,46,59,60, 63-65,67,68,70, 73,76-78	SAME	153.0	36.0	34.0	6.0
YR	50	SAME	153.0	43.0	42.0	6.0
YR	83,84,85	SAME	111.0	31.0	31.0	4.0
YRB	1,2	REPAIR & BERTHING BARGE	111.0	30.0	30.0	4.0
YRB	22,25	SAME	110.0	34.0	34.0	4.0
YRBM	1-6,8,9,11-15	REPAIR, BERTHING & MESSING BARGE NSP	110-112	36.0	34.0	4.0
YRBM	31-36	SAME	--	--	--	--
YRBM	20	SAME	261.0	48.0	48.0	9.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
YRBM	23-30	REPAIR, BERTHING & MESSING BARGE NSP	146.0	46.0	46.0	4.0
YRDH	1,6,7	FLOATING DRYDOCK WORKSHOP HULL	150.0	--	34.0	6.0
YRDH	2	SAME	--	--	--	--
YRDM	1,2,5,7	FLOATING DRYDOCK WORKSHOP MACHINERY	150.0	--	34.0	6.0
YRR	1	RADIOLOGICAL REPAIR BARGE	150.0	43.0	42.0	7.0
YRR	2,5-14	SAME	150-153	36.0	34.0	6.0
YRR	3	SAME	110.0	35.0	34.0	8.0
YRR	4	SAME	150.0	32.0	32.0	4.0
YRST	1,2	SALVAGE CRAFT TENDER NSP	261.0	48.0	48.0	9.0
YRST	3,6	SAME	110.0	35.0	34.0	4.0-6.0
YRST	5	SAME	124.0	61.0	--	4.0
YSD	15,39,53,63, 74,77	SEAPLANE WRECKING DERRICK	104.0	31.0	30.0	4.0
YSR	4,6,7	SLUDGE REMOVAL BARGE	95.0	31.0	30.0	7.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2)		DRAFTS IN FEET (3)
				EXTREME	AT LOADED WATERLINE	MAXIMUM NAVIGATIONAL
YSR	11,17-20,23, 27-29	SLUDGE REMOVAL BARGE	80.0	32.0	32.0	5.0
YSR	25,26	SAME	94.0	30.0	30.0	7.0
YSR	30-33,37,38-40, 45	SAME	110.0	34.0	34.0	9.0
YTB	752,753,756-759,762-771, 774-836	LARGE HARBOR TUG	101-109	29-31	25-31	14.0-16.0
YTB	760,761	SAME	85.0	24.0	23.0	11.0
YTL	422,434,438, 439,550,583, 588,591,594, 602	SMALL HARBOR TUG	66.0	18.0	17.0	8.0
YTM	146,149,151, 176,178,180, 189,252,265, 268,359,364, 366,380-383, 391-395,397-400,403-406, 413,415,417, 496,521-524, 526,527,534, 536,542-549, 701-702,704	MEDIUM HARBOR TUG	100-102	24-28	24-25	10.0-11.0

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	BREADTHS IN FEET (2) AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
YTM	748,768,770, 776,777,779	MEDIUM HARBOR TUG	101-107	27-28	25.0	12.0
YTM	760,761	SAME	85.0	24.0	23.0	--
YW	83,86,98,101, 108,113,119, 123,126-128	WATER BARGE SP	174.0	33.0	32.0	13.0
YWN	70,71,78,79, 82	SAME	165.0	35.0	35.0	8.0
YWN	147	SAME	86.0	20.0	--	7.0
YWN	156	SAME	120.0	33.0	--	--
*ARS	50,51,52,53	SALVAGE SHIP	255.0	51.0	50.4	17.9

Ship Characteristics
(Continued)

VESSEL DESIG-NATION	VESSELS IN CLASS (1)	TYPE OF VESSEL	OVERALL LENGTH IN FEET	BREADTHS IN FEET (2) EXTREME	BREADTHS IN FEET (2) AT LOADED WATERLINE	DRAFTS IN FEET (3) MAXIMUM NAVIGATIONAL
YTM	748,768,770, 776,777,779	MEDIUM HARBOR TUG	101-107	27-28	25.0	12.0
YTM	760,761	SAME	85.0	24.0	23.0	--
YW	83,86,98,101, 108,113,119, 123,126-128	WATER BARGE SP	174.0	33.0	32.0	13.0
YWN	70,71,78,79, 82	SAME	165.0	35.0	35.0	8.0
YWN	147	SAME	86.0	20.0	--	7.0
YWN	156	SAME	120.0	33.0	--	--
*ARS	50,51,52,53	SALVAGE SHIP	255.0	51.0	50.4	17.9

Floating Drydock Characteristics

DOCK DESIG-NATION	DOCKS IN CLASS	TYPE OF DOCK	LENGTHS IN FEET OVERALL INCLUDING OUT RIGGERS	BREADTHS IN FEET EXTREME	MAXIMUM SUB-MERGENCE	DRAFTS IN FEET LIGHT
AFDB	1	LARGE AUXILIARY FLOATING DRYDOCK	512.0	256.0	78.0	9.0
AFDB	2	SAME	927.0	256.0	78.0	9.0
AFDB	3	SAME	843.0	256.0	78.0	9.0
AFDB	4,5	SAME	825.0	240.0	67.3	8.7
AFDB	7	SAME	513.0	240.0	67.3	8.7
AFDL	1,2,6,8-12,15, 16,19,21,23,25, 29	SMALL AUXILIARY FLOATING DRYDOCK	200.0	64.0	28.5	3.4
AFDL	7,22,23	SAME	288.0	64.0	31.3	3.2
AFDL	37,38,40,41,44, 45	SAME	389.0	84.0	38.5	10.0
AFDL	47	SAME	489.7	97.0	42.3	4.2
AFDL	48	SAME	400.0	96.0	46.8	13.4
AFDM	1,2	MEDIUM AUXILIARY FLOATING DRYDOCK	614.0	116.0	50.4	5.8
AFDM	3,5-10	SAME	622.0	124.0	50.4-52.8	5.8-6.2
ARD	5,7,8	AUXILIARY REPAIR DRYDOCK	482.6	71.0	32.6	5.3

Floating Drydock Characteristics
(continued)

DOCK DESIG-NATION	DOCKS IN CLASS	TYPE OF DOCK	LENGTHS IN FEET OVERALL INCLUDING OUT RIGGERS	BREADTHS IN FEET EXTREME	MAXIMUM SUB-MERGENCE	DRAFTS IN FEET LIGHT
ARD-ARDM	ARD 12,30,32; ARDM-1,2	AUXILIARY REPAIR DRYDOCK	488.6	81.0	32.8	5.7
ARDM	3	MEDIUM AUX. REPAIR DRYDOCK	512.6	81.0	41.3	7.2
ARDM	4	SAME	492.0	96.0	54.5	6.0
YFD	8	YARD FLOATING DRYDOCK	657.3	132.5	49.7	8.3
YFD	23	SAME	542.0	114.0	45.8	7.8
YFD	54	SAME	412.0	90.0	37.0	6.8
YFD	68-71	SAME	598.0	118.0	45.8	5.7
YFD	83	SAME	200.0	64.0	28.5	3.4

TABLE 151-11
Typical Pier and Wharf Widths

Function Classification	Vessel Type	Minimum Pier Width (Feet)	Minimum Wharf Apron Width (Feet)	Railroad Tracks (Standard Gage)	Rail-mounted Cranes
1. Ammunition	Ammunition	100	100	-	-
2. Berthing	Aircraft Carrier	100*	-	-	-
3. Berthing	Cruiser	80	-	-	-
	Destroyer	80	-	-	-
	Frigate	80	-	-	-
	Submarine	60	-	-	-
	Auxiliary	80	-	-	-
4. Fitting-Out	Destroyer	100	-	2 Tracks 1 Each Side	2 30 ft. Gage, 1 Each Side
5. Repair	Cruiser	125	-	4 Tracks, 2 Each Side	2 30 ft. Gage, 1 Each Side
	Auxiliary	125	-	4 Tracks, 2 Each Side	2 30 ft. Gage, 1 Each Side
6. Fueling	Auxiliary	50	-	-	-
7. Supply (General Cargo)	Auxiliary	125 plus shed width	60	2 Tracks	-
8. Supply (Container Cargo)	Auxiliary	80	80	Up to 3 Tracks	1 50 ft. Gage

*Width applies when 60 foot camels are used to breast out carriers.

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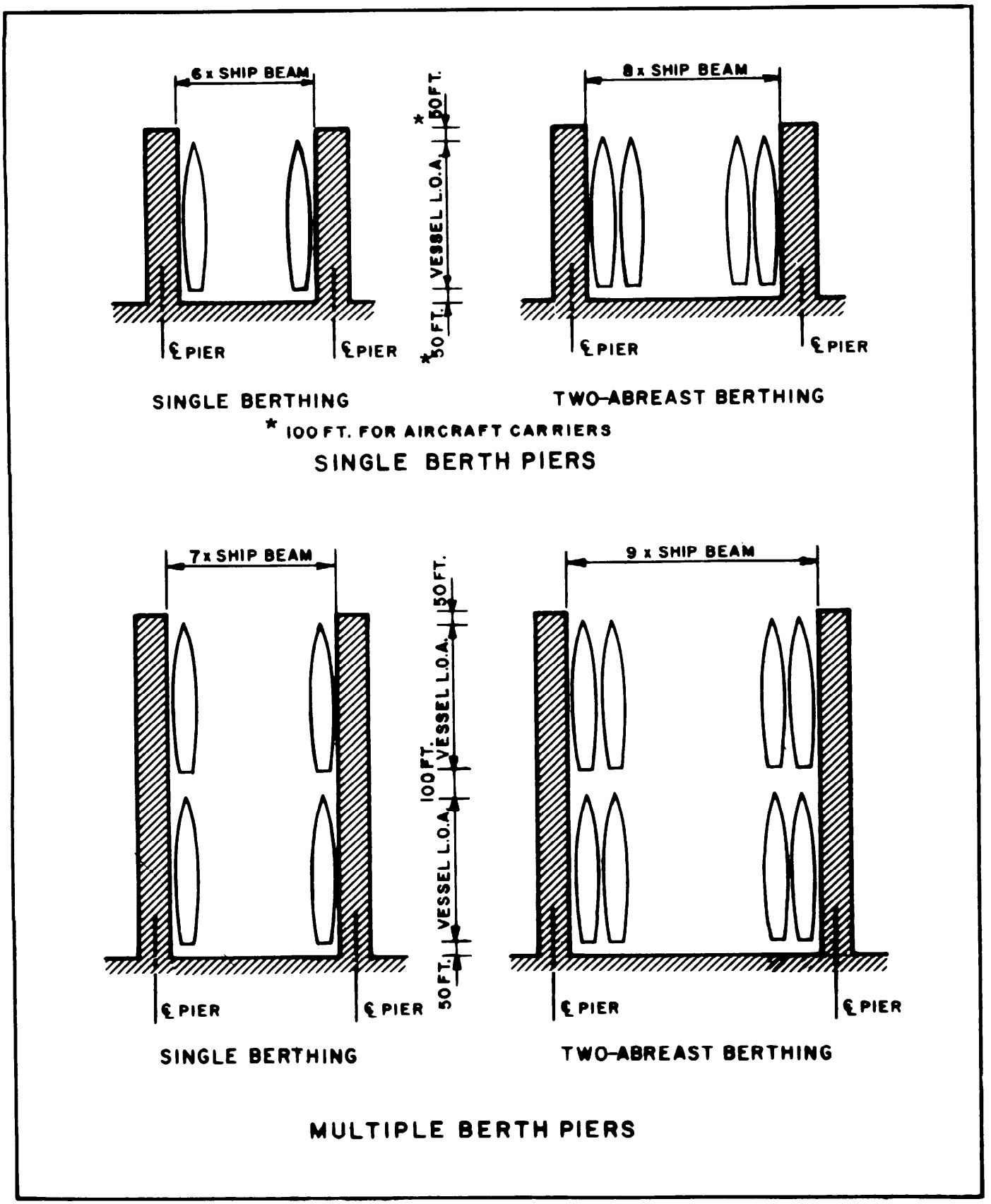

FIGURE 151-10
Slip Widths

151 20 GENERAL PURPOSE/BERTHING PIER (FB)

Berthing piers are used primarily for mooring ships that do not require piers equipped with shipyard facilities. Berthing piers are classified as active or inactive. The active berthing piers are used when ships are berthed for a relatively short time; the inactive classes are used when ships are to be tied up for long periods in a decommissioned status.

When berthing for carriers is to be provided on one side only or on both sides of a berthing pier the width of the structure shall be adequate to provide clearance for the overhang of the flight decks and sponsors. Alternatively, camels or other separators may be provided to fend off carriers.

All piers regardless of their function, will include such appurtenances as protective dolphins, fender systems, and dredging in connection with the facility. Supporting utilities, crane/railroad trackage, fixed cranes, and transit sheds on piers will carry their appropriate category codes. For a typical berthing pier, see Definitive Designs, NAVFAC P-272. For other pertinent information, see Code 151 (general notes).

For design criteria see Waterfront Operational Facilities, NAVFAC DM-25.

151 30 FITTING-OUT PIER (FB)

Piers for fitting-out are very similar to those used for repair purposes, providing approximately the same facilities. However, fitting-out piers will have, in addition to light and heavy gantry cranes, a large fixed-tower crane for handling guns, turrets, engines, and heavy armor. The area around this facility must be of sufficient size to permit other equipment to maneuver and operate. This may vary depending on station mission. For dimensional and other pertinent information, see Code 151.

For design criteria see Waterfront Operational Facilities, NAVFAC DM-25.

151 40 FUELING PIER (FB)

Facilities for berthing ships while discharging fuel to storage or receiving fuel from storage are provided at fueling piers. Such piers will provide salt water for firefighting, freshwater, steam in cold climates, electric power, and telephone and fire alarm facilities. In addition, a fuel main and special protective hose racks and small derricks for handling fuel hoses are necessary. They shall also be equipped with pipelines for each type of fuel to be stored at the site, including bilge and ballast lines. Stripper pumps for emptying lines are also necessary. A fueling pier may be justified for those stations where bulk quantities of liquid fuel can be economically handled by water transportation. These piers vary according to the service required, the local exposure to wind and water, and the geologic formation of the site. For dimensional and other pertinent information, see Code 151.

For design criteria see Waterfront Operational Facilities, NAVFAC DM-25.

151 50 REPAIR PIER (FB)

Repair piers are constructed and equipped to permit overhaul of those portions of a vessel above the waterline. These structures will normally be equipped with a gantry crane and standard-gage railroad tracks and have facilities to provide salt and freshwater, steam, compressed air, telephone and fire alarm service, and electric power for ship service, lighting, and welding. In some cases industrial gases may be provided.

For typical repair pier see Definitive Designs, NAVFAC P-272. For dimensional and other pertinent information see Code 151.

For design criteria see Waterfront Operational Facilities, NAVFAC DM-25.

151 60 SUPPLY PIER (FB)

Supply piers accommodate berthing for the transfer of materials between ship and shore. A large building or transit shed normally occupies the central portion of a supply pier. The pier width will be in direct ratio to the width of the shed or sheds, placed longitudinally down the center of the pier. For example, the shed for a ship needing 600 feet of berthing space is 150 feet wide. Transit sheds are normally placed side by side parallel with the long axis of the pier when both sides of a pier are used for shipments. The pier width should then be from 380 to 420 feet because the pier deck or apron should be from 40 to 60 feet wide to accommodate railroad track, dock truck trains and allow proper cargo handling. Space restrictions at some seacoast installations will undoubtedly dictate the construction of piers of lesser width. In such cases, transit sheds must be designed with these restrictions. Planning for supply piers at installations will usually be restricted to industrial seaport locations having a primary stock point mission. For dimensional and other pertinent information relative to supply piers other than that in the preceding paragraph, see Code 151.

For design criteria see Waterfront Operational Facilities, NAVFAC DM-25; Supply Facilities, NAVFAC DM-32.

151 70 ORDNANCE CONTAINER HANDLING PIER (FB)

An ordnance container handling pier is used primarily for the outloading and receiving of explosive ordnance in containers from non-self-sustaining container ships. This does not preclude use of the pier by conventional break-bulk or self-sustaining container ships. The pier should be sited in accordance with NAVSEA OP-5, Volume I. The services and facilities provided on the pier are lighting, telephones, fire alarms, and salt water for fire fighting. Railroad tracks are provided where the normal method of drilling containers to the pier is by Trailer on Flat Car or Container on Flat Car (TOFC/COFC). Rails are flush with pier deck surface for ease of operations when moving containers by trucks on the pier. For dimensional and other pertinent data, see Code 151 (general notes) and NAVFAC DM-25.

151 71 DEGAUSSING PIER (FB)

No criteria are currently available for this code.

151 80 DEPERMING PIER (FB)

No criteria are currently available for this code.

152 WHARVES

A wharf is an open type marginal structure for the berthing of vessels; it is usually connected to the shore at more than one point, In most cases it will accommodate berthing along the outer face only, although a portion of the inner face may provide berthing space at a shallower draft. A wharf does not have continuous access to the shore. In general, the planning criteria that apply to piers are also applicable to wharves. Either may serve the same practicable purpose, however, since their physical design and layout will be much different, their capacities for berthing and cargo handling will vary. Piers are generally preferable structures, however, certain locations will dictate the use of a wharf rather than a pier because of the marginal fairway and topography involved.

For general planning information pertinent to wharves listed under Code 152 10 through Code 152 80, see the same pier designation listed under Code 151 10 through 151 80. The corresponding category codes for wharves are as follows:

152 10 AMMUNITION WHARF (FB)
152 20 GENERAL PURPOSE/BERTHING WHARF (FB)
152 30 FITTING OUT WHARF (FB)
152 40 FUELING WHARF (FB)
152 50 REPAIR WHARF (FB)
152 60 SUPPLY WHARF (FB)
152 70 ORDNANCE CONTAINER HANDLING WHARF (FB)
152 80 DEPERMING WHARF (FB)

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153 CARGO HANDLING OR STAGING AREAS

153 10 CARGO STAGING AREA (SY)

A cargo staging area is an open hardstand for temporary storage of cargo awaiting further transshipment. For Open Storage, approximately 30,000 square feet of open storage area is required for approximately each 431 short tons, or 385 long tons, or 1,000 measurement tons of cargo on hand per month based on a conversion factor of 2.32 measurement tons per short ton. For conversion factors for different commodities see page 400-101 Average stacking height should be six feet. The square footage requirement should be established at 10% more than the space needed at peak times unless there is a wide discrepancy between the average amount of cargo on hand per month and the largest amount of cargo on hand at any one month during the last year. The square footage requirement should be established at 15% more than the average space needed in peak times if the discrepancy is recurring in nature. Average amount of receipts compared to issues per month as well as average hold time of cargo per month may be useful in developing data to support the facility requirement.

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154 SEAWALLS, BULKHEADS, QUAYWALLS

Seawalls, bulkheads, and quaywalls are shore protective structures not intended primarily for berthing vessels. Bulkheads and quaywalls have the principal advantage of affording accessibility for their entire length along the foreshore. In addition, a much greater working area normally is available at each berth for storage, laydown, and repair operations than at berths alongside piers and wharves. The ratio of berthing space to a given length of waterfront, however, is much less for bulkheads and quaywalls. The relative cost per berth is much greater for quaywalls, especially for those in deep water or at sites with poor foundation conditions. Maneuverability into a berth at a long quaywall occupied by ships in adjoining berths is more difficult than entry into a single-length pier berth. In spite of these drawbacks, a quaywall may prove to be the only choice at a site located along a river or other relatively narrow channels if the natural terrain is high along the shore, making dredging of a recessed basin for piers very expensive, or if there is insufficient width of waterway for safe navigation into finger piers projecting out at an angle from the natural shoreline.

154 10 BULKHEADS (LF)

A bulkhead is a flexible wall partition that retains earth along a shoreline. There are two general types. The most common type, which has no relieving platform, is used in relatively shallow water; the type with a relieving platform is used in relatively deep water. In addition to their function as protective boundary structures for filled areas, bulkheads are used as seawalls or as berthing facilities for the smaller classes of naval vessels. Barges, tugs, and other small yardcraft are berthed at bulkheads at the in-shore ends of slips between piers. Heavy-supply operations and ship repairs usually are not possible on bulkheads. The maximum water depth that can be provided in front of a simple bulkhead is limited to about 30 feet. The maximum water depths for bulkheads without relieving platforms is 16 to 30 feet, while the maximum depths for bulkheads with relieving platforms is 20 to 35 feet. See Definitive Designs, NAVFAC P-272. The linear footage and type of bulkheads required at any one installation would be determined by site location, topography, wind and wave action, and by the numbers and types of yardcraft for berthing.

154 20 QUAYWALLS (LF)

A quaywall is a heavy gravity or platform structure fronting on navigable water and behind which earthfill is placed to finish grade along its length. There are two general types: the open-type quaywall and the closed-type quaywall. Numerous variations exist in the design and construction of each of these two general types.

At sites having deep water or poor soil condition, quaywalls are used instead of bulkheads as retaining structures at the inshore ends of slips between piers. A quaywall will provide berthing for vessels of greater draft than can be accommodated at a bulkhead. Service classification of quaywalls, such as active berthing, repair, supply, and fitting-out are

identical with those used for piers and wharves. Quaywalls are not employed for fueling or ammunition handling operations. Open-type quaywalls have bulkheads located on the inshore face, so that piles beneath the platform structure stand in open water. Use of the open-type quaywall normally is not economical in depths greater than 40 feet. See Definitive Designs, NAVFAC P-272.

A closed-type quaywall is one in which the earthfill extends to the entire height of the wall along the harbor face. A great advantage common to all closed-type quaywalls is the flexibility and installation and relocation of tracks and services within the earthfill.

The linear footage and type of quaywalls required at any one installation would be determined by site location, topography, wind and water action, and the numbers and types of vessels for berthing.

154 30 SEAWALLS (LF)

A seawall is a structure that is built along and parallel to a shoreline for the purpose of protecting and stabilizing the shore against erosion resulting from wave action.

Seawalls are classified according to the profile of the exposed wallface and may be vertical wall, curved face, stepped face, or composite. See Definitive Designs, NAVFAC P-272.

The most economical and efficient seawall for a particular location can be determined only after a thorough study of local hydrography and meteorology 9 the amount and type of protection desired, and the character of the property to be protected. For a seawall project of sufficient magnitude, a model test is the most reliable and expeditious means of determining the effectiveness of the proposed design under the exposure conditions previously determined to exist in the area. The availability of labor and materials will have a great influence on the type of structure chosen and the materials used in its construction.

155 SMALL CRAFT BERTHING

This basic category group provides facilities supporting small craft operations.

155 10 FLEET LANDING (FB)

A fleet landing is a fixed or floating pier designed for the loading and/or unloading of a ship's personnel onto or from a personnel boat or ferry.

This facility must be in quiet water, carefully sheltered against disturbances. Water depth must be adequate for the type of ferry craft used.

155 11 FLEET LANDING BUILDING (SF)

A fleet landing building is a structure used to accommodate ship's personnel being loaded or unloaded from a personnel boat or ferry. The size and type of structure is dependent upon the average number of personnel being transferred at any one time and the type of climate in which the structure is located. In the absence of specific criteria, the quantitative requirements for the facility should be determined on an individual basis based on the experience and knowledge of the activity involved and the appropriate Systems Commands.

155 20 SMALL CRAFT BERTHING (FB)

Berthing plans at waterfront facilities will provide space for all small craft authorized by CNO/CMC. Access and maintenance mooring arrangements should include facilities for harbor and pilot launches, survey boats, work boats, special service craft, rescue boats, and other small craft. If necessary, breakwaters will be provided for shelter against wind and wave action. Small boat piers and boathouses may be planned if several craft of medium and large size are to be accommodated. For medium and larger craft, water depth must be a minimum of 6 feet and preferably 8 feet at mean low water. The pier may be designed to handle vehicles and provide turning space at the ell end of the pier. Water and electricity are required, as well as boat-fueling dispensers at the ell end of the pier. The utility services (Code 800) and fueling for small craft (Code 124 40) are provided as secondary code items.

155 21 SMALL CRAFT BOATHOUSE (SF)

A boathouse is necessary where an alert crew is required, where a boat facility is remote from the supporting activity, or where boat repair facilities are essential. Boat crew quarters or a boathouse may be programmed for those locations that justify an alert crew for the aviation rescue boats, where the boat facility is remotely located from the supporting facility, and where boat repair facilities (either Code 213-56 or 213-58

as appropriate) are required. The boathouse is programmed on the following basis:

Alert crew quarters	85 square feet per man
Office and shop space	85 square feet per man
	170 square feet per man (includes toilet and custodial space)

Plus-boat shelter of 2,970 square feet (maximum allowed, accommodates two-AVR craft).

The following facilities should be provided for: repair shops and working platforms, crew bunkhouse, toilets, mechanical equipment room, a small office, boat machine and carpenter shops, marine railway hoist or crane, covered storage, paint shop, battery shop, fuel storage tanks with pumping apparatus, water, electricity, and sail loft, if necessary. At mean low water, the depths in a boathouse shall not be less than 5 to 6 feet. The ceiling clearances shall conform to the requirements of the various craft accommodated, but they should not be less than 16 feet. Working platforms should be about 3 feet above mean high water. A boathouse roof should provide cover over walkways and berths for emergency craft.

For a typical small craft berthing facility, see Definitive Designs, NAVFAC P-272.

156 CARGO HANDLING FACILITIES - BUILDINGS

156 10 WATERFRONT TRANSIT SHED (SF)

A waterfront transit shed is a building or shed for storage of cargo awaiting further transshipment and requiring protection. For Covered Storage, approximately 8000 square feet of covered storage area is required for each 560 short tons, or 500 long tons, or 1000 measurement tons of cargo based on a conversion factor of 2.32 measurement tons per short ton. For conversion factors for different commodities see page 400-10. Average stacking height should be twelve feet.

The actual space assigned to an activity must be developed taking cognizance of many factors such as planned organization and mission changes, packaging and labeling requirements, commodity mix, local fire control procedures, MHE aisle space, etc. Therefore, the best approach to use for planning purposes is to develop a general square footage figure and then adjust that figure based on other quantitative/qualitative information available. It is recommended that the following criteria be used to develop a general square footage requirement:

a. Average amount of cargo on hand per month.
b. Average amount of receipts compared to issues per month.
c. Largest amount of cargo on hand at any one month during the last year.
d. Average hold time of cargo per month.

Basically, there are three situations that are taken into consideration for calculating the space requirements for the storage of cargo awaiting further transshipment and requiring protection. These situations are as follows:

Situation (1) A relatively uniform amount of cargo is stored each month throughout the year. Since there is relatively little discrepancy between the data obtained from a and c; the square footage requirements should be established at 10% more than the space needed at peak times.

Situation (2) A relatively uniform amount of cargo is stored each month throughout the year with the exception that there is a large discrepancy that results from a one time situation as indicated from the data in c. The square footage requirement is established as 10% more than the average actual space used per month.

Situation (3) A relatively uniform amount of cargo is stored each month throughout the year with the exception that there is a discrepancy which is recurring in nature and is predictable. The square footage requirement is established at 15% more than the average space needed during the peak times brought about by the discrepanties.

Data developed from b and d may be useful in explaining/factoring the developed requirements.

The same criteria should be used in determining space requirements for label cargo. It should be noted, however, that since quantities of label cargo on hand are usually small, modifications to existing facilities (firewalls, secure area, etc.) should be considered prior to initiating construction of new facilities.

156 20 CONTAINER OPERATIONS BUILDING (SY)

A container operations building is essential for safe direction and control of container operations to promote efficient and continuous flow to, within, and from the handling area. It is located to provide visual sighting of and two-way communication with handling operating facilities, such as shiploading, and rail track and truck corridors serving and penetrating the handling area. The building contains muster areas, locker space, toilets, lunch room facilities, and an administrative area for container operations. A 50-foot tower contains two rooms at 30-foot and 40-foot levels for visual observation of ship, rail, and truck corridors and operational facilities.

A total gross area of approximately 6,000 square feet will house 15 employees in the administration area, 100 employees in the locker room, and 125 employees in the lunch room. The tower will accommodate 12 employees in approximately 700 gross square feet. The usual remoteness of this facility may necessitate the provision of parking spaces for all employees.

159 OTHER WATERFRONT OPERATIONAL FACILITIES

This basic category group provides for facilities which cannot be coded in basic groups 151 through 156.

159 10 AIRCRAFT DOCKING FACILITY (EA)

No criteria are available for this code. It is primarily intended for inventory purposes at locations with existing seaplane facilities.

159 20 DEGAUSSING BUILDING (SF)

Degaussing is the science dealing with the methods and techniques of reducing a ship's magnetic field so that the possibility of detection by magnetic mines and other magnetic influence detection devices is minimized. It consists of two functionally interdependent installations: An underwater Degaussing Range installation (Category Code 159 21) and this facility, which serves as an instrument station. The degaussing facility records a ship's magnetic field as it passes over the Degaussing Range and notifies the ship as to what adjustments must be made to the degaussing coils on board the ship (with the exception of submarines which have none) in order to reduce the ship's magnetic field to a safe operational level. If the vessel's magnetic field cannot be sufficiently reduced because of excessive permanent magnetization, the ship is scheduled to report for deperming (the process of reduction of permanent magnetism). See Category Code 159 30 for criteria relating to a deperming facility.

159 21 DEGAUSSING RANGE (EA)

A degaussing range is an area set aside in a channel or harbor that contains submerged instruments, connected to the computer in the degaussing building (Category Code 159-20), which registers a ship's magnetic signature as it passes thru the range. The computer in the degaussing building indicates whether the internal degaussing system on board the ship is calibrated properly or, if not, what the new calibration settings should be in order to neutralize the field to within an acceptable tolerance, and the equipment is operating properly, then the ship may be scheduled for deperming.

Range Location. The range site for the degaussing facility should be carefully selected because the type of range to be installed and the method of installation depend mainly on the depth of water. The water depth will vary in accordance with the size of vessel to be ranged. The shallow range is located in 15 to 30 feet mean water depth and is used to range minesweepers and other vessels of comparable size. The medium range, which is generally 45 to 60 feet below the surface, is used for DD-s and LST's. The deep range, used for heavy carriers and the like, is located in 75 to 100 feet of water. The variation in water depth should not be greater than 10 feet for a particular range (shallow, medium, and deep). The range location should be based on the following considerations:,

(1) Depth of water.
(2) Types of sea bottom.
(3) Tides and currents.
(4) Position of range relative to range house.
(5) Navigational hazards.
(6) Heading of range (generally on a north-south magnetic heading).

The selection of a range site must be approved by local naval port authorities. Continental sites and installations must be approved by the U.S. Army Corps of Engineers. See Category Codes 159-20 Degaussing Building and 159 30 Deperming Building for additional information.

159 30 DEPERMING BUILDING (SF)

A Deperming Building is a facility that contains electrical instruments used to regulate and monitor the deperming operation.

Deperming, the second phase of degaussing, is the process by which a ship's permanent longitudinal and athwartship magnetism is removed and its permanent vertical magnetism stabilized at a low level. The deperming facility consists of a Deperming Building, which serves as an instrumentation building, a Deperming Pier, Category Code 151 80, and, if required, a generator house. The Deperming Building floor area should not exceed 2,000 gross square feet. Pier size must accommodate any size ship that requires deperming. Plans must include electrical facilities capable of providing direct current up to 500 volts and 14,000 amperes.

159 35 SOUND SURVEY FACILITY (EA)

No criteria are currently available for this code.

159 50 FERRY SLIP (EA)

A ferry slip provides the anchorage for ferries while loading or unloading. It consists of water areas directly in front of transfer bridges and is usually bordered by fender racks. The offshore waters must provide maneuvering area for the largest ferry to be accommodated. Depth of water depends on the ferries accommodated. For design criteria, see Waterfront Operational Facilities, NAVFAC DM-25.

159 64 WATERFRONT OPERATIONS SUPPORT BUILDING (SF)

A waterfront operations support building, provides support to the Ship Movement Office, Category Code 137-40, by performing such functions as maintenance and repair of small craft, including related electronics systems, and providing such facilities as a duty crew bunk room, crew's lounge, bosun's locker, berthing for small boats if an integral part of the building, space for storage of boat gear and paint, oil spill equipment and a battery charging room.

Criteria for this facility is currently not available. Actual gross square footage requirements are based upon the requirements of the facility, which depends upon the size of the port serviced, the size of the ships utilizing the port-and the frequency of movement of ships within the port and entrance channel(s).

159 66 LANDING CRAFT RAMP (EA)

The functional purpose of this facility is to provide a suitable method of loading and unloading landing craft through the bow door onto beaches without being affected by changing tides. Of particular concern in this type of operation is the possibility of the landing craft becoming grounded due to the outgoing tide. Landing craft presently in the inventory were designed for use on beaches with underwater gradients greater than 3 percent. These craft draw 3 to 4 feet of water at the bow with normal beaching loads. For instance, the LST in landing condition (10 percent fuel and 500 tons of cargo) draws 4 feet forward and from 10 to 13 feet aft, depending on the class. All LSTs are designed to ground evenly on a beach with a slope of 1 foot in every 50. In order for a landing craft not to ground with the outgoing tide, it is necessary that the ramp extend from the shoreline to within 20 feet of where the 3-foot depth of water would exist at low tide, assuming that the beach gradient is sufficient to preclude grounding at the stern of the craft. The gradient of the face of the ramp should be approximately 3:20, or about 15 percent, if the point of grounding at the bow is 20 feet from the end of the lowered bow ramp.

The most practical materials for the construction of this facility are crushed rock, gravel, or small cobbles. These materials are heavy enough to resist scour, do not lose their shear strength when saturated, and, if properly placed, are flexible enough to prevent highly concentrated loading by the hull of the craft.

The construction of a permeable timber pile groin adjacent to this facility may be necessary if the littoral or tidal currents parallel to shore cause a continuous depletion of the ramp material. If this timber pile groin is constructed, the piles should be sized so as to extend well above the high-water level, so that they do not become a navigation hazard. The groin itself, should extend slightly beyond the end of the ramp. To install an impermeable groin would cause accretion to occur behind it and a steep dropoff at the end, which is usually undesirable.

Pilings at the landing craft ramp can also be driven onshore, to the side of each ramp, to act as mooring bits. Mooring lines can be connected from the stern of the landing craft to these piles so that the engines can be shut off while loading and unloading the craft.

In locations where rock is not readily available, or after initial expeditionary landing, it may be necessary or desirable to construct a permanent rigid landing ramp out of either concrete or timber. Under such circumstances, it is usually desirable to plan the facility in much the same manner as those required for servicing ships with stern roll-on/roll-off or for ferry-type boats. Mooring facilities should be provided along the side of the craft so that the bow does not have to bear against the rigid

structure. An approach channel may require dredging. Multiple ramps shall be spaced three to four times the beam of the landing craft.

In the event that mooring dolphins are employed to secure the landing craft, it is highly desirable that they be connected by catwalks so that lines can be handled easily. The spacing of the dolphins should be compatible with the different sizes of craft using the ramp. The dolphins should be as permeable as possible so that the slips do not silt up.

It may be considered beneficial to extend a pier between two landing craft ramps in order to provide both mooring and a platform from which a crane can deck-load LST's. This type of layout is also ideal for loading and unloading barges. The pier can be constructed from small self-elevating barges, such as the Ammi barge.

159 70 DREDGE CONTROL/PUMPING FACILITY (GM)

No criteria are currently available for this code.

160 HARBOR AND COASTAL FACILITIES

This category group includes all special facilities which may be required for protecting the harbor or coast against military action. This category also includes installations for mooring vessels and marine improvements for protecting the harbor land area or coastline from current or wave action and from flood conditions.

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161 HARBOR PROTECTION FACILITIES

This basic category provides facilities for protecting the harbor against military action.

161 20 FIXED NET ANCHORAGE (EA)

Planning for the installation of a fixed net anchorage is not a peacetime function. This code is for inventory purposes only

161 30 WINCH HOUSE (EA)

A winch house is a structure used in control of harbor nets. Existing facilities may be maintained for training purposes. Planning for this type of facility in peacetime is not normally done.

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162 COASTAL PROTECTION FACILITIES

This basic category provides facilities for protecting the coast against military action.

162 10 GUN EMPLACEMENTS (EA)

Space in strategic sites is provided on-base for the installation of gun emplacements, including antiaircraft guns, for use in harbor defense.

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163 MOORINGS

This basic category provides fixed structures for mooring vessels and includes catwalks between mooring platforms.

163 10 MOORING DOLPHIN (EA)

Mooring dolphins consist of clusters of vertical timber piles in planned patterns and spacing. The piles are bound and secured by wire rope, shearing blocks, and bolts. Dolphins are used to deflect ships and assist in their alignment as the ships approach and enter a slip. Naval installations with harbor or waterfront facility requirements for mooring of small craft and ships, up to carriers, may plan for mooring dolphins to insure the safety and protection of the vessels. The number, size, and type of dolphins is dependent upon the type of vessels involved and the complexity of the approach to the slip. For typical dolphin arrangements, see DEFINITIVE DESIGNS, NAVFAC P-272.

163 20 MOORING PLATFORM (EA)

A mooring platform is an isolated structure consisting of a timber of concrete deck supported on piling. Two or more platforms are provided in line for berthing of one or more vessels alongside. Mooring platforms provide facilities beyond those points where marginal wharves or piers cease to function effectively as service or loading areas. Mooring platforms may include catwalks between each platform structure and the wharf. A berthing camel should be used between fender piles and the moored vessel. The mooring platform is shown in general plan and detail in DEFINITIVE DESIGNS. NAVFAC P-272. See Harbor and Coastal Facilities. NAVFAC DM-26, for technical design information.

163 30 STARE PILE MOORING (EA)

A stake pile mooring consists of a stake pile driven below the surface of the firm bottom of the ocean floor. A chain attached to the stake is used to moor the vessel. The advantages of using stake piles instead of anchors for moorings are that they are fixed anchorage points and that they are comparatively cheap, if a pile driving rig is available when a number are to be driven. The disadvantages are that the mooring lines do not equalize the pulls in a spread mooring; the stake pile, because it is fixed, does not absorb shock energy as well as an anchor; and finally, approval from the authority in charge of channel dredging is necessary before driving stake piles into a bottom. When dredging is required in an area where stake piles are located, there is some hazard of damaging dredge cutters. The folding capacity, size, and other design details of stake piles can only be accurately determined by an analysis of bottom soil borings and field experiments at the site. See NAVFAC drawings listed in Table 163-30, Stake Pile Drawings, for typical details.

TABLE 163-30
Stake Pile Drawings

200,000 lb stake pile, 12-3/4" O.D. pipe (std Dwg)	660853
200,000 lb stake pile, 12 BP 53 (Std Dwg)	660857
100,000 lb stake pile, 12 BP 53 (Std Dwg)	896109

164 MARINE IMPROVEMENTS

This basic category provides structures for protecting the harbor, land area, or coastline from current or wave action and from flood conditions.

164 10 BREAKWATER (LF)

A breakwater is a free-standing barrier designed to break up and disperse heavy seas and to shield the waters of a harbor from wave action. Breakwaters are planned where primary protection is necessary to create or shelter a harbor or a basin for vessels from wave action. The type and quantity of breakwater is determined by local design considerations. Types of breakwater structures are shown in DEFINITIVE DESIGNS, NAVFAC P-272. See HARBOR AND COASTAL FACILITIES, NAVFAC DM-26, for technical design information.

164 20 GROINS AND JETTIES (LF)

Groins and jetties are structures built to intercept and deflect currents to control drift and deposit of sand and silt.

Groins are generally classified according to the principal construction materials used; that is, steel sheet piling, timber, stone, or concrete. A series of groins usually extending at right angles to the shoreline will protect the beaches from erosion. A groin serves to intercept currents that cause littoral drift of sand along a beach and under favorable conditions causes the deposition of sand, so as to reduce shore erosion.

Jetties are planned at harbor entrances and channels to control unstable conditions of silting and deposit of sand caused by river flow or tidal or wave action. A properly located jetty system will encourage scouring and maintain channel depth with a minimum of maintenance dredging. Jetties are similar in design to breakwaters, but are smaller.

The types and lengths of groins and jetties will vary with local design considerations. Types and applications of groins and jetties are shown in DEFINITIVE DESIGNS, NAVFAC P-272. See Harbor and Coastal Facilities, NAVFAC DM-26, for design details.

164 30 LEVEES (LF)

Levees are earthen embankments designed to protect property from water damage during the flood stage of rivers and/or other high water. The size and length of a levee will vary with local design considerations. Levees may be justified at air installations and at other naval installation where usable property must be protected from water damage.

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165 DREDGING

Original dredging such as channel and turning basin dredging not directly related to the specific construction of a facility, is planned under Basic Category 165. Dredging performed primarily to provide fill shall be coded under Basic Category 932, Site Improvement. Dredging directly related to the specific construction of an item shall bear the same code as the item. Do not use this category code for inventory purposes.

165 10 DREDGING (CY)

Dredging is planned to provide operating channels, maneuvering area, anchorages and moving basins for ships. Generally, harbor-area depths vary. Certain areas are set aside for the use of small craft and other areas for the use of larger ships. Depth requirements for channels differ from those at anchorages and berths. No matter which area is under consideration, provisions of adequate depth and all anticipated water levels is essential. A tabulation of some of the characteristics of auxiliary and combatant vessels as well as service craft is given in Table 151-10. Where harbor design requires critical clearances for a particular vessel type or condition, specific verification by NAVSEA Ship Logistics Manager is required.

Anchorage and Berthing Depth are identical for any specific type vessel. The minimum required depth for an undamaged vessel is estimated by adding 4 feet to the maximum navigational draft for the type of vessel indicated in Table 151-10. However, in all instances, the required minimum berthing depth for all undamaged aircraft carriers, battleships and fast combat support ships is 50.0 feet. The minimum required depth for floating drydocks is determined by adding 2 feet to the maximum navigational draft for this type of vessel indicated in Table 151-10.

Channel Depths for fully operational channels protected from direct storm-wave attack are determined by using a ratio of channel depth to navigational draft. The optimum ratio of the largest vessel should be 1.3 for vessels speeds of less than 7 knots and 1.5 for vessels speeds in excess of 7 to 8 knots. At these ratios, the bottom effects on vessel handling become negligible. In many instances, these desired depths are not attainable. For general design minimum used in preliminary harbor planning, but subject to subsequent detailed analysis, use the approximation indicated as follows:

Vessel Type	Channel Depth
CV, AOE & BB	45
CG	36
Destroyers, submarines and auxiliary ships	Maximum navigational draft plus 5
Small craft	12 to 15

Channel Widths for interior channels protected from open sea water and strong coast currents are determined by the dimensions shown in Figure 165-10 where B = beam of vessel.

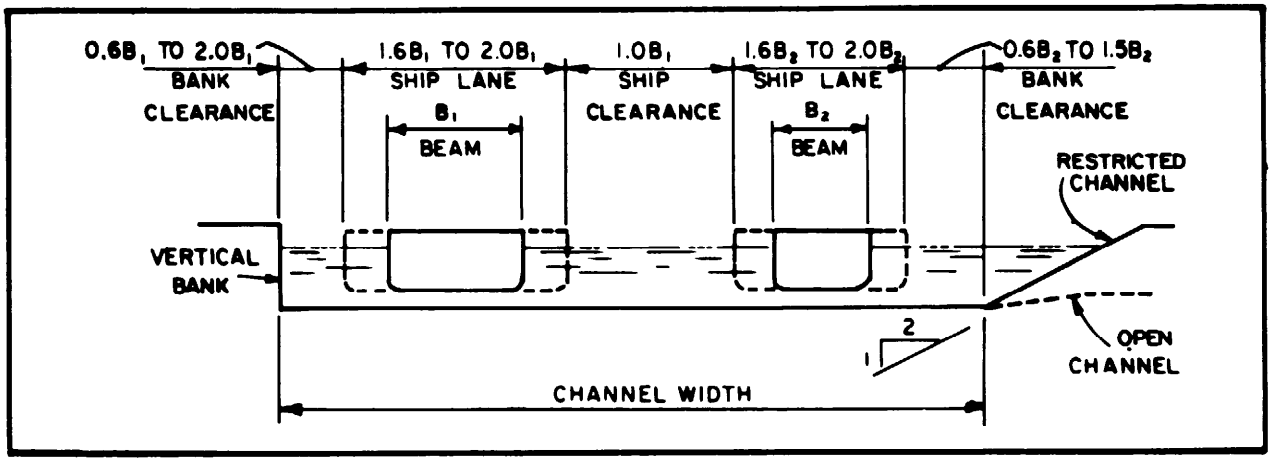

FIGURE 165-10
Dimensioning Protected Interior Channels

(1) Ship-Lane Widths. Where good operating conditions (that is, a maximum ship speed of 10 knots, currents less than 3 knots, good visibility, and wind less than 15 knots) exist, the following ship-lane widths should be used:

Vessel Maneuvering characteristics	Lane Width as a Multiple of Beam
Excellent--CG and DD	1.6
Good-FFG, CV, AOE, BB, and LSD 36	1.8
Poor--Submarines, Tenders, AE, and AS	2.0

(2) Ship Clearance. Ship clearance is normally assumed to be equal to the beam at waterline of the largest vessel. Where a channel is to be frequently used by aircraft carriers having large overhanging decks, increase the clearance between ship lanes to maximum vessel breadth.

(3) Bank Clearance. Vessels traveling in restricted waterways experience hydrodynamic suction from the banks. This is offset by rudder-angle adjustment.

In addition to rudder-angle and vessel-handling criteria, overall vessel safety must be considered in determining bank-clearance distance. In an open channel, the markings of the channel limits may not be as fully defined as in a restricted channel. This can be compounded in times of poor visibility. Similarly, where there exists a high damage probability for grounding, as in the case of an underwater rock ledge, additional bank-clearance margins should be considered. Extra allowance should also be made where the channel is subject to siltation from the side slopes. Under conditions such as those mentioned above, the minimum desired bank clearance for design purposes should be equal to the beam of the largest vessel frequenting the harbor. For open channels with steeper than l-on-3 side slopes, this minimum clearance should be 1.2 times the beam.

Anchorages and Turning Basins. Naval Activities planned for locations abutting sheltered waters of large extent but inadequate overall depth frequently require, in addition to the dredged channel access, area of sufficient size and depth for use as anchorages or turning basins. These areas in the bays or estuaries of coastal waters should be selected initially to acquire the advantages of natural channels which, in the case of anchorages, may connect widely separated but acceptable areas. Turning basins at the inboard end of dredged channels should be shaped and dimensioned with due consideration for the orientation of the wharves and for the size and turning characteristics of the ships to be accommodated. At marginal wharves, sufficient deep water must be left beyond the ends of the wharves for maneuvering from the wharf to the basin.

For a detail analysis of design requirements affecting this category code see NAVFAC DM 25 and DM 26 Series for additional information.

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169 OTHER HARBOR AND COASTAL FACILITIES

This basic category provides for harbor and entrance control points and signal towers.

169-10 HARBOR ENTRANCE CONTROL FACILITY (EA)

Permanent installations from military control of a harbor entrance are not planned for peacetime, except that a large paved area may be planned, where appropriate, as a site for layout and assembly of harbor nets and allied equipment. The layout area should be near the waterfront and accessible to mobile cranes for net and equipment handling. The area is known as the net depot and is used for net maintenance and for training in net handling.

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170 TRAINING FACILITIES

This category group covers facilities designated for the service career and reserve training of Navy and Marine Corps personnel. There are two basic categories under this code:

171 Training Buildings
179 Training Facilities Other than Buildings

There are several specialized facility types such as auditoriums, drill halls and others. Training facilities for general advancement of Navy/Marine Corps personnel, i.e., educational studies which are conducted on an individual's own initiative and time, are planned under category code 740-88 (Educational Services Office).

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171 TRAINING BUILDINGS

General. Facilities in this basic category are identified according to the nature of instruction provided. The major building types are:

1. Academic Instruction Building (Code 171 10)

This facility provides accommodations for classroom lecture instruction, using chairs with fixed table arms, tables, desks or other similar working surfaces.

2. Reserve Training Building (Code 171 15)

This facility is utilized for training Navy and Marine Corps Reserves.

3. Applied Instruction Building (Code 171 20)

This facility is used to accommodate training through the use of equipment and tools such as drafting tables, workbenches, machinery, equipment or functional systems.

4. Operational Trainer Space (Code 171 35)

This space is required to accommodate highly specialized real-life simulation training that needs specifically designed space within a building or a separate building. The size and configuration of these specialized spaces differ considerably from a typical applied instruction classroom.

TRAINING BUILDINGS

Training Buildings generally consist of three different types of spaces, classrooms, support and circulation, and service areas. The following is a description of the spaces and their components. See Table 171-A for space allowances.

1. CLASSROOM SPACES

a. General Academic Space. These classrooms devoted to lecture space are academic instruction classrooms defined under Code 171 10. Use Table 171 10 for space allowances.

b. Modified Academic Space. This space consists of a lecture-laboratory combination classroom and is used for both lectures and practical exercises involving hands-on disassembly and assembly of small training aids applicable to the subject matter. A class that requires standard office desks is included in this category. Area includes work space, circulation, teaching station and book storage. These classrooms are identified under Code 171-10.

Workbench Lecture Space. This space is for an instructional laboratory, the size of which may be only determined on an individual basis. The facility planners have to take into consideration the student/equipment/instructor ratio which determines the numbers of instructional or test equipment per student station and consequently the space requirements, For example, electronics-related training requires approximately 6 linear feet of workbench resulting in approximately 50 to 55 net SF classroom space per student station, including circulation. Individual justification must accompany EWR submittals.

d. Space for Hands-on Mockups. This space is for a classroom in which instruction is given to individual or groups of students on stationary training devices representing all or part of an operating system. The size of this type classroom is generally determined not by the number of students, but by the physical size of the equipment. Figure 171-20 under code 171-20 provides a formula which may be used to determine the required net floor space. A single line layout drawing indicating major dimensions should accompany BFR submittals.

e. Learning Centers. The learning center is a classroom utilized by students for individual study where training is conducted on a self-paced basis. It is space equipped with study carrels either designed for reading only or equipped with audio-visual training media. Since the self-paced training system has an unstructured time frame (i.e., students may use the facility whenever they have time available), the number of study carrels must be determined individually, the BFR submittal must show these calculations which should be based on the overall number of students requiring such facilities and the estimated number of students which are anticipated to use a learning center at a given time.

f. Modified Academic Classroom. This room is equipped with desks or other working surfaces in lieu of standard chairs with fixed tablet arms. Space requirements are 45 net SF per student station, including circulation. Larger areas require justification. These spaces are identified under code 171-10.

2. SUPPORT SPACES

a. Instructor's Work Space. Facilities should be provided for each instructor to perform his administrative and preparatory duties.

b. Instructor's Lounge. The fixed allowance shown in Table 171 A assumes that no more than 10 instructors will be present at one time' Reduce this area proportionally if smaller use is anticipated. An increase in space above the amount indicated requires specific justification.

c. Student Break Area. This space should accommodate the average number of students scheduled to have a class recess at any given time. It can be provided at one location or dispersed in several locations throughout the school building.

d. Library. Due to the relative complexity of library operations, required space is broken down as follows:

(1) Reading Area. To estimate the number of persons utilizing this facility, use 20% of the average on board student load.

(2) Stack Area. Allowance given in Table 171-A is based on 100 volumes per 3 linear feet section, 7.5 feet high, or 15 volumes per net square feet of floor area.

(3) Film/Videotape Storage. Allowance given in Table 171-A is based on storage of 50 reels in a section of shelving 3 feet long by 7.5 feet high in a space 3 feet wide. The width of this floor space provides for the cabinet depth plus half the width of an access aisle.

(4) Film/Video Viewing Room. This space is provided for viewing both movie film and videotape.

(5) Staff Area. Includes files, administration, reproduction space and material preparation area.

e. Administrative Space. This is space required for functions related to overall administration of the training facility in question and the allowances are governed by the number of administrative personnel. Planning procedures and net space allowances are the same as for category code 610 10 (Administrative Office), planning method 2 (detailed planning factors). The broad planning factor of 150 gross SF per occupant, under category code 610 10, may not be used because it would duplicate some of the support space allowances already provided for under this code (171).

f. Training Aid Storage. The space allowance is shown on Table 171-A.

g. Other Support Spaces not listed above must be identified separately and specific justification should accompany BFR submittals.

3. SERVICE AREAS AND CIRCULATION.

These areas represents all spaces not in direct support of the training function, including walls, rest rooms, mechanical equipment, halls and corridors.

PLANNING PROCEDURES.

Choose one of the following three methods to compute classroom net square feet space requirements.

1. AVERAGE ON BOARD

This method is straight forward. in the calculation of classroom space. requirements. The formula requires a minimum amount of information as follows:

(a) Total number of students per year for each course.
(b) Total number of days (duration) to complete the course.
(c) The proper choice of square feet per student from Table 171-A based on the type of classroom instruction.

2. CLASSROOM SCHEDULING METHOD

This method is preferred sometimes because it’s easier to picture classrooms with a set number of students and a drawn schedule. The schedule shows an overall view of the student loading per month and gaps in classroom scheduling. The following minimum information is needed:

(d) The number of students planned for each classroom.
(b) The duration of each course and the number of times taught throughout the year.
(c) A decision on whether or not the classroom can be used for other courses.

3. STUDENT TIME DISTRIBUTION METHOD

This method uses a more involved accounting system to estimate time expenditures for different types of course instruction. The method shows a detail study and breakdown of planned time distribution in labs, lectures and special applications classes. More information is required than in the other two methods

In addition to computing classroom space requirements, develop the requirements for Support Spaces separately. Convert final totals to gross square feet.

SPECIAL NOTES

1. Any construction project, regardless of funding source, submitted for authorization must be accompanied by detailed supporting documentation (broad planning factors cannot be used in lieu of detailed analysis).

2. Facility requirements for Fleet Marine Force Units are contained in P-272, Part IV.

3. Planning for training buildings shall be based on maximum utilization of available classrooms. To this end, the number and sizes of classrooms shall be determined on the basis of a detailed study encompassing curricula, group sizes, schedules, security and proximity requirements, and/or any other pertinent aspects. It is recognized that a number of subjects, especially in the applied instruction field, require extensive training aids or special classroom configurations. Every attempt must be made, however, to minimize the number of such single subject or “dedicated” classrooms, especially in those cases where their use would be relatively infrequent. Cross-scheduling of classroom use must be considered on an installation-wide basis, crossing organizational boundaries if necessary.

4. As a general rule, most training buildings will consist of a mixture of different types of instructional space (normally a combination of academic and applied instruction). For buildings of this type, thespecific applicable criteria must be utilized to plan the facility in question even though a resulting project may carry only a single category code (171 10 or 171 20). For example, an applied instruction building (category code 171 20) contains academic classrooms utilized to teach basic or familiarization aspects of an applied instruction curriculum. In such case, academic classrooms are sized using code 171 10 criteria, although on planning documentation, this space will eventually be combined with the figures for the applied instruction (code 171 20) portions of the facility.

COMPUTATION METHODS FOR COMPUTING CLASSROOM SPACE

AVERAGE ON BOARD

1. Use Figure 171-A and list the courses of instruction conducted by the Activity. List the requirements in separate categories (eg. general academic, lab-lecture, etc).
2. Show the Course Data Processing Code (CDPC), course title, and other requested information. The columns of information are defined at the bottom of the table. Information is available in the Master Course Reference File (MCRF) of the Navy Integrated Training Resources and Administrative System (NITRAS) and other sources.
3. Use the AOB formula to calculate the number of students per class.
4. Based on the type of instruction, select the proper square feet per student from Table 171-A.
5. Calculate the Required NSF for each course.
6. Add the Required NSF column to obtain the total requirements.

CLASSROOM SCHEDULING METHOD

1. Use Figure 171-B and list each course
2. Assume the courses meet all day. If a course meets during the AM hours in a room and a different course can meet in the same room during PM hours, assume one room requirement.
3. Draw a line through the number of weeks the course is held each time during the year. Show the week the course begins and ends each time.
4. Show the number of students planned for each course above the course duration line.
5. After the class scheduling is drawn, use Figure 171-C to organize the requirements. List each course, type of class space, number of students for each classroom and the square feet used to calculate requirements obtained from Table 171-A.
6. Determine whether or not the classroom requirement should be dedicated strictly for the course or if other courses can be scheduled in the same room.
7. Use one of the following formulas to calculate space requirements and show the calculation in Figure 171-C Column E or F.
8. Total Classroom requirements is the sum of Columns E and F. Separate the totals into classifications (e.g., total general academic, lab-class, etc., space).

Dedicated Classroom - This classroom has permanently installed demonstrations, mock-ups, laboratory equipment, or special teaching aids. The room is usually not conveniently set-up for teaching other courses.

Dedicated Class NSF	=	No. Pupils Per Course In Classroom	x	Table 171-A Type Class

Partial Classroom Requirement - This condition applies to courses that can meet in general classroom areas or courses that meet less than 60% of a 250 day school year.

Partial Class room Reqmt. NSF	=	No. Pupils Per Course in Class room	x	Table 171-A Type Class Sq Ft	x Tot. Course Days Per Year / 250 School Days

School Year = 250 class days per year.

STUDENT TIME DISTRIBUTION METHOD

1. Use Figure 171-D to enter information.
2. Organize the list of planned courses according to the anticipated number of students in each classroom.
3. Group the courses in descending class sizes (e.g. classes with 40, 30, 20, students etc.) in Columns A and B.
4. Show the course duration in number of weeks. Use fractional weeks as necessary.
5. In Columns E, G, I, and K show the estimated percentage of time spent in each type of class (e.g., 50% lecture, 50% lab).
6. In Columns F, H, J, and L, show the equivalent weeks per year for the types of instruction (e.g., Col F = (C) x (D) x (E)
7. Total the weeks in Columns F, H, J, and L.
8. Organize the data according to types of instruction and class sizes as shown in the example Figure 171-D.
9. Calculate the classroom sizes from the square feet allowances per student shown in Table 171-A. For example, to calculate a general academic classroom for 8 students, use 22 sq ft from Table 171-A, which refers user to Table 171-10. Therefore, 8 x 22 = 176 sq ft. Use the same calculation method for labs and the other types of classroom spaces.
9. The totals in the Classroom Computation Schedule show the number of classrooms and net square feet.

FIGURE 171-A
Classroom Space Requirement Computation

COURSE CDP	COURSE SHORT TITLE	DURATION IN DAYS (DD)	ANNUAL FREQUENCY (AF)	PUPILS PER CL (S)	ANNUAL INPUT (AI)	STUDENT AOB*	NSF PER STUDENT (NSF)	REQUIREMENT NET AREA**
TOTAL STUDENT AOB AND TOTAL REQUIREMENT IN NET SQ. FT.								

$$\text{Student Average on Board (AOB)} = \frac{\text{Duration (DD)} \times \text{Annual Input (AI)}}{\text{250 (Classroom Days Per Year)}}$$

$$\text{Required NSF Area} = \text{AOB} \times \text{NSF} \times 1.5$$

Round all Fractions to the next highest whole number
School year = 250 class days

NSF = Select proper square feet per student from Table 171-A according to type of installation
CDP = Course Data Processing Code
DD = Duration of course in actual classroom days
AF = Number of times course is taught per year
AI = Number of students trained annually AI = (AF) x (S)

1.5 = A utilization factor required to compensate for the inability to completely schedule classes and fully use classroom capacity.

FIGURE 171-B
Classroom Scheduling Method

Type of Training Space: Various

COURSE TITLE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	REMARKS
AN/xyz	15		15		15		15		15		15		
BB Applied	10		10		10		10		10		10		
CD Lab		6		6		6		6		6		6	
Total Student Loading/Month	25	16	25	16	25	16	25	16	25	16	15	6	

Figure 171-C
Calculation Summary - Scheduling Method

(A) Course Desc	(B) Type of Class	(C) No. of Pupils Per Class	(D) Sq Ft Used Table 171-A	(E) Dedicated Room Sq Ft	or (F) Partial or Gen Class Sq Ft
AN/xyz	Lecture	15	22		330
BB Applied	Mod Lec	10	30		300
CD Lab	Lab	6	45	270	
TOTALS				270	630

Grand Total = 900 nsf

FIGURE 171-D

Course Data and Student Time Distribution

COURSE TITLE (ARRANGED BY DECREASING CLASS SIZE) A	CLASS SIZE B	FREQUENCY OF CLASS PER YEAR C	DURATION OF CLASS IN WEEKS D	% TIME IN GENERAL ACADEMIC CLASSROOM OR LECTURE SPACE E	WEEKS PER YEAR (F=CxDxE) F	% TIME IN MODIFIED ACADEMIC CLASSROOM OR MODIFIED LECTURE SPACE G	WEEKS PER YEAR (H=CxDxG) H	% TIME IN WORK-BENCH TYPE SPACE I	WEEKS PER YEAR (J=CxDxI) J	% TIME IN HANDS-ON-MOCKUPS K	WEEKS PER YEAR (L=CxDxK) L	% TIME ELSEWHERE M

Explanation:
- Column B - Projected student loading for the designated class
- Column C - Number of times per year course is offered
- Column D - Individual course duration in weeks
- Column E G I K - Percentage of actual student's instructional time spent in the various classroom types
- Column F H J L - Requirements of that particular class room size and type by number of weeks

EXAMPLE FIGURE 171-D
Course Data and Student Time Distribution

(NOTE: Same column headings as Figure 171-D)

COURSE TITLE (ARRANGED BY DECREASING CLASS SIZE) A	B	C	D	E	F	G	H	I	J	K	L	M
AAA - 0000	40	25	.4	100%	10							
ABC - XXXX	40	10	2	100%	20							
40 PN Totals					30							
DEF - XXXX	20	6	2	50%	6	50%	6					
GHI - YYYY	20	3	10	100%	36							
JKL - 1234	20	5	10	50%	25	20%	10			30%	15	
MNO - 6250	20	2	5	25%	3	50%	5	25%	3			
PQR - 1111	20	50	.6	100%	30							
29 PN Totals					100		21		3		15	
ABD - 0001	10	5	10	100%	50							
" - 0002	10	2	20	50%	20	50%	20					
" - 0003	10	25	1	100%	25							
" - 0004	10	50	.4	100%	20							
10 PN Totals					115		20					

Explanation:
- Column B - Projected student loading for the designated class
- Column C - Number of times per year course is offered
- Column D - Individual course duration in weeks
- Column E G I K - Percentage of actual student's instructional time spent in the various classroom types
- Column F H J L - Requirements of that particular class room size and type by number of weeks

CLASSROOM COMPUTATIONS
Refer to Figure 171-D

CLASS SIZE	TOTAL WEEKS PER YEAR REQUIRED	÷	50 WEEKS PER YEAR	=	COMPUTED* CLASSROOM REQUIREMENT	ACTUAL** CLASSROOMS REQUIRED		SIZE***		NET SQUARE FEET
GENERAL ACADEMIC CLASSROOM OR LECTURE SPACE										
40 PN	30	÷	50	=	.6	1 Ea	x	800 NSF	=	800
20 PN	100	÷	50	=	2.0	2 Ea	x	440 NSF	=	880
10 PN	115	÷	50	=	2.3	3 Ea	x	220 NSF	=	660
				Total	4.9	6 Ea				
MODIFIED ACADEMIC CLASSROOM OR MODIFIED LECTURE SPACE										
20 PN	21	÷	50	=	.4	1 Ea	x	20 PN x 45 NSF	=	900
10 PN	20	÷	50	=	.4	0				
				Total	.8	1 Ea				3240 NSF

Workbench type space
(Use Individual Justification)
Hands-on-Mock-ups
(Use Formula in Figure 171-20)

* Allows for Holiday stand downs and scheduling flexibility.
** Actual classrooms required must equal or exceed computed classroom requirement. Number of required classrooms must take into account the excess time available in larger size rooms, i.e., smaller classes can use available excess time in larger rooms.
*** Size data follows Table 171-A.

TABLE 171-A
Space Allowances for Instruction Facilities

TYPE OF SPACE	MAXIMUM ALLOWANCES
1. CLASSROOM SPACE	
a. General Academic	Use Table 171 10 allowances
b. Modified Academic Space	30 net SF per student station
c. Lecture-Lab Space	45 net SF per student station
d. Modified Academic with office desks	45 net SF per student station
c. Workbench Type Space	Individual justification required
d. Hands-On Mockup Space	Use formula given in Figure 171 20
e. Learning Centers	40 net SF per student station
2. SUPPORT SPACE	
a. Instructor's Work Space	60 net SF per instructor
b. Instructor's Lounge	450 net SF fixed allowance
c. Student Break Area	6 net SF per student
d. Library	
(1) Reading Area	25 net SF per person
(2) Stack Area	6.6 net SF per 100 volumes
(3) Film/Videotape Storage	9 net SF per 50 reels or cassettes
(4) Film/Video Viewing Room	100 net SF fixed allowance
(5) Staff Area	10% of sum of reading stack, film storage and viewing areas
e. Administrative Space	Use category code 610 10 detailed criteria
f. Training Aid Storage	1.5 net SF per student station
g. Other Support Spaces	Individual justification required
3. CIRCULATION AND SERVICE AREAS (Net to Gross Conversion)	Multiply NSF by 1.33

Note: Student station is defined as a classroom seat or shop workbench area designed to accommodate one student.

171 10 ACADEMIC INSTRUCTION BUILDING (SF)

A facility dedicated entirely to academic instruction will seldom be planned. In most cases, instruction of this type will be part of another training function, such as at a Service School or conducted in some other type of applied instruction building. The criteria for this type facility is based on net classroom square feet per student seat.

For planning purposes, academic classrooms can be divided into two general categories:

1. General Academic Classroom - is one which supports approved training programs and provides accommodations for classroom lecture instruction, using standard chairs with fixed tablet arms or a similar seating configuration providing the student a writing surface and book depository. An instructor station is provided, with space for the use of portable training aids.

The individual general academic classroom sizes in net square feet (i.e., within the interior walls of the room), as dictated by the required number of seats, shall not exceed the figures given in Table 171-10.

2. Modified Academic Classroom - is one which is equipped with desks or other working surfaces in lieu of standard chairs with fixed tablet arms.

PLANNING STEPS

The number and size of individual classrooms must be determined in accordance with the general guidelines given under the topic Planning Procedures in the preceding general section for Basic Category 171.

GROSS SQUARE FEET - BROAD PLANNING

The space allowances for general and modified academic classrooms represent net classroom space only. The requirements for supporting spaces must be calculated separately in order to obtain gross SF building area. This may be done by either one of the two alternate methods:

1. In the absence of detailed data during early stages of planning, the gross SF building area (including all necessary support space) shall be computed as follows:

a. In cases where the training building is composed entirely of general academic classrooms, use the broad planning factor of 45 gross SF per student station for the entire building.

b. In cases where some or all of the classrooms are of the modified academic classroom type, by using the broad planning factor of 75 gross SF per student station for the entire building.

2. In cases where, within an academic training facility, a number of classrooms must be modified to accommodate working surfaces different than standard chairs, the net area for such modified academic classroooms may be increased. For instance, modified academic classrooms (with standard office desks) will require approximately 45 net SF per student station, including circulation. Larger increases will require specific justification.

a. Maximum consideration must be given to provide a variety of classroom sizes in order to optimize space utilization.

TABLE 171- 10
Space Criteria for General Academic Classrooms

No. of Seats	Sq Ft per Seat	No. of Seats	Sq Ft per Seat
20	22	81 to 90	17
30	21	91 to 100	16
40	20	101 to 120	15.5
50	19.5	121 to 140	15
60	19	141 to 160	14.5
70	18.5	161 to 180	14
80	18	over 180	14

171 15 RESERVE TRAINING BUILDING (SF)

See 171 Supplement - Naval and Marine Corps Reserve Training Facilities (at the end of code group 171 text) for applicable criteria.

171 17 TV CENTER FOR INSTRUCTIONAL MATTER. (SF)

This facility may be provided only when specifically authorized by CNET. Requirements will be determined for each individual case, with CNET guidance.

171 20 APPLIED INSTRUCTION BUILDING (SF)

This facility provides for training personnel through the applied use of technical equipment and tools. Some of the characteristic features of applied instruction classrooms are:

- The use of drafting tables
- The use of workbenches to train personnel in trade/specialized skills such as electronics, machine tool operation, welding and similar.
- The use of operational training machinery such as automotive or other engines, refrigeration equipment, etc.
- The requirement for complete functional systems such as weapons delivery systems, fire control systems, etc.

For planning purposes, applied instruction facilities can be divided into two general categories:

1. General Applied Instruction Facilities (for example, Service School Shops and Laboratories).

2. Specialized Applied Instruction Facilities (for example, Multi-engine Patrol Plane Training Building).

Facilities for each category must be planned separately because planning methodologies are different for each group. General applied instruction facilities have flexible space allowances and must be planned to individually suit the type of instruction to be accommodated. Specialized applied instruction facilities have fixed space allowances. In the following text, each category is discussed separately.

BROAD PLANNING FACTORS

1. GENERAL APPLIED INSTRUCTION FACILITIES. The gross SF building area (for BFR purposes) may be computed by either one of the two alternate methods:

a. In the absence of detailed data or when close approximation to precise requirements is not considered necessary, the gross building area should be computed based on 150 gross square feet per student station.

b. If specific personnel data is available follow the planning procedure and table given under Basic Category 171 and 171-20.

Figure 171-20 provides a method to calculate floor area requirements for hands-on mockup training devices.

FIGURE 171-20
Planning Formula for Determining Floor Requirements
for Hands-on Mockup Space

FORMULA: A = B (CD + E)

DEFINITIONS

A= Area of classroom in net SF

B = Number of items of practice equipment required. This figure is obtained by dividing c into the average number of students in each class session.

C = Number of students assigned to each item of practice equipment.

D= Net SF of floor area required for one student working on an item of practice equipment.

E= Net SF of floor area occupied by one item of practice equipment. Includes clearances and aisles. Human engineering factors, including safety, must be considered. In cases where student working areas (item D) partially overlap equipment clearance areas, insure that the space requirements are not duplicated.

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2. SPECIALIZED APPLIED INSTRUCTION FACILITIES. This category includes facilities designed for training in specialized functions requiring a dedicated building. Space allowances are either fixed or given in gross SF per student and in every case includes all necessary support spaces, such as administration, lounges, training aid storage, library space, reproduction areas, learning centers, toilets, showers, locker rooms, corridors, and janitorial space. For some of the facilities listed below which require a specific building configuration, definitive designs have been prepared. Those cases are annotated in the text. For design criteria also see NAVFAC DM-27.

a. Flight Training and Briefing Building. This building provides space for student pilots in support of direct flight training. Included in the allowance is space for lecture rooms and classrooms, instructor pilot offices, ready rooms, flight planning rooms, briefing rooms, and other support space. The facility provides the necessary space for interaction of student and instructor in briefing and debriefing of actual training flight, singly or in groups. This space is over and above the space requirements for extensive classroom, instrument trainer or flight simulator training which are covered in other category codes or in other sublistings under this category code. Also, this space is in addition to the normal squadron administrative space covered under category code 211 07. The planning factor for Flight Training and Briefing Building is.125 gross SF Per student, based on the average on-board student load.

b. Naval Air Maintenance Training Building. Naval Air Maintenance Training Buildings provide the necessary classrooms and other space in support of one or more Maintenance Trainer Sets (MTS's). MTS's,

consisting of instructional items as displays, actual systems/subsystems/ equipment/parts/materials, cut-aways, mock-ups, audio/visual aids, provide maintenance personnel and pilots with technical training on aeronautical systems and associated equipment, organizational and intermediate maintenance, operation and special techniques as applied to aircraft subsystems, missiles and specific equipment and other training as the Chief of Naval Operations may direct.

The planning factor for the Naval Air Maintenance Training Building is 160 gross SF per student. The number of students for planning purposes shall be the average on-board student loading.

Highly sophisticated new weapon systems may require more space than-would be computed on the basis of 160 square feet per student. The facility or site study prepared for each new weapon system provides the necessary information for making such determination. When the maintenance training space requirement is found to exceed 160 square feet per student, the requirements shall be fully documented, to include data relative to size of trainers, students per trainer, support space requirements and other pertinent matters to enable evaluation of the actually required gross area.

c. Fleet Readiness Aviation Maintenance Personnel (FRAMP) and Aircrew Learning Center. This facility provides classrooms, briefing rooms and environmentally protected FRAMP practical training work areas to support initial and recurrent training for fleet aircrew (pilots, Naval Flight Officers, and when applicable, enlisted crew members) and aircraft maintenance personnel. Gross area requirements vary with model of aircraft and student loading and must be determined for each individual case. Although FRAMP and aircrew training facilities can be separate, integrated facilities permit efficient utilization of classrooms, study carrels, media reproduction and support areas and administrative spaces. Simulator facilities (code 171 35) may be attached to this building.

d. All Weather Training Building. The all-weather training building provides the necessary space to house the special devices used by pilots, crewmen, and ground controllers to maintain their operating proficiency for adverse weather conditions. The planning factor for this facility is one (1) standard all-weather training building for an all-weather training station supporting two or more all-weather squadrons. The standard all-weather training building has an area of 7702 gross SF. The building contains six classrooms of about 600 square feet each to house special devices, a map-making room, support spaces and space for routine maintenance and equipment testing. See NAVFAC P-272.

e. Multi-enqine Patrol Plane (VP) Training Building. This facility houses special devices and gear used by patrol pilots and crewmen to maintain proficiency in submarine search and detection, aircraft and missile detection, and the employment of counter-measures against enemy radar. The planning factor is one (1) standard multi-engine patrol plane training building for a patrol plane station with a mission for continuous support of two or more patrol squadrons. The facility has an area of 26,120 gross SF, and contains 23 classrooms (18 feet by 22 feet average size), support spaces, and a lecture-demonstration hall. See NAVFAC P-272.

f. Aviation Physiological Training Building. This building provides classroom and support space for implementation of the aviation physiology training syllabus. The syllabus pertains to aeromedical aspects of night vision, acceleration and deceleration forces, explosive decompression, oxygen equipment, pressure suits, survival, protective and safety equipment. The planning factor is one (1) aviation physiological training building for each station that will support four carrier. air groups or the equivalent of one HATWING OF VAH jet aircraft. The building is planned with the concurrence of NAVMEDCOM. The size of the building is 15,000 gross SF.

g. Delivery Retaining Detachment Building. This facility provides refresher training for teams that handle and maintain special weapons and for pilots and crews assigned special weapons missions. The planning factor is one (1) delivery retraining detachment building for each air station supporting operational units with a special weapons capability. The building has an area of 1,590 gross SF. See NAVFAC P-272.

h. Band Practice Facility. This facility accommodates all band functions. It includes rehearsal studio, recording rooms, practice rooms composing rooms, instrument repair shops, and support spaces. Space allowances in gross square feet are as follows:

20 to 35 piece band	8,500 SF
45 piece band	9,000 SF
60 piece band and over	10,000 SF

l. Naval Construction Battalion Unit (CBU) Facility. This facility provides a construction unit contingency augmentation capability to the Naval Construction Forces and assures unit and individual skill training essential to required readiness posture. Space requirements may be satisfied by a single or multiple building configuration. Facilities of this type will be planned only at locations designated by higher authority. Space allowances for CBU’s are given in Table 171-20A.

TABLE 171-20A

Space Criteria for Naval Construction Battalion Units

Functional space	Notes	Gross Sq Ft	Gross Sq M
Administration		1,460	136
Engineering Lab		570	53
Locker/Showers	(3)	1,000	93
Classroom/Workbench		1,060	98
Classroom/Academic		580	54
Equipment Maintenance Shops	(1)	4,400	409
Vertical Shops (BU/SW/CE/UT)	(2)	4,000	372
Central Tool Room (CTR)	(2)	2,940	273
Project Material Storage (MLO)	(2)	2,540	236
Greens Issue/782 Issue	(2)	810	75
TOTAL GROSS AREA		19,360	1,799

Notes: (1) Based on three equipment repair bays.

(2) Definition for the abbreviations used in this criteria are as follows:

BU	= Builder
SW	= Steelworker
CE	= Construction Electrician
UT	= Utilitiesman
CTR	= Central Tool Room
MLO	= Construction Project Material Storage (operated by the Materials Liaison Officer)
Greens/782 Issue	= Organizational Clothing/Gear Issue

(3) Total Gross Area includes both men and women.

j. Combat Training Pool/Tank, Enclosed. This facility provides an enclosed pool/tank for instruction in swimming and survival under combat conditions. It generally includes the pool and supporting spaces, such as locker room, instructional deck, mechanical room, etc., however the actual composition of individual facilities may vary according to their particular training requirements. A recruit training pool may utilize typical swimming pool design criteria as found in Definitive Designs NAVFAC P-272 and Morale, Welfare, and Recreational Facilities, NAVFAC DM-37, however, unique pool/tank design considerations may be required for special&d training facilities such as aviators' survival training tanks and EOD/underwater demolition training. For general planning criteria, See Category Code 179-55.

171 25 GENERAL PURPOSE AUDITORIUM (SF)

An auditorium may be authorized when required as an adjunct to training or other functions (except administration). The primary purpose of the auditorium is an assembly area for instruction and training. General purpose auditoriums will not be planned at an installation where a motion picture theater is authorized except where justified by special circumstances. Seating capacity of an auditorium is to be determined in each specific case and justification provided. The size of an auditorium shall be calculated based on 12 square feet per seat gross floor area or 9 square feet per seat net floor area (in cases where auditorium is a part of a multiple use building sharing common circulation and service spaces).

171 35 OPERATIONAL TRAINER FACILITY (SF)

This category is assigned to training space which meets one or more of the following criteria:

1. It houses large operational trainers, usually duplicating part or all of surface or air weapons system.

2. It is specifically designed and sized for a trainer; has characteristics such as high ceiling height, large room dimensions, and removable exterior wall panels to facilitate servicing; it may also include special design features to satisfy stability requirements of visual systems, unique environmental control requirements (HVAC & filtering), loads associated with motion base(s), and abnormal power requirements.

3. Actual space requirement is dictated by the size of the trainer rather than student loading.

Examples of the type of trainers which should be categorized under this code area:

a. Weapons System Trainer/Flight Simulator.
b. Part-Task Trainer (air).
c. Cockpit Procedure Trainer.
d. Instrument Trainer.
e. Mock-ups of ships and submarines and their associated armament.
f. Full scale models of ships boiler rooms.
g. Full scale mock-up of a Polaris tube.
h. Full scale mock-up of a Tartar Launcher.
i. Large scale models of water basins for practice of berthing procedures.

Space which houses small trainers, such as radios, etc., is not categorized under this code, even though the trainers are operational. Use Category Code 171 20.

As space for operational trainers may occur as either a separate facility or as a wing or room of an applied instruction building, the following method of assigning the appropriate category code shall be used.

In the case of a building to be used solely for the housing of a trainer and its required support space, the entire building shall be categorized as 171 35. The support space includes corridors, storage, briefing rooms, offices, mechanical room, and the like.

In the case of an operational trainer meeting the requirements for this category and which can be or is suitably located in space which is part ‘of a large instruction building, the room housing the trainer shall be categorized as 171 35, Space used solely for the support of the trainer such us storage, briefing room equipment, repair room, etc., shall also be assigned the 171 35 Category Code. However, if any of the above space or any other support space such as administration offices, lounges, staff offices, etc., is used jointly for the operation of the trainer and the instruction given in the rest of the building, the support space shall be given the category assigned to the building, usually 171 20.

Planning factors are given for a limited number of operational trainer facilities. Others will be added as they are developed. Where planning factors are not available, space requirements must be fully justified. Room sizes, size of trainers, and support space should be listed, and the justification should be accompanied by drawings.

Flight Simulator Space. This facility houses the Flight Simulator/Weapon System Trainer (WST) and associated Part Task Trainers (PTT). It is planned for stations supporting naval aircraft and is sized depending on aircraft type and average number of squadrons on-board. The total number of organizational units permanently assigned plus the average number of organizational units of rotational and special aircraft on-board shall be used for planning. Table 171-35A provides information on the gross areas required. The 6,000-square-foot area for example, will contain the following basic components:

(1) Trainer Room. An air conditioned room of 50 by 50 feet minimum size, to house the necessary equipment of one (1) Weapon System Trainer (WST).

(2) Briefing Room. A classroom to house a maximum class of 20 pilots at 20 square feet per man.

(3) Administration. Office space for the officer-in-charge and two assistants.

(4) Maintenance Shop. A 20- by 15-foot space for the periodic maintenance of the test equipment.

(5) Mechanical and Electrical Equipment Room. Space of about 15 by 20 feet for the heating, air conditioning, and electrical distribution panels.

(6) Part Task Trainer Rooms. A minimum of two rooms of 20 by 20 feet for the housing of two Part Task Trainers (PTT).

The other sizes will have similar requirements.

TABLE 171-35A
Flight Simulator Trainer Space Requirements

Type of Squadron	Number of Squadrons	Number of Trainers	Gross Area (sq ft)
VA/VF/HS/HM	2 - 8	1-WST, 2-PTT	6,000
VA/VF/HS/HM	9 - 15	2-WST, 2-PTT	7,500
VA/VP	1 - 4 (VS) 1 - 2 (VP)	1-WST, 2-PTT	9,000
VS/VP	5 - 8 (VS) 3 - 5 (VP)	2-WST, 4-PTT	12,000

Instrument Trainer Space. This facility houses instrument trainers and cockpit procedure trainers. The size of this facility is based upon the number and type of aircraft squadrons or attack carrier air wings (CVW). Table 171-358 provides information on the gross area requirements. Included is space for: administrative office, briefing room, technical order library, storage room, equipment maintenance shop, mechanical equipment room, and trainer room. In using Table 171-358, the total number of permanently assigned organizational units on-board shall be counted.

TABLE 171-358
Basic Instrument Trainer Space Requirements

Type of Unit	Number of Units	Gross Sq Ft
VP, VS, or AEW squadron	1 squadron 2 squadrons	5,000 8,000
CVW of VF/VA/HS/HM	1 or 2 wings 3 or 4 wings	5,000 8,000

171 36 RADAR SIMULATOR FACILITY (SF)

This facility may be provided only when specifically authorized by CNT. Requirements will be determined for each individual case, with CNT guidance.

171 40 DRILL HALL (SF)

Need for this facility must be determined on an individual basis and requires specific justification, This code is generally intended for inventory purposes.

171 45 MOCK-UP AND TRAINING AID PREPARATION CENTER (SF)

This facility may be provided only when specifically authorized by CRT. Requirements will be determined for each individual case, with CNT guidance.

171 50 SMALL ARMS RANGE -- INDOORS (SF)

An indoor small arms range provides training space for the use of pistols and small caliber (22) rifles. Ranges will be used by all services on a joint basis when feasible, and they must be of sufficient size and capacity to provide continual training and retraining for all military personnel that require weapons training/qualification.

The capacity of existing ranges or new requirements can be determined by:

1. Identifying the number of personnel to be trained.

2. Establish the number and size of training sessions.

3. Determine the number of hours per session and schedule training over an annual basis.

4. Calculate the required number of firing points based upon efficient arrangement of the size and schedules of the training groups.

In the absence of detailed information compute the number of firing points based upon the number of military personnel requiring weapons qualification in accordance with the following tabulation:

Military Strength	Number of Firing Points
up to 2,000	6
3,500	10
5,000	13
7,000	15

Indoor ranges are generally planned at locations where prevailing weather conditions seriously interfere with the scheduling of training. Otherwise, plan for outdoor ranges (Code 179 40).

For indoor range design and design and safety criteria SEE NAVFAC W-27.

171 60 RECRUIT PROCESSING BUILDING (SF)

A recruit processing building is a facility for receiving, examining, and outfitting recruits. The processing building must provide space for the complete orientation, examination, and processing (medical, dental, supply, administrative) of all newly inducted and recruited personnel. The size of the facility will be determined by an engineering survey.

171 77 TRAINING MATERIAL STORAGE (READY ISSUE/SHOP STORES/MISC) (SF)

Storage facilities for miscellaneous goods or equipment related to training facility support will be provided only where it can be individually justified. There are no criteria for this type of facility. General information on storage parameters is provided in Category Code 440 series.

NAVAL AND MARINE CORPS RESERVE TRAINING

This section provides planning criteria for Air and Naval/Marine Corps ground Reserve training facilities. Also included in this supplement is a discussion of support facilities required, with either the criteria provided or with a reference to the applicable criteria found elsewhere in this publication. The contents of this supplement are as follows:

I. AIR RESERVE FACILITIES
II. A. NAVAL SURFACE RESERVE
B. MARINE CORPS GROUND RESERVE FACILITIES
C. MARINE CORPS RESERVE VEHICLE AND MAINTENANCE TRAINING FACILITY
D. PARKING CRITERIA
III. RESERVE NAVAL CONSTRUCTION FORCES (RNCF) Facilities
IV. RESERVE FORCES FACILITIES FUNCTIONAL GUIDANCE

Applicability of Category Code Numbers. The category code number applicable to the basic reserve training facilities is 171 15. This number must be assigned to all Air Reserve Training Buildings (discussed under paragraph I-A) and Naval Surface Reserve and Marine Surface Facilities (discussed under paragraph II). All other facility types (e.g., Quarters, Dining Facilities or other) must carry the category code number which is assigned to the general respective facility types as given in NAVFAC P-72.

I. AIR RESERVE FACILITIES

A. Air Reserve Technical Training Building. This facility provides an academic and general instruction facility for aviation technical training. It is specifically designed to accommodate the classroom technical training, training devices, administration and instruction features involved with the various training programs for Naval and Marine Corps Reserve aviation personnel.

1. Space Criteria. Space allowance for this facility will be based on mission requirements and will be determined in accordance with assigned personnel at each location, student loading, functional areas authorized such as classrooms, laboratories, shops, administration, or similar spaces, and capability to schedule classes, including weekends. Following are guidelines for some specific types of spaces:

(a) General Academic Classrooms. Definition of this classroom type and net space allowances are identical to those for category code 171 10, Academic Instruct ion Building. Use Table 171 10 to determine net square feet of classroom space requirements. For planning purposes and in the absence of specific supporting space data, the gross area may be estimated by multiplying the total net classroom area by a factor of 1.20. This gross area now includes, in addition to the classrooms, space for operational storage, toilets, corridors, mechanical equipment, staircases, walls and partitions.

(b) Technical Training Classrooms. Space allowance for classrooms in which technical equipment is used for training will be individually determined and based on equipment size, student loading, and support areas such as storage, toilets, libraries and similar spaces. Sufficient back-up

data and calculations shall be provided including number, seating, capacity and square footage of classrooms, shops, or laboratories required per course. Provide drawings showing seating arrangements, size of trainers, etc. To compute space for corridors, walls, partitions and mechanical equipment, use a multiplier of 1.20 to convert net area to gross area.

(c) Administrative Spaces. Space allowance for staff offices and administrative personnel will not exceed 150 gross square feet per person. This includes net off ice areas, files, conference rooms, storage, lounges, other office related space, circulation, walls and partitions.

B. Bachelor Personnel Quarters

1. General. Quarters will provide adequate accommodations for permanent party, students, transients, Active Duty for Training (ACDUTRA), and weekend drill personnel assigned to Reserve air stations. However, personnel being paid basic allowance for quarters (BAQ) are considered adequately housed. Vacant rental efficiency apartments in the civilian community priced with the BAQ, are also considered as assets in determining the programming deficit. The requirements for quarters therefore will vary with the mission and location of the activity.

2. Bachelor Enlisted Quarters (BEQ's)

(a) Design Capacity. The computation of requirements must take cognizance of family housing requirements for active duty personnel to insure against double counting. The programming limit for quarters at a given activity is equal to 90 percent of the authorized projected assigned permanent party strength, including tenant activities where applicable, augmented by ACDUTRA and weekend drill personnel and, where applicable, by the average daily strength of students, transients, trainees, and rotational personnel, less the number of enlisted personnel who are married and accompanied by dependents and are eligible for family quarters. Activities whose transient population is unknown or where no experience figure is available, may use ten percent of the permanent party activity strength for computing transient strength. Programming requirements for quarters are based on the average on-board count' of Reservists on two-week ACDUTRA and weekend drill personnel who live outside a 50-mile radius from the drill site. See Table 171-S.

Requirements for enlisted quarters for Reservists will be based on an economic analysis of constructing on base versus contract billeting with commercial establishments.

TABLE 171-S1
Summary of Planning Requirements for Bachelor Quarters

Type Personnel	Design Capacity
Permanent Party	90% of Authorized
Students, Transients, Rotational	100% Average Daily Strength
Reservists: ACDUTRA and Weekend Drill	100% of average on-board count of reservists on two-week active duty and active duty plus. drilling Reservists who live outside a 50-mile radius from the drill site.

(b) Space Criteria. Generally, Reservists assigned to an installation for more than 8 weeks are considered as Permanent Party personnel. and are assigned more spacious quarters than Reservists with less than 8 weeks assignments.

The following space allowance criteria applies to New Construction or Rehabilitation of Existing Housing.

Reservists assigned to installations more than 8 weeks - Permanent Party, transient personnel and enlisted Reservists assigned to an installation for more than 8 weeks are considered as Permanent Party personnel and subject to the space allowances provided under Category Code 721.

Reservists assigned to installations for less than 8 weeks - Active Duty for Training (ACDUTRA) weekend drilling personnel and enlisted personnel in a travel status assigned to an installation for less than 8 weeks are considered as transient personnel and subject to the following space allowances:

Grade E2-E6: Rooms with a net living area of 180 square feet, two person per room. Connecting bathroom provided each two rooms.

Marine Corps personnel in the Grade of E6 are considered as staff NCO's and are provided facilities comparable to Grades E7-E9.

Grade E7-E9: Rooms with a net living area of 180 square feet, one person per room. Connecting bathroom provided each two rooms.

Rehabilitation of Existing Housing specifically to accommodate non Permanent Party ACDUTRA and weekend drill personnel shall comply with the following:

Grade E2-E6: Rooms with a net living area of 85-90 square feet per person. Maximum four persons per room. Gang heads which will serve eight rooms will be provided.

Grade E7-E9: Rooms with a net living area of 85-90 square feet per person. Two persons per room. Gang heads which will serve eight rooms will be provided.

3. Bachelor Officers' Quarters (BOQ's)

(a) Design Capacity. The programming limit for a given i&allation will be equal to the authorized projected officer strength, including tenant activities where applicable, augmented by Reserve, student, transient, and rotational personnel, less the number of officers who are married and eligible for family quarters.

For students and rotational Personnel, use 100 percent of the average daily strength. For transient Personnel, use 100 percent of the average daily strength or, if figures are not available, use 10 percent of the installation officer strength. The requirements for permanent party officers will be based on 90 percent of installation officer strength. Programming requirements for housing Reserve officers will be based on 100 percent of the average on-board count of Reservists on two week Active Duty for Training and weekend drill personnel who live outside a 50-mile radius from the drill site.

Requirements for constructing quarters for unmarried Reserve officers must be supported by an economic analysis comparing the construction on base versus contract billeting with commercial establishments. See Table 171-S1.

(b) Space Criteria. Space criteria for bachelor officers' quarters, excluding Reserve personnel and officers in a travel status for a period of eight weeks or less, shall comply with criteria provided under category code group 724.

Space criteria for quarters, designed to accommodate ACDUTRA and weekend drill officers and officers in a travel status for a period of eight weeks or less, will be the same as for permanent party personnel, except that each suite will accommodate two persons versus one.

c. Dining Facilities - Enlisted Personnel. Dining facilities for enlisted personnel will be provided as cafeteria-style feeding. Provide plate service for short order and regular menu meals.

(a) Design Capacity. The following personnel are eligible for dining facilities:

1. The host and tenant activities current on-board enlisted military plus

2. The average on-board students, transients, and rotational personnel, plus

3. The average on-board Reservists on weekend and two-week Active Duty for Training.

Dining facility capacity should be based on historical data of daily meal participation adjusted to reflect utilization by Reservists on weekend and two-week Active Duty for Training. The criteria for calculating mess hall requirements are given under category code 722 10.

D. Other Facilities. Other Reserve air facilities covered in this section will comply with active air criteria (e.g., aircraft parking aprons, maintenance hangars, maintenance shops, operational facilities and similar facilities.

II. NAVAL SURFACE RESERVE AND MARINE CORPS GROUND RESERVE FACILITIES

1. General

a. Definitive Designs. Definitive designs are available for the representative sizes of training centers. These plans are to be used as guides in consideration of functional floor plans and are not intended for actual use when more economical arrangements can be developed with the incorporation of another user's requirements. Refer to NAVFAC P-272.

b. Design Capacity for a Naval Reserve Center shall be determined on the basis of the total number of drilling Naval Reservists receiving drill pay only (e.g., for a total loading of 283 Drill Pay Reservists, the basic size shall be a 200-man facility). To select one of the basic sizes given in Table 171-15A, the activity must meet one of the following conditions.

(1) Have an average on-board drill pay strength spanning the latest three-year period equal to or greater than the designated center size, plus a current year average on-board total drill pay strength equal to or greater than the designated center size, or

(2) Have current year average on-board drill pay strength equal to or greater than the designated center size with the latest three-year average strength figures Indicating a progressive increase with at least 20 percent in the latest year.

c. Design Capacity for a Marine Corps Reserve Center shall be determined on the basis of assigned loading as authorized by the Commandant of the Marine Corps.

2. Space Criteria. The net floor space allowed for various functional areas of Naval/Marine Corps Reserve Centers are provided in the following tables and applicable footnotes:

A. Table 171-l5A NAVAL RESERVE CENTERS
B. Table 171-158 MARINE CORPS RESERVE TRAINING & ADMINISTRATION BUILDING
C. Table 171-15C MARINE CORPS RESERVE VEHICLE & EQUIPMENT MAINTENANCE TRAINING FACILITY
D. Table 852-10 PARKING CRITERIA

TABLE 171-15A

A. Space Criteria for Naval Reserve Centers

	DESIGN STRENGTH (MN)															
	60		100		200		300		400		500		600		OVER 600 ADD PER 100 MN	
FUNCTION (Note)	Col 1	Col 2	Col 1	Col 2	Col 1	Col 2	Col 1	Col 2	Col 1	Col 2	Col 1	Col 2	Col 1	Col 2	Col 1	Col 2
A. JOINT SPACE (1)																
Assembly Hall	-	-	2,000	-	2,000	-	2,800	-	2,800	-	3,500	-	3,500	-	-	-
Classrooms	1,600	-	1,600	-	2,000	-	2,700	-	3,100	-	3,400	-	3,800	-	300	150
Medical Examination	100	50	650	325	650	325	650	325	650	325	650	325	650	325	-	-
Mech. Equipment	100	50	400	200	400	200	600	300	600	300	650	325	650	325	As req'd	As req'd
Conference/Classroom	-	-	400	-	450	-	450	-	600	-	600	-	600	-	-	-
Janitorial Space	-	-	100	50	225	115	275	140	300	150	400	200	500	250	25	12
Toilets/Shower, Male	150	75	400	200	500	250	500	250	525	265	525	265	550	275	30	15
Toilets, Female	-	-	300	150	300	150	300	150	400	200	400	200	400	200	-	-
Lounge	-	-	300	-	400	-	500	-	500	-	500	-	500	-	-	-
Total Joint Space	1,950	175	6,150	925	6,925	1,040	8,775	1,165	9,475	1,240	10,625	1,315	11,150	1,375	355	177
B. EXCLUSIVE SPACE (2,3)																
Admin.-Active Duty	260		650		1,050		1,300		1,400		1,700		2,000		200 SF/100 person	
Admin.-Unit	120		1,000		1,600		2,400		2,800		3,400		3,800		500 SF/100 person	
Recruiting	250		250		250		250		400		400		400		-	
Training Aids	300		530		580		680		780		880		980		100 SF/100 person	
Multi-Media Center	-		600		600		600		900		900		900		-	
Team Training	-		3,100		3,100		3,100		3,100		3,100		3,100		-	
Shops	300		1,900		1,900		1,900		1,900		1,900		1,900		-	
Lockers	-		200		200		200		400		400		400		-	
Storage	200		700		800		900		1,000		1,100		1,100		100 SF/100 person	
Garage & Flam. Stor.	-		580		580		580		580		580		580		-	
Total Exclusive Space	1,430		9,510		10,660		11,910		13,260		14,360		15,160		900 SF/100 person	
Total Net Functional Space (A + B)(Note 4)	3,380		15,660		17,585		20,685		22,735		24,985		26,310		1,255 SF/100 person	
Walls/Partitions (5%)	169		783		879		1,034		1,137		1,249		1,316		63 SF/100 person	
Total, Excluding Circulation (5)	3,549		16,443		18,464		21,719		23,872		26,234		27,626		1,318 SF/100 person	
Land, Acres (6)	2		4		4		4		4		5		5			

NOTES FOLLOWING TABLE 171-15B

TABLE 171-15B
B. Space Criteria for Marine Corps Reserve Training Centers
Training and Administration Building
(Net Area, Exclusive of Wall and Partitions)

SEE NOTE	FUNCTION	DESIGN STRENGTH (MN) SMALL 110 - 209 Col 1	Col 2	MEDIUM 210 - 349 Col 1	Col 2	LARGE 350 - 550 Col 1	Col 2
1	A. JOINT SPACE						
	Assembly Hall	2,800	-	3,500	-	5,400	-
	Classrooms	1,600	-	2,400	-	4,200	-
	Medical Examination	650	240	650	240	650	240
	Mech. Equipment	400	200	600	300	650	325
	Conference/Classrcom	400	-	450	-	600	-
	Janitorial Space	100	50	250	75	350	100
	Toilets/Shower, Mule	400	200	600	300	800	400
	Toilets, Female	200	100	200	100	200	109
	Lounge	300	-	400	-	500	-
8	Rifle Range	1,800	-	1,800	-	1,800	-
	Total Joint Space	8,650	790	10,850	1,015	15,150	1,165
3	B. EXCLUSIVE SPACE						
	Admin. - Active Duty	920		920		990	
	Recruiting Area	250		250		400	
	Admin. - Unit	1,000		2,400		4,200	
	Training Aids	400		400		600	
	Lockers	1,200		2,200		3,200	
	Shops & Storage	1,200		1,800		2,400	
	Armory	400		450		600	
	Total Exclusive Space	5,370		8,420		12,390	
5	Total Net Functional Space (A + B)	14,020		19,270		27,540	
	Walls/Partitions (5%)	700		965		1,380	
6	Total, Excluding Circulation	14,720		20,235		28,920	
7	Land, Acres	4-6		7-10		10-12	

NOTES - TABLES 171-15A & B

NOTE 1. Joint space. When two or more Services are combined into a single joint reserve facility, 50% of the smallest individual Service re-yuirements for medical, janitorial, male and female toilet areas shall be added to the largest individual Service's requirement for each respective area. Therefore, in order to facilitate the planning process, the joint space allowances under each Naval and Marine Corps reserve facility size are given in the following two columns:

Column 1 is to be used where the facility serves only one Service or for the largest individual Service requirements in joint facilities.

Column 2 shows the supplemental joint space allowances (50% of the regular allowance) generated by the smallest individual Service requirement in joint facilities.

EXAMPLE: At a joint 400 MN Naval and SMALL Marine Corps Reserve Center, the total male toilet/shower requirement is determined as follows:

525 SF Navy requirement (Table 171 15A, 400 MN, Col 1) plus 200 SF Marine Corps requirement (Table 171 15B, SMALL, Col 2) equals 725 SF total requirement. On the planning documentation, the designated host activity's figures shall show it's own sole requirement (i.e., 525 SF) and the tenant's figures shall shows its respective requirement (i.e., 200 SF).

NOTE 2. NAVY - Exclusive Space. Additional space is authorized when the following special units are attached and/or under following conditions:

a. Construction Battalion Unit (CBU):

Admin -	300 SF	
Lockers -	400 SF	
Storage -	300 SF	
TOTAL -		1,000 SF

b. Security Group:

Communications Room -	700 SF

c. Inshore Undersea Warfare (IUW) Division:

Storage -	400 SF
Shop -	100 SF

(where MOMAG unit is attached (item d), increase shop to 150 SF for joint use)

Vehicle Maintenance Shop -	780 SF

(at Reserve Centers with USMC or Army Vehicle Maintenance Shops, omit this requirement if joint use is permitted)

TOTAL - (subject to above notes)		1,280 SF
TRAINING SITE -		2 Acres

d. Mobile Mine Assembly Group (MOMAG):

Vault	18 SF	
Shop	400 SF	
TOTAL -		418 SF

e. Central Mobile Mine Assembly Group Training Site:

Active Duty Admin Area	180 SF	
Shop Area	1,750 SF	
Storage Area	100 SF	
TOTAL -		2,030 SF

f. Readiness Command: Administration per person 150 SF

g. photographic Unit: Dark Room 100 SF

h. Cargo Handling Battalion:

Vehicle Maintenance Shop	880 SF	
Vehicle Handling Shed	420 SF	
TOTAL-		1,300 SF

note: The additional space authorized above for special units shall not be increased where multiples of the same unit type are assigned.

NOTE 3 MARINE CORPS - Exclusive Space.- Additional space is authorized when the following units are attached and/or conditions exist:

a. Marine Corps - Active Duty Admin:
When Marine Corps active duty Regiment/Battalion/Battery Headquarters staffs are located with a Marine Corps Inspector-Instructor (I&I) staff, use the following NSF space allowances for admin/command/control billets instead of Table 171-15B allowances:

80 Square Feet each Enlisted Admin Billet
120 Square Feet Captain/Lieutenant SgtMajor
140 Square Feet Major
160 Square Feet Lieutenant Colonel
200 Square Feet Colonel

b. Marine Corps - Unit Admin:
Space requirements will be determined by providing 80 net square feet for each Enlisted Admin billet and 120 net square feet for each Officer Command/Control/Admin billet.

C. Shops and Equipment Storage:
Where a combination of Reserve units, each having separate accountability for equipment and supplies, are collocated at a single Reserve center, space requirements will be determined individually according to the design strengths of Table 171-15B and then summed. The following example illustrates the determination process:

Unit a	150 Mn	- 1200 Square Feet
Unit b	180 Mn	- 1200 Square Feet
Unit c	215 Mn	- 1800 Square Feet
Total Requirement		- 4200 Square Feet

NOTE 4. Reduction of Exclusive Spaces - At specified Reserve centers determined by Commander, Naval Reserve Force, eliminate the space allowances for TEAM TRAINING and SHOP as shown in Table 171-15A.

NOTE 5. The total figures indicated herein have been computed for exclusive Naval and Marine Corps Reserve centers (using Column 1 of Joint Space figures).

NOTE 6. The total net functional area shall be increased by 15% for single-story construction or 22% for multiple-story construction, to provide necessary circulation space, (e.g., corridors, stairwells, lobby).

NOTE 7. Acreages shown are intended as minimum guidelines for a rectangular, level site. Consideration must be given to (1) availability of land, (2) community standards, (3) adaptability of proposed sites and (4) joint construction, future expansion, and/or additions by other Reserve components. When security groups are attached, an additional acre is required for antenna fields.-

NOTE 8. Rifle Range (Marine Corps) shall be provided only when there exists a valid requirement for marksmanship training and no other comparable facilities are available in the immediate area that could be shared with other users. Rifle Range shall be sized to provide a 4-point, 1,000-inch range, including range storage and seating space for two relays waiting to fire. Includes approximately 200 SF for storage space at the firing point end.

Use the following criteria and guidelines for planning Marine Corps Reserve Vehicle and Equipment Maintenance Training Facilities.

TABLE 171-15C
C. Space Criteria for Marine Corps Reserve Training Centers
Vehicle and Equipment Maintenance Training Facility

UNIT TYPE	FACILITY TYPE
COMPANIES:	
INFANTRY/MILITARY POLICE	A
COMMUNICATIONS/RECONNAISSANCE	B
ANGLICO/MOTOR TRANSPORT/AMPHIBIAN TRACTOR/TANK	C
ENGINEER/TRANSPORT	E
BATTERIES:	
106 mmHOW/155 mmHOW	C
LAAM	D
SP:155 mmHOW/8" HOW	E
BATTALIONS:	
INFANTRY/RECONNAISSANCE	B
TANK/ARTILLERY/AMPHIBIAN TRACTOR/MOTOR TRANSPORT	C
ENGINEER/ARTILLERY (SP)	E

SPACE ALLOWANCE - GROSS SF

	Code 214 20		Code 214 10		Code 214 20	
			TRACK/ARTILLERY			
FACILITY	AUTOMOTIVE		HEAVY EQUIPMENT		GENERAL	
TYPE	BAYS	SF	BAYS	SF	SPACE	TOTAL
A	3	480	-		300	780
B	2	960	-		300	1,260
C	1	480	2	1,280	400	2,160
D	2	960	2	1,280	400	2,640
E	1	480	3	1,920	400	2,800
F	3	1,440	3	1,920	400	3,760
G	3	1,440	4	2,560	400	4,400

NOTES FOR TABLE 171-15C

Provide in a separate structure, located out of public view, if possible.
Each automotive bay shall be 16'X30' - (480 gross SF) and each heavy equipment bay shall be 16'X40; - (640 gross SF).
General space includes office, storage, work bench and toilets.
Other features such as battery shop, vehicle washing area, crane, hoist, and grease rack shall be provided according to the echelon of maintenance authorized for the Reserve unit.
Use category codes as noted on top of each column.

D. PARKING CRITERIA. For non-organizational vehicles use criteria provided under category code 852-10 (Parking Area).

Marine Corps Reserve Organization Vehicles, Use the following allowances:

Tracked Vehicles and larger equipment	75 SY
Wheeled Vehicles	50 SY
Engineer equipment over 30 feet	75 SY

The areas provide for parking and interior circulation. Areas for access roads and entrance throats are not included.

At Joint Facilities
Parking areas shall be collocated to the maximum extent possible. Provide the following minimum requirements.

Cargo Handling Battalion	900 SY
Inshore Undersea Warfare	450 SY

III. SPACE CRITERIA FOR RESERVE NAVAL CONSTRUCTION FORCES (RNCF) FACILITIES

Within the RNCF is the First Naval Reserve Construction Brigade. Within the Brigade are eight Reserve Naval Construction Regiments (RNCR), seventeen Reserve Naval Mobile Construction Battalions (RNMCB) and four Reserve Naval Construction Forces Support Units (RNCFSU). The RNCR requires a permanent headquarters facility to perform administrative and training functions. The RNMCB and the RNCFSU are headquartered at a Permanent Drill Site (PDS). Brigade administrative personnel are located in a non-permanent rotational headquarters facility. Table 171-15D provides the maximum gross area allowances for RNCF facilities.

Table 171 15D
RESERVE NAVAL CONSTRUCTION FORCES

	Description	Reference Category Code(s)	Gross Areas (SF)
RNCR (HQ)	Academic Instruction/ Administrative Annex	(171 10)	960
	Regiment Headquarters	(610 71)	4,000
		Total:	4,960
RNMCB (PDS)	Operational Storage	(143 77)	10,265
	Operational Hazardous/ Flammable Storage	(143 78)	225
	"B" Company Headquarters, Shop, Academic Instruction and Administrative Annex	(171 10) (171 20) (610 10)	4,000
	"A" Company Organizational Maintenance Shop	(214 51)	5,000
	Battalion Headquarters	(610 72)	5,700
	"A" Company Headquarters and operations	(610 73)	960
		Total:	26,150
RNCFSU (PDS)	Operational Storage	(143 77)	2,600
	Operational Hazardous/ Flammable Storage	(143 78)	225
	Academic Instruction/ Administrative Annex	(171 10)	1,400
	"A" Company Organizational Maintenance Shop	(214 51)	4,000
	Unit Headquarters	(610 72)	4,000
	"A" Company Headquarters/ Operations	(610 73)	960
		Total:	13,185

1. Notes for Table 171 15D:

a. For requirements planning and inventory purposes use category code 171 15. To determine the layout and size of specific areas, such as administrative offices or vehicle bays, see the current criteria for the referenced category codes, e.g., 610 10 for administrative space.

b. The allowances indicated are maximum gross values, excluding mechanical equipment space.

2. Land Requirements. For planning purposes, land requirements can be determined as follows:

RNCR	0.75 Acres
RNMCB (PDS)	13.00 Acres
RNCFSU (PDS)	10.00 Acres

Actual requirements will be developed as a result of Master Planning and site layout.

3. Parking (852 10). For privately owned vehicles (POV) use 35 SY per vehicle for 80% of maximum loading. This includes parking, circulation lanes, entrances and exits. For organizational vehicle and equipment parking at the PDS use 7000 SY (maximum). This includes parking, circulation lanes, miscellaneous open storage/laydown area and space for loading and unloading ramp, vehicle wash platform, and grease rack.

4. All requirements for Reserve Naval Construction Forces facilities shall be reviewed by the Chief of Naval Reserve.

IV. RESERVE FORCES FACILITIES FUNCTIONAL GUIDANCE

A. GENERAL.

1. Functional planning and programming policy guidance for Reserve Forces facilities is provided to supplement the specific construction criteria contained in this supplement and applicable chapters of DOD 4270.1M which govern Reserve Forces facilities.

a. Readiness. Facilities shall be constructed so as to make the greatest contribution to readiness, and promote economy and efficiency.

b. Joint Use. All opportunities shall be explored for combining or integrating proposed facility requirements with the existing or proposed facility requirements of other Services and within the Service.

c. Existing Facilities. Maximum use shall be made of existing facilities of all components in order to accomplish proposed facility requirements, partially or fully.

c. Standard Designs. Definitive designs of major components or complete buildings shall be accomplished and used where possible.

e. Flexibility. Facilities shall be designed so as to lend themselves to occupancy by new units, reorganized units, and units with new missions with the minimum of additional construction.

f. Redundant Space. Space shall not be constructed in more than one place for the performance of an individual's function.

g. Economical Design. Reserve component facilities shall be designed to be austere, but shall ensure life cycle economy of both construction and maintenance.

B. STANDARDS OF CONSTRUCTION, New facilities generally shall be of permanent construction and the quality of construction shall be consistent with the anticipated useful life and utilization. However, for new facilities at training areas and for facilities of uncertain useful life, construction may be permanent, semi-permanent or temporary, as appropriate. All facilities shall be similar to those of the active forces with modifications to account for periodic usage. These modifications should result in less costly projects. Designs shall make appropriate provisions for future expansion.

C. BACHELOR PERSONNEL HOUSING AT MAJOR TRAINING AREAS. The required number of barracks may be based on the authorized strength of the units and the Reserve components that the installations are designed to accommodate at any one time.

1. Enlisted Personnel. For enlisted personnel, the accommodation may include semi-private bedrooms for senior personnel and a central latrine and dayroom.

2. Officer Personnel. For officers, the accommodations may include a semi-private bedroom, semi-private latrines or central latrine and dayroom.

D. LOCAL TRAINING AREAS. For those training areas where cantonment-type construction is not justified, facilities may be of a type consistent with training in a field environment. Construction may be semi-permanent or permanent and shall comply with environmental and pollution control regulations. Temporary construction is authorized for facilities such as field kitchens, mess shelters, tent pads, and logistic facilities. Ranges and training courses may be authorized when justified. Installation of utilities, construction of roads, security fencing, fuel dispensing systems, and other like projects will be considered on an individual basis.

E. OTHER FACILITIES. Other facilities required on an infrequent basis, and for which, criteria are not specifically provided here, shall be established by criteria for similar facilities, but adjusted in accordance with the actual. mission requirements.

F. AIRFIELD REQUIREMENTS. Special requirements for airfield runways, taxiways, aprons, navigational and approach aids, airfield lighting, arresting gear installations, and related airfield facilities shall be determined in the same manner as for active forces when located at active installations. Adherence to these requirements at other locations shall be modified by applicable Service regulations or other agency criteria.

G. ADMINISTRATIVE SPACE. Wherever possible administrative space shall be open, joint use space with only the minimum essential number of offices constructed. Wherever possible, offices shall be joint use with the number of exclusive offices being kept to the minimum.

H. STORAGE. Facilities shall include adequate space for shortage of equipment in the proper locations (Home Station, Mobilization Station, Central Storage, etc.).

I. BACHELOR PERSONNEL QUARTERS (HOME STATION). Requirements for personnel, quarters for Reservists shall include an economic analysis of constructing bachelor personnel quarters on the installation versus contract billeting with commercial establishments.

179 TRAINING FACILITIES OTHER THAN BUILDINGS

This basic category includes requirements for weapons ranges, training courses and mockups, training pools/tanks, and parade and drill fields, but it does not include expendable targets.

179 10 AIRCRAFT GUNNERY, BOMBING, AND ROCKET RANGES (EA)

Aircraft Gunnery, Bombing and Rocket Ranges (Aircraft Weapons Ranges) provide air crews with operating areas for the development of proficiency in gunnery, bombing, rocketry, missile delivery, strafing, and mine laying. Ranges should generally be within 100 miles of the supporting air installation. The following criteria are not absolute as far as requirements are concerned; however, any plans to deviate from these criteria shall be referred to the Naval Air Systems Command, Code AIR-535.

Air-to-Air Weapons Ranges. The Air-to-Air Weapons Ranges are Gunnery and Missile Ranges and should, if possible, be over water. The minimum surface impact areas and coincident restricted airspaces, whose minimum altitude is based on the characteristics of the using aircraft, are as follows:

(1) Gunnery Range - 23 nautical miles by 50 nautical miles.

(2) Rocket and Missile Ranges - 50 nautical miles square.

Air-to-Ground Ranges. The Air-to-Ground Ranges are for training in strafing, high-altitude level bombing, loft bombing, close air support, aerial mining, and missile delivery. Communications are required between ground stations and between target controller and aircraft at these ranges. See Table 179-10 for specific surface impact areas, minimum restricted airspace, and other data applicable to air-to-ground ranges.

The following information for Air-to-Ground Weapons Ranges is provided in addition to that contained in Table 179-10.

(1) Strafing Range. A strafing range is for air-to-ground gunnery proficiency training in low-altitude strafing firing 20-millimeter and possibly 30-millimeter ammunition. Targets may be panels or may simulate aircraft, gun emplacements, truck convoys, etc., and may be automatic recording targets.

(2) High-Altitude Level-Bombing Range. The high altitude level bombing range provides training in high-speed, high-altitude, level-attitude bomb releases. The center of the target is visible from 10 nautical miles at 50,000 feet. Offset bombing exercises are also conducted.

(3) Multipurpose Target Range. The multipurpose range is used for training in conventional dive bombing, high-altitude dive bombing, glide-bombing, strafing, and rocketry (excluding controlled air-to-ground missiles). Inert training weapons with small charges are used to facilitate spotting.

TABLE 179-10
Basic Requirement for Air-to-Ground Ranges

Range	Minimum surface impact area (nautical miles)	Minimum restricted airspace (nautical miles)	Maximum altitude of airspace (feet)	Control and spotting towers Note (2)	Target illumination for night operations
A. Strafing	1 x 1/2	radius 5	10,000	1 Control	yes
B. High-altitude level-bombing	radius 3	radius 5	Unlimited	1 Control; Note (3)	yes
C. Multipurpose target	radius 1-1/2	radius 5	Note (1)	Note (4)	yes
D. Loft bombing	radius 1-1/2	radius 5 length 30; Note (8)	24,000 Note (8)	Note (5)	yes
E. Close air support and combat training area	16 x 20	radius 25	Note (1)	Note (6)	yes
F. Aerial mining	3 x 8	3 x 8	Note (1)	Note (4)	no
G. Guided missile	8 x 8	radius 5; length 20; Note (8)	24,000	Note (6) and (7)	yes

NOTES:
(1) The restricted airspace extends vertically to the maximum altitude required by the using aircraft.
(2) See Operational Tower, Category Code 179 35, and NAVFAC DM-27.
(3) Two spotting towers also required to provide accurate three-dimensional rake information where remote spotting devices are not used.
(4) One control and two spotting towers are required to provide accurate three-dimensional rake information.
(5) One control and three spotting towers are required.
(6) One control tower and two spotting towers at each designated target site are required.
(7) Towers are required only at ranges where self-guiding missiles are fired.
(8) See detailed airspace description in text.

(4) Loft Bombing Range. The loft bombing range is a highly instrumented land range for practice bombing with simulated nuclear weapons. A minimum altitude approach is used; bomb release maneuvers practiced include loft, toss, and over-the-shoulder techniques providing training in rapid recovery and escape from atomic-weapon effects, detection, and retaliatory ground fire.

The restricted airspace includes a 5-nautical-mile radius from the target center extending upward from the surface to 24,000 feet above the target and multiple-approach corridors extending 25 miles from target center. A 6-nautical-mile corridor width is required when alternate left or right escape maneuvers are performed. Clearance above the corridors is 3,000 feet for the first 10 nautical miles of the approach, 5,000 feet for the next 8 nautical miles, and 9,000 feet for the remaining 2 nautical miles to the airspace cylinder around the target center. The initial point of aim is at 50,000 feet from the target center which must be visible from an aircraft at 100 feet altitude. Instrumentation along the primary approach to the target provides instantaneous speed measurements, photo coverage, and profile and escape information.

(5) Close Air Support and Combat Training Area. The close air support and combat training area is planned for training with live ordnance, shapes, napalm, and air-to-ground missiles.

(6) Aerial Mining Range. The aerial mining range is planned for training in low-altitude and high-altitude mining. The restricted airspace is generally parallel to an adjacent irregular coastline with readily identifiable landmarks.

(7) Guided Missile Range. The air-to-ground guided missile target range is used for training in controlled air-to-ground missiles.

The restricted airspace is 24,000 feet in height and consists of a rectangular-shaped primary line of approach 4 nautical miles wide by 5 nautical miles long starting at a point 15 nautical miles from the center of the impact area. The total length of the range is 20 nautical miles.

See NAVFAC DM-27 for design criteria and NAVFAC P-272 for definitive drawings of weapons ranges.

179 30 SURFACE PROJECTILE RANGE (EA)

This code is for ranges supporting surface-launched projectiles as opposed to ranges for air-launched projectiles which are coded as 179 10. Criteria are not presently available for surface projectile range requirements.

179 35 WEAPONS RANGE OPERATIONS TOWER (EA)

Range operations towers are used at gunnery, bombing, and rocket ranges to provide an unobstructed view of target areas for purposes of control and spotting impacts. For the tower requirements associated with the various ranges, see Category Code 179 10 (Table 179-10). The two types of weapons

range operations tower are:

1. The control range operations tower (control tower) has a gross area of 1,428 square feet and provides for the radio control of all range activities, including the scoring of training missions both visually and electronically.

2. The spotting range operations tower (spotting tower) has a gross area of 100 square feet and is a secondary observation point to provide for visual scoring.

Location of towers at each range is provided in NAVFAC DM-27. See NAVFAC P-272 for design of a typical tower and NAVFAC DM-27 for design criteria.

179 40 SMALL ARMS RANGE -- OUTDOOR (EA)

A small arms range provides an area for training in the use of pistols, small caliber rifles, and small caliber machine guns. Ranges must be available all year to provide continual training and retraining for personnel who must be proficient in the use of small arms. If feasible, a small-arms range should provide training facilities for all military services within the area.

The capacity of existing ranges or new requirements can be determined by:

(1) Identifying the number of personnel to be trained.

(2) Establish the number and size of training sessions.

(3) Determine the number of hours per session and schedule training over an annual basis.

(4) Calculate the required number of firing points based upon efficient arrangement of the size and schedules of the training groups.

In developing requirements, the base number of training days less holidays and weekends is 242 days. However, ranges require maintenance and periods of recovery for flora and fauna and are often unusable during periods of severe weather or peculiar local limitations. The basic number of training days can be further reduced to 180 days based on local conditions. In the absence of detailed information, compute the number of firing points based on the number of military personnel to be served as follows:

Military Strength	Firing Points
up to 2,000	6
3,500	12
5,000	16
7,000	20

For certain types of small arms and where prevailing weather conditions seriously interfere with scheduling of training, an indoor range (Code 171 50) may be planned.

For outdoor range design, safety criteria, and area requirements, see NAVFAC P-272 and NAVFAC DM-27.

179 45 TRAINING MOCK-UPS (EA)

This code includes mockup structures representing all or parts of ships, aircraft, tanks, or buildings for training personnel in skills such as disaster control, fire fighting, and equipment handling.

179 50 TRAINING COURSE (AC)

This code includes areas designated for personnel training in various skills under actual operational conditions. Table 179-50 outlines the facilities of this group and approximate requirements.

TABLE 179-50
Training Course Criteria

Type of Course	Approximate Size	Terrain	Improvements
Obstacle	2 acres	Flat	Obstacles, drainage
Combat techniques, guerrilla warfare, counterinsurgency	100 acres	Rough, heavy vegetation	Provisional messhall and toilets where justified
Weapons ranges	See Code 179 10		
Disaster control, firefighting, etc.	2 acres	Flat	Training mockups
Field engineering surveying practice	2 acres	Rolling	None
Building construction practice	2 acres	Flat	1,200 square yards of paved area
Construction equipment operations	20 acres	Rolling, no vegetation	None
Vehicle safety, driver testing	6 acres	Flat	Paved area, course markers
Swimming, survival	See Code 179 55		

179 55 COMBAT TRAINING POOL/TANK (EA)

A combat training pool/tank is planned for instructions in swimming and survival under combat conditions. The swimming pool/tank may be provided only as required for training purposes, normally on the following basis: for each increment of 5,000 men to be trained, one swimming pool; pool area not to exceed 13,000 square feet. If survival training is required at installations having less than 5,000 assigned strength, one swimming pool of appropriate size may be provided, but not to exceed 13,000 square feet in pool area. Outdoor pools may be provided where feasible. For a typical swimming pool, see Definitive Designs, NAVFAC P-272, and for design criteria, see Morale, Welfare, and Recreational Facilities, NAVFAC DM-37.

179 60 PARADE AND DRILL FIELD (AC)

This facility provides space for formation drills, parade and review functions, and honor ceremonies. Such a field may be planned for stations having independent command functions. The size of the field is computed on the basis of 1 acre per 125 men, total planned military strength. Surface will be turf where feasible and will be stabilized where climate and other conditions dictate. A reviewing stand may be planned with a capacity based on 5 percent of the total officer strength.

179 70 RADAR BOMB SCORING FACILITY (EA)

A Radar Bomb Scoring Facility (RBS) is used to measure, electronically, aircraft simulated-bombing results and to produce graphic flight path tracking data and other pertinent aircraft target scoring information. An RBS facility is available as a self-contained trailer-mounted facility. The mobile RBS equipment includes an operations trailer, acquisition radar, tracking radar, maintenance and spare parts trailer, and power trailer. A permanent power supply at the range eliminates the power trailer requirement. Criteria are not presently available for a fixed RBS System which would utilize permanent structures. RBS facilities are provided for selected aircraft ranges as determined by CNO.

See NAVFAC DM-27 for design criteria.

179 71 ELECTRONIC WARFARE TRAINING RANGE (EA)

Criteria for the Electronic Warfare Training Range are not currently available.

179 72 UNDERWATER TRACKING TRAINING RANGE (EA)

The underwater tracking range is used primarily to support surface and subsurface weapon system accuracy trials and development, test, and evaluation projects. No planning factors are currently available for this facility. Planning factors, standards, and guides for computing

requirements for facilities under this category are excluded from this publication because of the special provisions and variances in the application of criteria for planning underwater tracking ranges. In the absence of specific criteria, the quantitative requirements for the range facilities should be determined on an individual basis based on the experience and knowledge of the activity involved and the appropriate Systems Commands.

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Section 2

FACILITY CLASS 200--MAINTENANCE AND PRODUCTION FACILITIES

Maintenance and production facility requirements for Navy Installations are classified in the 200 series. Maintenance facilities are listed in Category Group 210. Production facilities for the construction and assembly of new components and equipment under Category Group 220 are excluded from this publication.

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210 MAINTENANCE

This category group encompasses all shore-based maintenance facilities that may be required for the proper maintenance of Navy operational equipment. Basic categories of maintenance facilities are as follows:

Group 211 Aircraft
Group 212 Guided Missiles
Group 213 Ships, Spares
Group 214 Tank, Automotive
Group 215 Weapons, Spares
Group 216 Ammunition, Explosives, Toxics
Group 217 Electronics and Communications Equipment
Group 218 Miscellaneous Procured Items and Equipment
Group 219 Installation, Repair and Operation

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211 MAINTENlNCE - AIRCRAFT, SPARES

GENERAL

Facilities for the maintenance and repair of Navy and Marine Corps aircraft and related spares, including airframes, aircraft engines, aircraft weapons systems, avionics systems, and other related aircraft equipment are planned in accordance with maintenance functions and levels as authorized by the Chief of Naval Operations. Maintenance classifications are defined in OPNAVINST 4790. _____ (latest issue) and are the basis for the Naval Aircraft Maintenance Program (NAMP). These classifications of aircraft maintenance activities of the Naval Establishment are divided into three levels: depot maintenance, intermediate maintenance, and organizational maintenance. Each requirement for depot maintenance facilities must be planned and justified individually.

Planning factors for aircraft maintenance facilities are tabulated under category codes as follows:

(Note): The category codes marked "N" or with an asterisk are for Naval Air Rework Facility (NARF) use only. Those codes marked with an asterisk are pseudo codes and will be eliminated once criteria are developed for NARF facilities. The codes with an asterisk are to be used only for maintaining existing Basic Facility Requirement (BFR) data and must not be used for assets data or project submissions.

	211 01	Aircraft Acoustical Enclosure (NON-NARF)
	211 02	Nose Hangar
	211 03	Corrosion Control Hangar
	211 04	Pre-Engineered Maintenance Hangar
	211 05	Maintenance Hangar - OH space
	211 06	Maintenance Hangar - 01 Space
	211 07	Maintenance Hangar - 02 Space
	211 08	Airframes shop (NON-NARF)
	211 09	Aircraft Boresight Range (NON-NARF)
*	211 10	Aircraft Overhaul and Repair Shop (NARF)
N	211 11	Corrosion Control-Cleaning Shop (NARF)
N	211 12	Paint and Finishing Hangar (NARF)
N	211 13	Aircraft Non-Destructive Testing Shop (NARF)
N	211 14	Aircraft Rework Shop (NARF)
	211 15	Line Maintenance Shelter
*	211 20	Aircraft Engine Overhaul Shop (MARF)
	211 21	Engine Maintenance Shop (NON-NARF)
N	211 22	Engine Preparation and Storage Shop (NARF)
N	211 23	Engine Examination and Evaluation Shop (NARF)
N	211 24	Dedicated Aircraft Engine Overhaul-General Process (NARF)
N	211 25	Jet Engine Overhaul shop (NARF)
N	211 26	Reciprocating Engine Overhaul Shop (NARF)
N	211 27	Turbine Engine Overhaul Shop (NARF)
N	211 30	Aircraft and Engine Accessories Overhaul Shop (NARF)

N	211 31	Dedicated Aircraft and Engine Accessories Overhaul-General Process (NARF)
N	211 32	Metal Components Shop (NARF)
N	211 33	Non-Metal Components Shop (NARF)
N	211 34	Dynamic Components Shop (NARF)
N	211 35	Hydraulic Components Shop (NARF)
N	211 36	Electrical Components Shop (NARF)
N	211 37	Turbine Accessories Shop (NARF)
N	211 38	Pneumatic Oxygen shop (NARF)
N	211 39	Optical and Photographic Components Shop (NARF)
*	211 40	Electronics, Communication and Armament System Shop (NARF)
N	211 41	Dedicated Electronics, Communication and Armament-General. Process (NARF)
N	211 42	Electronic system Components Shop (NARF)
N	211 43	Inertial Quality Instrument Overhaul Shop (NARF)
N	211 44	Non-Inertial Quality Instrument Overhaul Shop (NARF)
	211 45	Avionics Shop (NON-NARF)
*	211 50	Aircraft Armament/Missile Rework Shop (NARF)
N	211 51	Dedicated Aircraft Armament/Missile Rework-General Purpose shop (NARF)
N	211 52	Aircraft Weapon Overhaul and Test Shop (NARF)
N	211 53	Air Launched Missile Rework Shop (NARF)
	211 54	Aviation Armament Shop (NON-NARF)
*	211 60	Support Equipment Rework Shop (NARF)
N	211 61	Dedicated Support Equipment Rework-General Purpose Shop (NARF)
N	211 62	Support Equipment Calibration Shop (NARF)
N	211 63	Ground Support Equipment Rework Shop (NARF)
N	211 64	Ground Support Equipment Holding Shed (NARF)
*	211 70	Manufacturing and Repair Shop (NARF)
N	211 71	Dedicated Manufacturing and Repair-General Purpose Shop (NARF)
N	211 72	Metal Fabrication/Manufacturing Shop (NARF)
N	211 73	Metal Treatment Shop (NARF)
N	211 74	Non-Metal Fabrication/Manufacturing Shop (NARF)
	211 75	Parachute/Survival Equipment Shop (NON-NARF)
N	211 76	Miscellaneous Parts/Components Repair Shop (NARF)
*	211 80	Test and Calibration Shop (NARF)
	211 81	Engine Test Cell (NON-NARF)
	211 82	Aircraft Weapons Alignment Shelter (NON-NARF)
N	211 83	Engine Test Cell (NARF)
N	211 84	Helicopter Blade Test Facility (NARF)
N	211 85	Radome Test Facility (NARF)
N	211 86	Radar/Antenna Test Facility (NARF)
N	211 87	Aircraft Weapons Alignment/Boresight Facility. (NARF)

	211 88	Power check Pad with Sound Suppression (NON-NARF)
	211 89	Power Check Pad Without Sound Suppression (NON-NARF)
*	211 90	Other Support Facilities (NARF)
N	211 91	Uncovered Ramp (NARF)
N	211 92	Covered Ground Check/Flight Test Facility (NARF)
N	211 93	Engineering Laboratory (NARF)
N	211 94	Aircraft Power Check Facilities (NARF)
N	211 95	Material and Equipment Staging/Storage Facility (NARF)
	211 96	Maintenance, Aircraft Spares Storage (Ready Issue/Shop Storage Miscellaneous)
N	211 97	Plant Services for Aircraft Overhaul (NARF)
N	211 98	Aircraft Acoustical Enclosure (NARF)
N	211 99	Hazardous Material Storehouse (NARF)

Additional air-related maintenance facilities are tabulated under the following category codes:

116-10	Airfield Washrack Pavement
116-15	Aircraft Rinse Facility
212-30	Missile Assembly and Test Building
214-30	Refueling Vehicle Shop
216-55	Air/Underwater Weapons Shop
218-60	Aircraft Ground Support Equipment Shop
218-61	Ground Support Equipment Holding Shed

AIRCRAFT LOADING

When planning Aircraft Maintenance Hangars for a given installation, the number of aircraft and squadrons to be counted are determined by projecting peak scheduled occupancy of all aircraft for which the station will have an air craft maintenance support mission. Peak scheduled occupancy defined as the maximum number of aircraft that are scheduled for simultaneous assignment to the installation for the planned construction year. Occasional periods of short-term overlap occupancy are not to be considered. If deployment schedules are available for the planned construction year (such as NAVAIRNOTE 013010, "Carrier Employment Support Planning Document"), these schedules, in conjunction with the Base Loading Report shall be used to determine peak scheduled occupancy* Long range projections, greater than five years, are available in the Aircraft Program Data File (APDF). When deployment schedules are not available, the base loading may be approximated by adding 100 percent of the permanently assigned aircraft to 75 percent of the deployable patrol aircraft and 66 2/3 percent of the deployable carrier-type aircraft.

Where maintenance operating factors (M.O. factors) are used as the basis for sizing intermediate level maintenance shops, the total assigned aircraft for the applicable construction year shall be utilized for planning computations. (The M.O. factor sizing curves have been adjusted for the various types of aircraft to account for deployed aircraft). In rare instances, an installation may be assigned the intermediate maintenance responsibility for aircraft not permanently assigned to the installation. In this case, these aircraft should be added to the base loading for the planning of intermediate

maintenance shops.

AIRCRAFT MAINTENANCE DEPARTMENT OFFICES

The shops comprising the Navy Intermediate Maintenance Facility may be established separately or grouped together in a consolidated complex. Space requirements for each individual shop having a specific category code include the administrative and training space for that shop. In addition, administrative and training spaces are required for the Aircraft Maintenance Department (AMD) offices, preferably in a centrally located administrative building within the maintenance complex. When shops are not consolidated into a complex, consideration shall be given to enlarging the administrative space in one of the intermediate maintenance shops to provide space for the AMD offices. Space allocations shall be made in accordance with Category Code 610 10.

MARINE CORPS CRITERIA

Marine Corps aircraft maintenance facilities are planned utilizing the basic criteria for comparable Navy facilities. However, additional guidance for planning intermediate maintenance facilities with a particular Marine Corps application is provided as a 211 - Supplement at the end of this section (Category Code 211).

DESIGN CRITERIA

See NAVFAC P-272 for definitive drawings and NAVFAC DM-28.1 for design criteria for aircraft maintenance facilities.

211 01 AIRCRAFT ACOUSTICAL ENCLOSURE (NON-NARF) (SF)

Description. During the aircraft maintenance and testing process, aircraft engines are run-up while aboard the aircraft (in-frame testing) and when removed from the aircraft (out-of-frame testing). In both cases, high noise levels are generated in surrounding areas unless sound abatement is provided. The aircraft acoustical enclosure, sometimes referred to as a hush house, is a total enclosure for fixed wing aircraft designed to abate noise during in-frame run-up of jet engines. The facility consists of a hangar-like aircraft enclosure, an absorbtive augmenter for inducing cooling air and absorbing noise, a 45 degree blast deflector, and observation room with lavatory and a mechanical equipment room. The observation and mechanical rooms are located adjacent to, not within, the aircraft enclosure.

Policy. This category code shall be used for acoustical enclosures which support organizational and intermediate level aircraft maintenance. Enclosures at Naval Air Rework Facilities (NARFs) supporting depot maintenance shall be coded as 211 98.

Criteria. The design of the acoustical enclosure is governed by the size of aircraft and the number and location of the engines. Standard designs are under development. The hangar like enclosure varies in width from-80 to 55 feet and in length from 85 to 65 feet while the length of the augmenter varies from 75 to 90 feet.

The Navy has operated only one hush house (NAS Miramar) long enough to collect meaningful data. These planning guidelines were developed from analysis of the Miramar data. On the average, 0.49 aircraft arrived per hour to use the hush house during the peak workload hours (0800-1600) and the average service time in the hush house was 1.1 hours. The hush house operated approximately a 20 hour day. Using these parameters and assuming that all high power run-ups will be done in the hush house, one hush house can support 140 jet aircraft and 2 hush houses up to 360 jet aircraft. (These planning factors are general guidelines which reflect NAS Miramar service times and aircraft mix.)

A variation to the basic enclosure, a "hybrid" enclosure has been designed in which both in-frame and out-of-frame testing may be performed. Out-of-frame testing is usually done in an engine test cell, Normally, it would not be cost effective to conduct out-of-frame testing in a hush house when it would result in the requirement for an additional hush house to support the out-of-frame testing. The hybrid hush house should be considered where (1) the facility is used as a backup facility to existing test cells and out-of-frame runups do not involve time consuming maintenance or (2) where in-frame utilization levels are expected to be below the hush house capability, thereby leaving excess availability for out-of-frame runups.

The enclosure provides a better Working environment than open pads by providing protection from inclement weather and cross winds which adversely effect the testing of engines, while at the same time significantly reducing exterior noise levels. NAVFAC P-970, Planning in the Noise Environment specifies acceptable noise levels for various land uses. Noise levels generated during engine run-ups, if not abated, could: (1) restrict land use, (2) require that sound insulation be installed in nearby buildings, or (3) require the run-up pad to be located at a considerable distance from inhabited buildings. The latter results in increased fuel consumption and lost time while transiting to and from the run-up area. In addition, noise generated during run-ups can result in complaints from civilian communities resulting in local pressure to restrict operations. As indicated by P-970, the total noise environment must be evaluated and the hush house considered as one possible solution to reducing noise levels. Most air installations have had detailed noise studies done as a part of the Air Installations Compatible Land Use Zones (AICUZ) program. AICUZ studies address solutions to noise problems and may serve as a basis for justifying the requirement for an acoustical enclosure. The number of hush houses can be determined using the guidelines provided herein. Until definitive drawings are pub- lished, information as to hush house size shall be obtained from Headquarters, NAVFACENGCOM.

211 02 NOSE HANGAR (SF)

The hangar provides limited protection for aircraft undergoing maintenance. The facility usually includes a canopy which covers the aircraft nose and engines, a service platform, and an enclosed shop area. Nose hangars are designed for the specific type of aircraft supported.

211 03 CORROSION CONTROL HANGAR (SF)

The corrosion control hangar provides space for washing, rinsing, paint stripping, corrosion removal, protective coating and painting of aircraft at the intermediate maintenance level. The hangar along with aircraft washracks (Category Code 116 10) and rinse facilities (Category Code 116 15) support the corrosion control program as described in Technic& Manual NAVAIR 01-1A-509, Aircraft Cleaning and Corrosion Control for organizational and Intermediate Maintenance Levels. Depot level maintenance facilities for stripping and complete repainting of aircraft shall be coded as 21112, Paint and Finishing Hangar.

The corrosion control hangar may be required at Navy and Marine Corps activities having aircraft subject to accelerated corrosion due to flight operations over water or the presence of a corrosive atmosphere at the station itself. The requirement for a corrosion control hangar should be endorsed by the cognizant type Commander and the Naval Air Systems Command prior to approval for planning purposes, Because of the high initial cost, extraordinary corrosion problems must exist to justify programming this hangar.

Two standard size corrosion control hangars are shown in NAVFAC P-272, definitive drawings: (Definitive drawings are currently under revision,)

Type A - For carrier and other aircraft with wingspans up to 70 feet: gross area, 11,152 SF

Type B - Primarily for land based patrol aircraft with wingspans up to 110 feet: gross area, 25,172 SF

Multiple hangars should not be planned unless the expected work load would exceed the capacity of a single hangar operating a 24 hour day. An average of one aircraft can be processed each 24 hour period, If additional hangars should be required, the number can be determined based on a 24 hour work day capability of one hangar and local records of the frequency of painting or the need for additional capability because of deployment schedules.

For design criteria see NAVFAC DM-28.1 and P-272. Strong consideration shall be given to industrial safety and environmental considerations as toxic paints are involved. For pavement requirement see category codes 113 40 Aircraft Access Apron and 852 10 Parking Area.

211 04 PRE-ENGINEERED MAINTENANCE HANGAR (SF)

The pre-engineered maintenance hangar provides an austere facility for organizational level maintenance of Navy and Marine Corps aircraft. It is intended for use primarily at overseas locations, particularly those where tenure may be limited. When provided, the pre-engineered hangars are programmed in lieu of, not in addition to, the larger standard Type I and II hangars (Category Codes 211 05, 211 06 and 211 07.

The pre-engineered maintenance hangar is intended for the support of a

detachment size unit of from three to five aircraft. NAVFAC P-272 contains definitive designs for three sizes (Types A, B and C). Each hangar consists of a hangar bay (OH) space and limited crew/equipment (01) and administrative (02) space. Movable partitions are provided within the crew/equipment and administrative space to facilitate configuring these areas in accordance with the requirements of the occupant.

The specific type of hangar to be selected is dependent on the size of aircraft to be maintained.

Type "A" Hangar - This hangar is designed primarily for attack (VA) and fighter (VF) aircraft and helicopters. It may also be utilized for antisubmarine (VS) and early warning (VW) aircraft or smaller transport (VR) aircraft with wingspans less than 85 feet. Gross Area = 8800 SF, Width = 105 FT and Depth = 80 FT.

Type "B" Hangar - This hangar is designed primarily for shore based patrol (VP) aircraft and transport (VR) aircraft with wingspans up to 100 feet. Gross Area = 14,700 SF, Width = 120 FT and Depth = 120 FT.

Type "C" Hangar - This hangar is designed primarily for (K)C-130 aircraft but may also be configured to accommodate other large transport aircraft (wingspans up to 132 feet). Gross Area = 21,466 SF, Width = 150 FT and Depth = 140 FT.

See NAVFAC P-272 and DM-28.1 for design criteria.

211 05 MAINTENANCE HANGAR - OH Space (SF)
211 06 MAINTENANCE HANGAR - 01 Space (SF)
211 07 MAINTENANCE HANGAR - 02 Space (SF)

Maintenance Hangars are required to provide weather-protected shelter for the servicing and repair of Navy and Marine Corps aircraft at the organizational level and emergency shelter for operable aircraft. Maintenance hangars configured for a Marine Corps Headquarters and Maintenance Squadron may provide for the servicing and repair of aircraft at the intermediate level as well as at the organizational level. See basic category 211 Supplement - Maintenance Aircraft Spares - for Marine Corps Aircraft Maintenance Facilities. The supplement is located at the end of the 211 series criteria. There are two basic types of modular hangars, Type I and Type II. These hangars each contain a hangar (OH) space, crew and equipment (01) space, and administrative (02) space. Each of these spaces is assigned a separate category code.

It is difficult to establish specific criteria which will meet the requirements of the multisized squadrons within the various commands of the Navy and Marine Corps. Sizes range from a 3-plane AEW squadron with a complement of 143 persons to a 56-plane VF squadron with a complement of 1,500 persons (including students). Accordingly, the criteria herein and further defined in examples 1 and 2 below and in the definitive drawings depicting the Type I and Type II Maintenance Hangar modules were developed primarily to maintain squadron facility integrity for standard size fleet support squadrons. In this context, '*standard size" is defined as a combination of the following factors:

1. 12 to 18 carrier-type aircraft and 150 to 400 persons or

2. 6 to 12 land-based patrol (or large transport) aircraft and 150 to 400 persons.

Guidance for applying these criteria to both standard and nonstandard size units is contained in subparagraph 1 below and illustrated in examples 1, 2 and 3.

The standard hangar modules shown in NAVFAC P-272 are:

Type I modular hangar:	principally designed for carrier aircraft but is adaptable for rotary wing aircraft, smaller general-purpose and transport (less than 85 foot length) aircraft, and special mission aircraft.
Type II modular hangar:	principally designed for patrol aircraft but is adaptable for large general-purpose and transport (including C-9) or special-mission aircraft.

Since the total hangar space requirement for organizational maintenance depends on the type and number of aircraft assigned to a squadron and the complexity of its maintenance mission, total hangar requirements for a given Navy or Marine Corps squadron are determined on the basis of the number of aircraft that require space for scheduled and unscheduled maintenance.

1. Guidelines for Applying Organizational Maintenance Facilities Criteria. In the application of the criteria for the planning of Organizational Maintenance Facilities, the following guidelines are established:

a. One Type I hangar module consisting of OH and 01/02 spaces will be planned for each "standard size" (as defined above) carrier-type squadron. Similarly, one Type II hangar module will be planned for each "standard size" VP squadron.

b. VS, VR, VT, AEW, RAG, HELO, Reserve, and other squadrons or units assigned to an activity which deviate in size (aircraft and/or persons) from the definition of "standard size" will be combined into a total base loading. Pool or station aircraft as well as the personnel assigned to organizational maintenance of these aircraft should be included in this base loading. Students assigned to training squadrons may be included only if a separate flight training and briefing building (Cat. Code 171 20) has not been provided. The OH space requirement for this loading is then computed using the formulas contained in subparagraphs 2 through 5 and as outlined in the examples shown below. The total 01/02 space can then be established on the basis of one such Type I or Type II component, as applicable, for each 275 persons included in this total case loading (see example 3 below). Movable partitions within the 01/02 components will facilitate prorating of space within these areas for nonstandard size squadrons and units.

c. The number of 01/02 and OH spaces computed shall be used as the requirement, except that the number of 01/02 spaces planned may not exceed the computed number of OH spaces.

d. On occasions, notably when planning for base loadings which include larger replacement or training squadrons or smaller early warning squadrons, it may be necessary to deviate from criteria by altering the size of the 01/02 components. This may be accomplished on the basis of approximately 65 square feet per person, by increasing or decreasing the depth of the component as required while maintaining the 192 foot or 240 foot width. For purposes of economy and/or standardization, such deviations will not be approved without presentation of strong justification.

2. Determining the Number of Hangar (OH) Spaces Required for Scheduled Maintenance. Hangar space requirements for scheduled maintenance may be considered as varying with (1) the number of engines installed on an aircraft and (2) the size and general type of aircraft. The following relationships apply:

a. For single-engine carrier aircraft:

$$Ns = \frac{n}{5} \qquad (1)$$

b. For twin-engine carrier aircraft:

$$Ns = \frac{n}{4} \qquad (2)$$

c. For land-based patrol, air early-warning aircraft, and training aircraft (or training versions of fleet aircraft):

$$Ns = \frac{n}{12} \qquad (3)$$

d. For land-based transport aircraft:

$$Ns = \frac{n}{40} \qquad (4)$$

Where Ns = number of aircraft hangar (OH) spaces for scheduled organizational maintenance, and
n = number of aircraft.

3. Determining the Number of Hangar (OH) Spaces Required for Unscheduled Maintenance. Hangar space requirements for unscheduled organizational maintenance-are a function of the complexity of the aircraft. The ratio of the Intermediate Maintenance Operating Factor (I.M.O.) to the Total Maintenance Operation Factor (T.M.O.) is a measure of the complexity. Data pertaining to I.M.O. and T.M.O. factors will be provided to approved requesters. The following relationship applies:

$$Nu = \frac{(I.M.O.)n}{T.M.O.} \qquad (5)$$

Where
Nu = number of aircraft hangar (OH) spaces for unscheduled maintenance, and

4. Determining the Total Number of Hangar Spaces (N) Required for Scheduled and Unscheduled Organizational Maintenance.

$$N = Ns + Nu \qquad (6)$$

5. Determining the Number of Hangar Modules Required. The determination of the number of aircraft hangar modules required, to satisfy the number of hangar spaces (N) required, depends upon the size of the aircraft and the size of the basic hangar module used. See Table 211-05. After determining which type of hangar is required by comparing the length and height of a given aircraft with the figures in the table, compute the required hangar width (RHW) as follows:

Fixed Wing Aircraft

$$RHW = N(W) + (N-1)D \qquad (7)$$

Helicopters (Rotor Folding Capability)

$$RHW = .25N\ (RS) + .75N(RF) + (N-1)D \qquad (8)$$

Helicopters (Without Rotor Folding Capability)

$$RHW = N(RS) + (N-1)D \qquad (9)$$

Where

W = Width of aircraft (use wings folded dimension for all aircraft having that capability)
N = See Paragraph 4 above
D = Distance between aircraft (For planning purposes assume 5 ft.)
RS = Rotor diameter when rotor spread
RF = Rotor diameter when rotor folded

TABLE 211-05
Modular Hangar Dimensional Statistics for Planning Purposes

	Hangar Spaces	Type I	Type II
(OH)	Hangar - Cat. Code 211 05		
	Gross Area (Sq. Ft.)	19,968	28,560
	Clear Height (Ft.)	28	42
	Usable Dept (Ft.)*	85	100**
	Usable Width (Ft.)***		
	1 Module	172	220
	1-1/2 Modules	258	335
	2 Modules	354	450
	2-1/2 Modules	445	565
	3 Modules	536	680
	3-1/2 Modules	627	795
	4 Modules	718	910
(01)	Crew and Equipment - Cat. Code 211 06		
	Gross Area (Sq. Ft.)	8,690	12,050
	Clear height (Ft.)	10	10

(Table continued on next page.)

TABLE 211-05 (Continued)
Modular Hangar Dimensional Statistics for Planning Purposes

Hangar Spaces	Type I	Type II
(02) Administrative - Cat. Code 211 07		
Gross Area (Sq. Ft.)	8,640	12,000
Clear Height (Ft.)	8	8
Mezzanine - Cat. Code 211 06		
Gross Area (Sq. Ft.)	1,536	NONE

*Computed upon the requirement for a lo-foot fire lane along the rear wall of the hangar and a S-foot work clearance between aircraft and doors.
** For aircraft other than the P-3, for which the Type II hangar was basically designed. May also be used for other longer aircraft by modifying doors for "tailcutout" closure.
*** Computed upon the requirement for one lo-foot wide fire lane from the front to the rear of the hangar and 5 feet from aircraft to outer walls. Also assumes aircraft will be parked parallel to each other and to the side walls of the hangar to minimize evacuation time in case of fire.

Compare the computed required hangar width (RHW) with the appropriate "usable width" column of Table 211-05, and if the FHW is:

a. Less than one module, one module is required.

b. More than one module, but less than one and one-half modules, one module is required.

c. Additional modules will be assigned on the same basis.

6. Planning for Collateral Organizational Space. Since line operations and line maintenance functions must be performed as close as possible to the apron-parked aircraft of a squadron, it has been found impractical to plan space within the hangar module for these purposes, and therefore separate structures must be provided. Additionally, to provide needed flexibility in making parking apron assignments to squadrons, these separate structures should be portable and must be planned as collateral equipment. See Category Code 141 30, Aircraft Line Operations Building, and Category Code 211 15, Line Maintenance Shelter, for planning criteria.

7. Examples. The squadrons used in examples 1 and 2 are standard size, and the hangar requirement could have been obtained without computation (see paragraph 1a). Computations are provided here to illustrate the use of formulas. Example 3 includes computation for a nonstandard size squadron.

a. Example No. 1. Determine the number of new hangar modules required for organizational maintenance support of a squadron of 15 carrier-type, twin-engine aircraft having a 330 person complement and the following specifics:

W = (width of aircraft) 25.33 ft.
D = (distance between aircraft) 5 ft.
I.M.0 = (see paragraph 3 above) 3.54
T.M.O. = (see paragraph 3 above) 18.25

Step 1. Determine the number of (OH) hangar spaces required for scheduled maintenance (Ns). Since the aircraft is twin engine and carrier type, equation (2) is used.

$$Ns = \frac{n}{4} \qquad (2)$$

$$Ns = \frac{15}{4}$$

$$Ns = 3.75$$

Step 2. Determine the number of (OH) hangar spaces required for unscheduled maintenance (Nu) by using equation (5).

$$Nu = \frac{(I.M.O.)n}{T.M.O.} \qquad (5)$$

$$Nu = \frac{(3.54)15}{18.25}$$

$$Nu = 2.91$$

Step 3. The total organizational maintenance (OH) hangar space requirement is now found by using equation (6).

$$N = Ns + Nu \qquad (6)$$

$$N = 3.75 + 2.91$$

$$N = 6.66$$

Therefore, 6.66 (OH) hangar spaces are required for organizational maintenance support for this squadron of 15 aircraft.

Step 4. Determine the required hangar width (RHW) by using equation (7).

$$RHW = N\ (W) + (N-1)D \qquad (7)$$

$$RHW = 6.66\ (25.33\ ft.) + (6.66-1)\ 5\ ft.$$

$$RHW = 196.99\ ft.$$

modules (258 feet). Therefore, one 192-foot hangar module is required for organizational maintenance support of the 15 carrier-type aircraft squadron.

b. Example no. 1. Determine the number of new hangar modules required for organizational maintenance support of a squadron of nine land-based patrol aircraft having a 270-person complement and the following specifics:

$$W = 99.8 \text{ ft.}$$

$$D = 5 \text{ ft.}$$

$$I.M.O. = 2.77$$

$$T.M.O. = 17.37$$

Step 1. Determine the number of (OH) hangar spaces required for scheduled maintenance (Ns) by using equation (3).

$$Ns = \frac{n}{12} \qquad (3)$$

$$Ns = \frac{9}{12} = .75$$

Step 2. Determine the number of (OH) hangar spaces required for unscheduled maintenance (Nu) by using equation (5).

$$Nu = \frac{(I.M.O.)n}{T.M.O.} \qquad (5)$$

$$Nu = \frac{(2.77)9}{17.37}$$

$$NU = 1.44$$

Step 3. Determine the total organizational maintenance (OH) hangar space by using equation (6).

$$N = Ns + Nu \qquad (6)$$

$$N = .75 + 1.44$$

$$N = 2.19$$

Therefore, 2.19 (OH) hangar spaces are required for organizational maintenance support of this patrol squadron of nine aircraft.

Step 4. Determine required hangar width (RHW) by using equation (7).

$$RHW = N(W) + (N-1)D \qquad (7)$$

$$RHW = 2.19\ (99.8 \text{ ft.}) + (2.19-1)\ 5 \text{ ft.}$$

RHW = 224.5 ft.

Step 5. Since the planning is for a patrol aircraft, the 240-foot Type II module will be used. By referring to Table 211-05 it is evident that the RHW of 224.5 feet is greater than the usable inside width of one module (220 feet) but less than one and one-half modules (335 feet)-. Therefore, one 240-hangar module is required for organizational maintenance support of the nine patrol aircraft squadron.

c. Example No. 3.

Organizational Maintenance Support of the Following Base Loading

Unit			A/C	Off.	Enlisted	Student
VP	99	9	P3A/B	50	330	-------
VAH	350	20	KA3B	50	540	-------
VA	500	13	A6A/B	30	340	-------
VA	501	10	A6A/B	26	394	-------
VA	502	13	A6A/B, 2 A6C	50	510	-------
VA	503	14	A6A/B	50	345	-------
VAH	351	12	KA3B, 6 TA3B	50	495	190
VA	504	20	A6A/B, 4 TC4C	50	660	145
Station		5	C54Q	50	110	-------
		3	US2B	30	---	-------
TOTALS		131		386	3,524	335

Step 1. By observation it is apparent that VP 99, VA 500, VA 502, and VA 503, consisting of 51 aircraft and 1,505 persons, are each standard size squadrons and in accordance with paragraph la will require three Type I OH spaces, three Type I 01/02 spaces (for Va 500, VA 502, and VA 503), and one Type II OH space and one Type II 01/02 space (for VP 99).

Step 2. Combine the remaining aircraft and personnel into a base loading with applicable specifics:

No. & Type A/C	*I.M.O.	*T.M.O.	W	D
32 KA3B	2.33	16.28	49.2	5
30 A6A/B	3.54	18.25	25.3	5
6 TA3B	4.85	23.40	49.2	5
4 TC4C	3.49	15.32	78.4	5
5 C54Q	2.59	14.62	117.5	5
3 US2B	1.20	7.69	27.3	5
80 Aircraft				

*I.M.O. and T.M.O. values shown are factitious.

Total Persons - 4,245 - 1,505 = 2,740.

Step 3. Compute the OH space requirements:

(a) For the Type I hangar module

For 32 KA3B Twin-Engine Carrier Aircraft

$$Ns = \frac{n}{4} \qquad (2)$$

$$Ns = \frac{32}{4} = 8.0$$

$$Nu = \frac{(I.M.O.)n}{T.M.O.} \qquad (5)$$

$$Nu = \frac{(2.33)32}{16.28} = 4.48$$

$$N = Ns + Nu \qquad (6)$$
$$N = 8.0 + 4.48 = 12.48$$

$$RHW = N(W) + (N-1)D \qquad (7)$$
$$RHW = 12.48\ (49.2) + (12.48-1)5 = 671.4 \text{ ft.}$$

For 30 A6A/B Twin-Engine Carrier Aircraft

$$Ns = \frac{n}{4} \qquad (2)$$

$$Ns = \frac{30}{4} = 7.5$$

$$Nu = \frac{(I.M.O.)n}{T.M.O.} \qquad (5)$$

$$Nu = \frac{(3.54)30}{18.25} = 5.7$$

$$N = Ns + Nu \qquad (6)$$
$$N = 7.5 + 5.7 = 13.2$$

$$RHW = N(W) + (N-l)D \qquad (7)$$
$$RHW = 13.2(25.3) + (13.2-1)5 = 395.0 \text{ ft.}$$

For 6 TA3B Training Aircraft

$$Ns = \frac{n}{4} \qquad (3)$$

$$Ns = \frac{6}{12} = 0.50$$

$$Nu = \frac{(I.M.O.)n}{T.M.O.} \qquad (5)$$

$$Nu = \frac{(4.85)6}{23.40} = 1.24$$

$$N = Ns + Nu \qquad (6)$$
$$N = 0.50 + 1.24 = 1.74$$

$$RHW = N(W) + (N-l)D \qquad (7)$$
$$RHW = 1.74(49.2) + (1.74-1)5 = 89.3 \text{ ft.}$$

For 4 TC4C Training Aircraft

$$Ns = \frac{n}{12} \qquad (3)$$

$$Ns = \frac{4}{12} = 0.33$$

$$Nu = \frac{(I.M.O.)n}{T.M.O.} \qquad (5)$$

$$Nu = \frac{(3.49)4}{15.32} = 0.91$$

$$N = Ns + Nu \qquad (6)$$
$$N = 0.33 + 0.91 = 1.24$$

$$RHW = N(W) + (N-1)D \qquad (7)$$
$$RHW = 1.24(78.4) + (1.24-1)5 = 98.5 \text{ ft.}$$

For 3 US2B Twin-Engine Carrier Aircraft

$$Ns = \frac{n}{4} \qquad (2)$$

$$Ns = \frac{3}{4} = 0.75$$

$$Nu = \frac{(I.M.O.)n}{T.M.O.} \qquad (5)$$

$$Nu = \frac{(1.20)3}{7.69} = 0.48$$

$$N = Ns + Nu \qquad (6)$$
$$N = 0.75 + 0.48 = 1.23$$

$$RHW = N(W) + (N-1)D \qquad (7)$$
$$RHW = 1.23(27.3) + (1.23-1)5 = 34.7 \text{ ft.}$$

Total Type I OH Space RHW - 671.4 + 395.0 + 89.3 + 98.5 + 34.7 = 1288.9 ft.

By extrapolating Table 211-05 it is determined that the RHW required is greater than the usable width of 7 modules but less than the usable width of 7.5 modules. (First module has a usable width of 172 feet; each additional module has 182 feet.) Therefore, 7 Type I OH spaces are required.

(b) For the Type II hangar module

For 5 C54Q Land Based Transport Aircraft

$$Ns = \frac{n}{40} \qquad (4)$$

$$Ns = \frac{5}{40} = 0.125$$

$$Nu = \frac{(I.M.O.)n}{T.M.O.} \qquad (5)$$

$$Nu = \frac{(2.59)5}{14.62} = 0.90$$

$$N = Ns + Nu \qquad (6)$$
$$N = 0.125 + 0.90 = 1.03$$

$$RHW = N(W) + (N-1)D \qquad (7)$$
$$RHW = 1.03(117.5) + (1.03-1)5 = 121.2 \text{ ft.}$$

By referring to Table 211-05 it is determined that 1 Type II OH space is required.

Step 4. Compute 01/02 space requirements.

Total Personnel: 2,740 (From Step 2)
01/02 Spaces = 2,740 = 10
275 (paragraph lb above)

Total: 9 Type I 01/02 spaces and 1 Type II 01/02 spaces are required

Step 5. Summary.

Unit	No. Type I OH	No. Type I 01/02	No. Type II OH	No. Type II 01/02
VP 99			1 (Step 1)	1 (Step 1)
VA 500	1 (Step 1)	1 (Step 1)		
VA 502	1 (Step 1)	1 (Step 1)		
VA 503	1 (Step 1)	1 (Step 1)		
VAH 350) VA 501) VAH 351) VA 504) Station)	7 (Step 3a)	9 (Step 4)	1 (Step 3b)	1 (Step 4)
TOTALS	1 0	12	2	2

Therefore, the total computed organizational hangar requirement is 10 Type I OH spaces, 12 Type I 01/02 spaces, 2 Type II OH spaces, and 2 Type II 01/02 spaces.

In accordance with subparagraph 1c, planning will be limited to 10 Type I hangar modules and 2 Type II hangar modules, as the number of 01/02 spaces programmed shall not exceed the number of OH spaces.

211 08 AIRFRAMES SHOP (NON-NARF) (SF)

Intermediate level maintenance of airframes is performed in this shop. These criteria are applicable where 50 or more aircraft are to be maintained; for less than 50 aircraft, the airframe shop requirement shall be individually justified. For additional guidance applicable at Marine

Corps installations, see the 211 Supplement - Marine Corps Aircraft Maintenance Facilities.

To determine the square-footage requirements for a given installation, the number of assigned aircraft of each type is multiplied by the sum of the corresponding Maintenance and Operations Intermediate Maintenance Level (I.M.O.) factors for aviation structural mechanic (AM), aviation structural mechanic, safety equipment (AME), aviation structural mechanic, structures (AMS), and aviation structural mechanic, hydraulics (AMH). Information pertaining to the I.M.O. factors will be released to approved requesters. The sum of the products for each type of aircraft becomes the "sizing factor" which is then matched to Column 1 of Table 211-08, and the required gross area for the airframes shop is read in Column 2. See the following example for a sample computation.

TABLE 211-08
Space Allowance for Airframes Shop

Column 1 Sizing Factor	Column 2 Gross Area
0 - 20	5,500
21 - 38	9,000
39 - 54	11,500
55 - 69	14,000
70 - 79	15,000
80 - 89	16,000
90 - 99	17,000
100 - 109	18,000
110 - 119	18,700
120 - 139	19,800
140 - 159	20,500
160 - 180	21,000

Example Computation - Airframes Shop

A/C	No. A/C (n)	AM (I.M.O.)	AME (I.M.O.)	AMH (I.M.O.)	AMS (I.M.O.)	Tot. (I.M.O.)	Sizing Factor (n x total I.M.O.)
Type A	96	0	.08	.16	.16	.40	38.4
Type B	4	0	0	.25	.25	.50	2.0
Type C	120	0	.07	.14	.21	.42	50.4
Type D	76	0	0	.19	.26	.45	34.2
	296						125.0

In accordance with data in Column 1, Table 211-36, 125 = 19,800 square feet required.

NAVFAC P-272 shows a small airframes shop containing a gross area of 11,500 square feet and a large shop containing 19,000 square feet. Airframes shops contain space for tire and wheel repair, sandblasting, cleaning and plating, painting, welding, machine work, structures work, hydraulics/pneumatic repair, fiberglass/plastics repair, ejection seat repair, nondestructive testing, tool and material storage, a technical library, administration, and training.

Exterior pavement is provided for vehicle access and nonorganizational vehicle parking. See Category Code 852 10, Parking Area. For design criteria, see NAVFAC DM-28.1.

211 09 AIRCRAFT BORESIGHT RANGE (NON-NARF) (EA)

One aircraft boresight range is required at Navy and Marine Corps air installations which service fighter aircraft equipped with fixed guns or gun pods. One boresight range has the capacity to boresight and fire-in 40 such aircraft each month on a single shift basis. A requirement for more than one boresight range at any station must be individually justified. The two types of ranges are: Type A, semienclosed and Type B, open. Type A is used unless there is existing land or restricted water area available for the 7,000-yard, 60-degree sector danger zone required by Type B. Where practicable, the boresight range should be oriented north and south to avoid firing toward the sun during early or late hours. Inhabited structures and station boundary should be separated by a minimum safety distance of 1,200 feet from the boresight range area. See NAVFAC P-272 and NAVFAC DM-28.1. In addition, a standard 12- by 20-foot line shelter is planned with this facility for crew shelter and storage of jacks and tiedown gear. See Category Code 211 15, Line Maintenance Shelter, for criteria.

The following category codes are for Naval Air Rework Facility (NARF) use only. Criteria are under development.

211 10 Aircraft Overhaul and Repair Shop (NARF)
211 11 Corrosion Control-Cleaning Shop (NARF)
211 12 Paint and Finishing Hangar (NARF)
211 13 Aircraft Non-Destructive Testing Shop (NARF)
211 14 Aircraft Rework Shop (NARF)

211 15 LINE MAINTENANCE SHELTER (SF)

Line maintenance shelters are required in support of aircraft maintenance hangars (Cat. Code 211 05) and aircraft boresight ranges (Cat. Code 211 09). One line maintenance shelter may be planned for each aircraft maintenance hangar module and one for each aircraft boresight range. Additional shelters may be provided as line operations buildings. See Category Code 141 30 for guidance.

The aircraft maintenance shelter is 20 feet by 12 feet and is usually a portable facility which is planned as collateral equipment for the basic facility. Collateral equipment is not Class II real property and cannot

be included in the real property inventory. However, this category code is being retained for real property inventory purposes since many of the existing facilities are not portable and accordingly must be reported in the RPI. For design criteria, see NAVFAC DM-28.1.

The following category code is for Naval Air Rework Facility (NARF) use only.

211 20 Aircraft Engine Overhaul Shop (NARF)

211 21 ENGINE MAINTENANCE SHOP (NON-NARF) (SF)

This section provides the method for determining the space requirement for the Power Plants Division (Engine Maintenance Shop) of an Intermediate Maintenance Activity (IMA). The Navy and Marine Corps Chain-of-Command through OPNAVINST 4790.2 assigned aircraft maintenance tasks and responsibilities to air activities which in turn establish individual work centers to perform these tasks. With regard to engine maintenance, individual work centers are established for each type of engine assigned, i.e., a work center would be established for the J-79 engine. Work centers may also be established for specialized maintenance tasks assigned to the activity, such as propeller maintenance, rotor dynamics maintenance, etc. Under the criteria outlined below, Engine Maintenance Shop space is allocated by work center to support maintenance tasks for assigned engines, equipment, or components authorized for repair at the activity by higher authority. The Engine Shop work centers, which are authorized for individual activities, can be obtained from the Individual Component Repair List (ICRL).

Table 211 21A lists the space required for all work centers involved in engine maintenance for the various types and numbers of aircraft within the Navy's inventory. (Certain aircraft types, such as the C-118 and S-2, are not listed because they have negligible impact on the sizing of an Engine Maintenance Shop.) First and second degree maintenance, as well as the following data items, were considered in calculating the listed space:

1. Size of engine
2. Number of engines per aircraft
3. Number, type and size of required maintenance stands
4. Work benches
5. Work center administrative and storage area
6. Fire lane/aisle space
7. Mean flight hours between failure (MFHBF) of engines requiring removal to an IMA
8. Averaged turn around time (TAT) of engine in IMA
9. Flight hours between inspections (FHBI)
10. Elapsed inspection time (EIT)
11. Quick engine change assembly (QECA) build up time (EBT)
12. Aircraft monthly utilization

To use Table 211-2lA, enter the total number of each aircraft type (EA-6, KA-6 and A-6 are considered one type, A-6s) into the appropriate column and read the area. Then total the areas read from the columns for each

aircraft model assigned engine maintenance.

Engine Maintenance Shop High Bay space, in addition to that shown in Table 211-21A, may be required for engine related components as indicated below if specialized work centers have been authorized for any of the following: (Only one work center of each type required, for example, only one APU work center at 1800 SF is required even if C-130, F-18 and S-3 aircraft are assigned.)

1. Auxiliary Fuel Stores associated with the A-4, A-6, A-7, F-4, F-14, F-18 - add 3375 S.F.

2. Auxiliary Power Unit (APU) associated with the C-2, C-130, F-18, H-46, H-53, H-60, P-3, S-3, AV-8 - add 1800 S.F.

3. Propellers associated with the C-2, C-130, E-2, P-3, T-34, OV-10 add 2925 S.F.

4. Rotor Dynamics associated with any helo - add 3375 S.F.

The space derived from Table 211-21A, in addition to any authorized above for specialized work centers, constitutes the high bay area of the Engine Maintenance Shop.

To determine the remaining space requirements for an Engine Maintenance Shop (i.e., administrative and other support functions such as cleaning, welding, supply support and storage) normally housed in the shop wings and mezzanine areas use the percentage factors in Table 211-21B applied to the areas established from Table 211-21A. Do not apply the percentage factors to the areas for specialized work centers shown above. See Examples 1 and 2 following these criteria.

TABLE 211-21A
Space Allowance for Engine Maintenance Shop
(High Bay Engine)

A-4 J52		A-6 J52		A-7 TF41		F-4 J79		F-14 TF30		F-18 F404	
No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA
1-9	925	1-8	1475	1-10	1975	1-8	1075	1-8	1975	1-8	1475
10-19	1475	9-16	2575	11-21	3575	9-16	3575	9-17	3575	9-17	2575
20-28	2025	17-24	3675	22-32	5175	17-24	5175	18-26	5175	18-25	3675
29-38	2575	25-32	4775	33-42	6775	25-32	6775	27-35	6775	26-34	4775
39-47	3125	33-40	5875	63-53	8375	33-40	8375	36-46	8375	35-43	5875
48-57	3675	41-48	6975	54-63	9975	41-49	9975	45-53	9975	44-51	6975
58-66	4225	49-56	8075	64-74	11575	50-57	11575	54-62	11575	52-60	8075
67-76	4775	57-64	9175	75-85	13175	58-65	13175	63-71	13175	61-69	9175
77-85	5325	65-72	10275	86-95	14775	66-73	16775	72-79	14775	70-77	10275
86-95	5875	73-80	11375	96-106	16375	74-81	16375	80-88	16375	78-86	11375
96-104	6425	81-88	12475	107-116	17975	82-89	17975	89-97	17975	87-94	12475
105-114	6975	89-96	13575	117-127	19575	90-98	19575	98-106	19575	93-103	13575
115-123	7525	97-104	14675	128-135	21175	99-106	21175	107-115	21175	104-112	14675
124-133	8075	105-112	15775	136-148	22775	107-114	22775	116-124	21775	113-121	15775
134-142	8625	113-120	16875	149-150	23575	115-122	24375	125-133	24375	122-129	16875
143-150	9175	121-128	17975			123-130	25975	134-142	25975	130-138	17975
		129-136	19075			131-138	27575	143-150	27575	139-147	19075
		137-145	20175			139-150	29175			148-150	19625
		146-150	20725								

H-1 T400		H-2 T58		H-3 T58		H-46 T58		H-53 T64		H-60 T700	
No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA
1-16	775	1-6	1175	1-8	1175	1-21	775	1-6	925	1-9	775
17-33	1175	7-12	1975	9-16	1975	22-42	1175	7-12	1475	10-18	1175
34-49	1575	13-19	2775	17-24	2775	43-64	1575	13-18	2025	19-28	1575
50-66	1975	20-25	3575	25-32	3575	65-85	1975	19-24	2575	29-37	1975
67-83	2375	26-32	4375	33-41	4375	86-107	2375	25-30	3125	38-47	2375
86-99	2775	33-38	5175	42-49	5175	108-128	2775	31-36	3675	48-56	2775
100-116	3175	39-45	5975	50-57	5975	129-150	3175	37-42	4225	57-65	3175
117-133	3575	46-51	6775	58-65	6775			43-48	6775	66-75	3575
134-150	3975	52-57	7575	66-74	7575			49-54	5325	76-84	3975
		58-64	8375	75-82	8375			55-60	5875	85-94	4375
		65-70	9175	83-90	9175			61-66	6425	95-103	4775
		71-77	9975	91-98	9975			67-72	6975	104-113	5175
		78-87	10775	99-106	10775			73-78	7525	114-122	5575
		84-90	11575	107-115	11575			79-85	8075	123-131	5975
		91-96	12375	116-123	12375			86-91	8625	132-141	6375
		97-102	13175	124-131	1317s			92-103	9725	142-150	6775
		103-115	14775	132-139	13975			104-115	10825		
		116-128	16375	169-148	14775			116-127	11925		
		129-141	17975	149-150	15175			128-139	13025		
		142-150	19175					140-150	14125		

TABLE 211-21A (continued)

C-2 T56		C-130 T56		P-3 T56		s-3 TF34		AV-8 F402		OV-10 T76	
No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA
1-19	1175	1-10	1975	1-8	1175	1-6	925	1-11	2775	1-8	775
20-39	1975	11-20	3575	9-16	1975	7-13	1475	12-22	5175	9-16	1175
40-58	2775	21-30	5175	17-24	2275	14-19	2025	23-33	7575	17-24	1575
59-76	3575	31-41	6775	25-32	3575	20-26	2575	34-45	9975	25-32	1975
79-97	4375	42-51	8375	33-40	4375	27-32	3125	46-56	12375	33-60	2375
98-117	5175	52-61	9975	41-48	5175	33-39	3675	57-67	14775	41-49	2775
118-136	5975	62-71	11575	49-57	5975	40-45	4225	68-78	17175	50-57	3175
137-150	6775	72-82	13175	58-65	6775	46-52	4775	79-80	19575	58-65	3575
		83-92	14775	66-73	7575	53-59	5325	91-101	21975	66-73	3975
		93-102	16375	74-81	8375	60-65	5875	102-112	24375	74-81	4375
		103-112	17975	82-89	9175	66-72	6425	113-123	26775	82-90	4775
		113-123	19575	90-97	9975	73-78	6975	124-135	29175	91-98	5175
		124-133	21175	98-106	10775	79-85	7525	136-146	31575	99-106	5575
		134-143	22775	107-114	11575	86-31	8075	147-150	33975	107-114	5975
		146-150	26375	115-122	12375	92-98	8625			115-122	6375
				123-130	13175	99-105	9175			123-130	6775
				131-138	13975	106-111	9725			131-139	7175
				139-146	14775	112-124	10825			140-147	7575
				147-150	15575	125-137	11925			148-150	7975
						138-140	13025				

E-2 T56	
No A/C	AREA
1-39	1175
40-78	1975
79-116	2775
117-150	3575

TA-4 J52		TH-1 T53		T2C J85		T-34C PT-6		T-39D J60		T-44A PT-6	
No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA	No A/C	AREA
1-7	925	1-26	775	1-7	1175	1-6	775	1-6	1475	1-8	1175
8-15	1475	27-53	1175	8-16	1975	7-13	1175	7-13	2575	9-16	1975
16-23	2025	54-80	1575	15-22	2775	14-20	1575	14-20	3675	17-24	2775
24-30	2575	81-107	1975	23-29	3575	21-27	1975	21-27	4775	25-33	3575
31-38	3125	108-134	2375	30-37	4375	28-33	2375	28-34	5875	34-41	4375
39-46	3675	135-150	2775	38-46	5175	36-40	2775	35-41	6975	42-49	5175
47-54	4225			45-52	5975	41-47	3175	42-48	8075	50-57	5975
55-61	4775			53-59	6775	48-54	3575	49-55	9175	58-66	6775
62-69	5325			60-67	7575	55-60	3975	56-62	10275	67-74	7575
70-77	587 5			68-74	8375	61-67	4375	62-68	11375	75-83	8375
78-84	6425			75-82	9175	68-74	4775	69-75	12475	84-91	9175
85-92	6975			83-89	9975	75-81	5175	76-82	13575	92-99	9975
93-100	7525			90-97	10775	82-88	5575	83-89	14675	100-108	10775
101-108	8075			98-104	11575	89-94	5975	90-96	15775	109-116	11575
109-115	8625			105-111	12375	95-101	6375	97-103	16875	117-124	12375
116-123	9175			112-119	13175	102-108	6775	104-110	17959	125-132	13175
126-131	9725			120-126	13975	109-115	7175	111-117	19075	133-141	13975
132-138	10275			127-134	16775	116-121	7575	118-124	20175	142-150	14775
139-146	10825			135-141	15575	122-135	8375	125-137	22375		
147-150	11375			142-150	16375	136-150	9175	138-150	16575		

TF-57 T-63	
No A/C	AREA
1-15	575
16-30	775
31-65	945
46-60	1175
61-75	1375
76-90	1575
91-105	1775
106-120	1975
121-135	2175
136-150	2375

TABLE 211-21B
Space Allowance for Engine Maintenance Shop
(Administration Areas)

up to	15,000 SF	50%	32,501	35,000	42%
15,001	17,500	49%	35,001	37,500	41%
17,501	20,000	48%	37,501	40,000	40%
20,001	22,500	47%	40,001	42,500	39%
22,501	25,000	46%	42,501	45,000	38%
25,001	27,500	45%	45,001	47,000	37%
27,501	30,000	44%	47,501	50,000	36%
30,001	32,500	43%	50,001	and up	35%

EXAMPLE NO. 1: Air station base loading is 47 A6E, 14 KA6D, 29 EA6B, 11 UH-1N, 9 P3A, 4 C-118D, 2 EA6A.

A/C No. & Type	High Bay-Engine (Table 211-2lA)	Rotor Dynamics	APU	PROPS	Aux. Fuel Stores	Total High Bay
92 A6	13575	-	-	-	3375	16950
11 H1	-	-	-	-	-	Note 1
9 P3	1975	-	1800	2925	-	6700
4 C-118	-	-	-	-	-	Note 1
	15550					23650

Shop Administration (Table 211-21B) 15550 x .49 = 7595 S.F.
Total Engine Maintenance Shop 23650 + 7595 = 31245 S.F.

EXAMPLE NO. 2: Air station has 2 C-117, 16 CH-46, 5 OV-10A, 5 AH-1J, 10 UH-1N, 1 CH-53, 8 C-130, 22 A4M, 13 AV-8A.

A/C No. & Type	High Bay-Engine (Table 211-21A)	Rotor Dynamics	APU	PROPS	Aux. Fuel Stores	Total High Bay
2 C-117	-	-	-	-	-	Note 1
16 H-46	775	3375	1800	-	-	5950
5 OV-10	775	-	-	-	-	775
15 H-1	775	Note 2	-	-	-	775
1 H-53	-	-	-	-	-	Note 1
8 C-130	1975	-	Note 2	2925	-	4900
22 A4	2025	-	-	-	3375	5400

A/C No. & Type	High Bay-Engine (Table 211-21A)	Rotor Dynamics	APU	PROPS	Aux. Fuel Stores	Total High Bay
13 AV-8	5175	-	Note 2	-	-	5175
	11500					22975

Administration 11500 x .50 = 5750
Total Engine Maintenance Shop 22975 + 5750 = 28725 S.F.

Note 1 - Activity does not have second and third degree maintenance responsibility for the engine or components per ICRL.

Note 2 - Only one component work center of each type required.

The following category codes are for Naval Air Rework Facility (NARF) use only. Criteria are under development.

211 22 Engine Preparation and Storage Shop (NARF)
211 23 Engine Examination and Evaluation Shop (NARF)
211 24 Dedicated Aircraft Engine Overhaul-General Process (NARF)
211 25 Jet Engine Overhaul Shop (NARF)
211 26 Reciprocating Engine Overhaul Shop (NARF)
211 27 Turbine Engine Overhaul Shop (NARF)

211 30 Aircraft and Engine Accessories Overhaul Shop (NARF)
211 31 Dedicated Aircraft and Engine Accessories Overhaul-General Process (NARF)
211 32 Metal Components Shop (NARF)
211 33 Non-Metal Components Shop (NARF)
211 34 Dynamic Components Shop (NARF)
211 35 Hydraulic Components Shop (NARF)
211 36 Electrical Components Shop (NARF)
211 37 Turbine Accessories Shop (NARF)
211 38 Pneumatic Oxygen Shop (NARF)
211 39 Optical and Photographic Components Shop (NARF)

211 40 Electronics, Communication and Armament System Shop (NARF)
211 41 Dedicated Electronics, Communication and Armament-General Process Shop (NARF)

211 42 Electronic System Components Shop (NARF)
211 43 Inertial Quality Instrument Overhaul Shop (NARF)
211 44 Non-Inertial Quality Instrument Overhaul Shop (NARF)

211 45 AVIONICS SHOP (NON-NARF) (SF)

An avionics shop at the intermediate maintenance level is required at Navy and Marine Corps air installations for the testing, maintenance, and repair

of avionics systems. See the basic Category 211 Supplement which provides additional planning guidance for Marine Corps activities. The avionics shops have some common spaces which vary proportionally with the overall shop size. These spaces include administrative, mechanical equipment, electrical, vari-drive, instrument calibration, material control, ready-for-issue, rotable pool, production control, classified storage, module test and repair, cleanroom, shielded, and crypto spaces. The shops also contain spaces which are not proportional to overall size and are peculiar to a given type of aircraft. Table 211-45A identifies the six basic shops (A, B, C, D, E, and F) for the major types of aircraft and shows the impact of the nonproportional/aircraft peculiar spaces on those shops:

TABLE 211-45A
Aircraft Peculiar Avionics Shop Spaces

Space	Type A (VF)	Type B (VA)	Type C (VW)	Type D (VP/VS)	Type E (VT/VU/ VC/H/VR	Type F (VMGR/ HM/VMO
Communications navigation and identification (CNI)	Major	Major	Average	Minor	varies	varies
Radar	None	None	Average	Average	varies	varies
Semiautomatic checkout (SACE)	None	Major	Major	None	varies	varies
Fire control/ radar	Major	Major	None	None	varies	varies
Electronic-counter measures (ECM)	Major	Major	None	None	varies	varies
Antisubma-rine warfare (ASW)	None	None	None	Average	varies	varies
Magnetic anomaly detection (MAD)	None	None	None	Average	None	None

NOTE: See Table 211-45B for definition of aircraft squadron designations

NAVFAC P-272 contains definitive drawings for large and small type A, B, C, and D shops. Because of the nonstandard mixes of the squadrons covered by the Type E shop, no definitive design is available. Each such shop must be planned to take into account the specific avionics configurations

of the assigned aircraft. NAVFAC P-272 also contains a Type F shop configured for an HM group and a Type A and B shop configured for a VMF/VMA group. The selection of the definitive drawing to be used in planning an avionics shop for a particular activity is generally a local decision. For example:

1. An activity with a majority of VF/VA aircraft may choose the definitive drawing for either the VA or VF avionics shop or may, if conditions warrant, select a combination of both definitives.
2. On the other hand, an activity with a majority of helo type aircraft, but having some VS aircraft, may choose a VS definitive drawing as being more adaptable to its avionics functions.

To determine the gross square-footage requirements for a given air installation, the number of assigned aircraft of each type is multiplied by the corresponding Intermediate Maintenance and Operations (I.M.O.) factors for aviation electricians mate (AE), aviation fire control technician (AQ, AQB, and AQF), aviation electronics technician (AT, ATN, ATR), master chief avionics technician (AVCM), and aviation antisubmarine warfare technician (AX). Information pertaining to the I.M.O. factors will be provided by NAVFAC Headquarters upon request. The sum of the products for each aircraft type within a particular group, as defined in Table 211-45B becomes the sizing factor for that group. The gross square foot area for each group is then read directly from the applicable column of Table 211-45B. In those instances where the total assigned loading of the installation is comprised entirely of aircraft of only one group, the area thus established is the maximum allowable for the avionics shop for that installation. Such a loading, however, would be the exception, as most assigned loadings include aircraft from any or all of the groups represented. To establish the maximum requirement for such a mixed assigned loading, the gross square foot area for each group is determined as described above. The gross area for the total mixed aircraft loading is then computed as follows:

EQUATION (1):

$$A = \sqrt{a^2 + b^2 + c^2 + d^2}$$

A = gross area
a = square foot area of 1st aircraft group from col. (1) Table 211-45B
b = 2nd col. (2)
c = 3rd col. (3)
d = 4th col. (4)

The area established by this method includes:
(a) Common spaces which vary proportionately with overall shop space.
(b) Aircraft peculiar spaces which are not proportional to overall shop space.

NOTE: Naval activities programmed to receive Versatile Avionics Systems Test (VAST) installations will require permanent space in addition to the above for each station programmed. As these stations are to be "tailored" for each individual activity and as the number of stations per activity will vary, the space requirements will be determined at the time the

equipment is assigned. For Basic Facilities Requirements (BFR) planning purposes, 1,000 square feet per station should be used.

Example 1

There are 118 assigned aircraft of the type and number indicated in Column (1) below. Column (2) contains the I.M.O. factors, and Column (3) is the product of Columns (1) and (2).

Step 1:

Use the following format to determine the "sizing factor." Assigned aircraft must be grouped to correspond to aircraft type groups identified in Columns (1) thru (4) of Table 211-45B. Sum the "sizing factors" to determine the total "sizing factor" for each particular group. In this case there is only one aircraft grouping as the assigned aircraft loadings all fall within the VF/VA/-VMA/VMF grouping of Table 211-45B.

Column 1 No. & Type A/C (n)	Column 2 IMO Factors		Column 3 Sizing Factor (n x IMO)
3 VA x	.56	=	1.68
96 VA x	2.94	=	282.24
19 VA x	1.25	=	23.75
118 A/C			307.67

Step 2:

Establish the space allowance for the avionics shop requirement for each particular group identified in Step 1. Only one group is in this example. Enter the "sizing factor" column of Table 211-45B with the total sizing factor computed for VA aircraft in Step 1 and read the avionics space allowance from Column (1) of the Table.

Sizing factor of 307.67 for VA.
From Column (1) of Table 211-45B, read 48,300 square feet.

Step 3:

Since there are no other aircraft-type groups represented in the base loading, the gross space allowance for the avionics shop is 48,300 square feet. See example 2 for application of criteria to an installation with multiple aircraft-type groups assigned.

Example 2

There are 105 assigned aircraft of the type and number indicated in Column (1) below. Column (2) contains the I.M.O. factors, and Column (3) is the product of Columns (1) and (2).

Step 1:

Use the following format to determine the "sizing factor". Assigned aircraft must be grouped to correspond to aircraft-type groups identified in

TABLE 211-45B
Space Allowance for Avionics Shop
(Gross Area)

Sizing	Column 1 VF/VA VMF/VMA Group (Sq Ft)	Column 2 VP/VS/VW Group (Sq Ft)	Column 3 VT/W/VC VR/H Group (Sq Ft)	Column 4 VMGR/HM/VMO Group (Sq Ft)
0-10	3,500	11,400	2,000	2,600
11-20	8,000	16,000	3,800	5,200
21-30	12,000	19,300	5,100	7,600
31-40	15,400	22,450	6,400	9,800
41-50	18,000	25,000	7,500	12,000
51-60	20,900	26,700	8,300	14,100
61-70	23,100	28,000	8,800	15,600
71-80	25,200	28,800	9,200	19,300
81-90	27,200	29,400	9,400	20,300
91-100	29,700	29,900		
101-110	30,750	30,300		
111-120	32,190	30,600		
121-130	33,600	30,900		
131-140	34,800	31,000		
141-150	36,100	31,100		
151-180	38,900			
181-210	41,400			
211-240	43,600			
241-270	45,300			
271-300	46,900			
301-330	48,300			
331-360	49,500			
361-390	50,600			
391-420	51,500			
421-450	52,400			
451-500	53,500			
501-550	54,600			
551-600	55,600			
601-650	56,500			

NOTE:

Squadron Designation

VF - Fixed wing fighter
VA - Fixed wing attack
VMF - Fixed wing fighter - USMC
VMS - Fixed wing attack - USMC
VP - Fixed wing patrol
VS - Fixed wing antisubmarine
VW - Fixed wing early warning
VT - Fixed wing training
VU - Fixed wing utility
VC - Fixed wing composite
VR - Fixed wing transport
H - Helicopter
HM - Helicopter - USMC
VMO - Fixed wing observation - USMC
VMGR - Fixed wing refueler/transport - USMC

Columns (1) thru (4) of Table 211-45B. Sum the "sizing factors" to determine the total "sizing factor" for each aircraft grouping.

For Column (1) of Table 211-45B, VF/VA/VMF/VMA Group

Column 1 No. & Type A/C (n)	Column 2 IMO Factors	Column 3 Sizing Factor (n x IMO)
2 VA x	.56 =	1.12
1 VA x	1.32 =	1.32
2 VA x	1.01 =	2.02
5 A/C		4.46

For Column (2) of Table 211-45B, VP/VS/VW Group

8 VS x	1.00 =	8.00
7 VW x	1.00 =	7.00
15		15.00

For Column (3) of Table 211-45B, VT/VU/VC/VR/H Group

Column 1 No. & Type A/C (n)	Column 2 IMO Factors	Column 3 Sizing Factor (n x IMO)
3 VU x	.48 =	1.44
19H x	1.00 =	19.00
4H x	1.05 =	4.20
34H x	1.31 =	44.54
3H x	.93 =	2.79
2 VT x	.05 =	.10
8H x	.57 =	4.56
6H x	.62 =	3.72
6H x	.50 =	3.00
85 A/C		83.35

Step 2:

Establish the space allowance for the avionics shop requirement for each particular aircraft group identified in Step 1. In the "sizing factor" column of Table 211-45B, locate the total "sizing factor" computed in Step 1 for each aircraft grouping and determine the shop allowance for that aircraft grouping.

Sizing factor of 4.46 for VA/VF
From col. (1) of Table 211-45B, read - - - - - - - - - - - 3,500 sq ft

Sizing factor of 15.00 for VS/VW
From col. (2) of Table 211-45B, read - - - - - - - - - - - 16,000 sq ft

Sizing factor of 83.35 for VT/VU/H
From col. (3) of Table 211-45B, read - - - - - - - - - - - 9,400 sq ft

Step 3:

Determining the gross space allowance for the avionics shop using Equation (1) which is stated in Category Code 211 45.

$$A = \sqrt{a^2 + b^2 + c^2 + d^2}$$

$$A = \sqrt{(3,500)^2 + (16,000)^2 + (9,400)^2 + (0)^2}$$

A= Gross Area = 18,884 sq ft

A= 18,884 sq ft, gross space allowance for avionics shop

For design criteria for avionics shops, see NAVFAC DM-28.1. Exterior pavement is provided for vehicle access and vehicle parking. See Category Code 852 10, Parking Area.

The following category codes are for Naval Air Rework Facility (NARF) use only. Criteria are under development.

211 50 Aircraft Armament/Missile Rework Shop (NARF)
211 51 Dedicated Aircraft Armament/Missile Rework-General Purpose (NARF)
211 52 Aircraft Weapon Overhaul and Test Shop (NARF)
211 53 Air Launched Missile Rework Shop (NARF)

211 54 AVIATION ARMAMENT SHOP (NON-NARF) (SF)

An aviation armament shop at the intermediate maintenance level is required at Navy and Marine Corps air installations having 24 or more aircraft capable of being armed. Installations with fewer than 24 such aircraft are provided space within organizational hangars or in other shops adjacent to them. Although missiles and rockets are handled at the missile maintenance shop or rocket assembly and loading areas, maintenance of reusable or nonexpendable-type rocket launchers classified as ammunition items and maintenance and storage of missile launchers are handled in the armament shop.

To determine the square footage requirements for a given station, the number of assigned aircraft of each type is multiplied by the corresponding Intermediate Maintenance and Operations (I.M.O.) factor for the aviation ordnanceman (AO) rating. Information pertaining to the I.M.O. factors for this rating will be released to approved requesters. The sum of the products for each type aircraft becomes the "sizing factor" which is then matched to Column 1 of Table 211-54, and the required gross area for the aviation armament shop is read in Column 2. See the following example for a sample computation.

TABLE 211-54
Space Allowances for Aviation Armament Shop

Column 1 Sizing Factor	Column 2 Square Feet
0 - 1.82	4,500
1.83 - 2.88	6,300
2.89 - 4.80	7,500
4.81 - 6.72	8,000
6.73 - 9.68	8,400
9.69 - 14.40	9,000
14.41 - 19.20	9,300
19.21 - 28.80	9,700
28.81 - 38.40	10,000
38.41 - 48.00	10,500

Example Computation - Aviation Armament Shop

A/C	No. A/C (n)	AO(I.M.0.)	Sizing Factor (n x I.M.O.)
Type A	96	.08	7.68
Type B	4	.11	.44
Type C	120	.14	16.80
Type D	76	.08	6.08
Total	296		31.00

Entering Column 1 of Table 211-54 with the sizing factor of 31.00, a required area of 10,000 gross square feet is read from Column 2.

NAVFAC P-272 shows a small armament shop containing a gross area of 4,500 square feet and a large armament shop containing a gross area of 10,000 square feet. The armament shop contains space for degreasing and storage of gun pods and ejector racks (MERs and TERs), production control, administration, a technical library, and a training room. Exterior paved areas are provided for vehicle access, special support equipment parking, and nonorganizational vehicle parking. See Category Code 852 10, Parking Area. For design criteria, see NAVFAC DM-28.1.

The following category codes are for Naval Air Rework Facilities (NARF) use only. Criteria are under development.

211 60 Support Equipment Rework Shop (NARF)
211 61 Dedicated Support Equipment Rework-General Purpose Shop (NARF)
211 62 Support Equipment Calibration Shop (NARF)
211 63 Ground Support Equipment Rework Shop (NARF)
211 64 Ground Support Equipment Holding Shed (NARF)

211 70 Manufacturing and Repair Shop (NARF)
211 71 Dedicated Manufacturing and Repair-General Purpose Shop (NARF)
211 72 Metal Fabrication/Manufacturing Shop (NARF)
211 73 Metal Treatment Shop (NARF)
211 74 Non-Metal Fabrication/Manufacturing Shop (NARF)

211 75 PARACHUTE AND SURVIVAL EQUIPMENT SHOP (NON-NARF) (SF)

A parachute and survival shop is required at Navy and Marine Corps air installations for drying, inspecting, repairing, repacking, and storage of parachutes and for the intermediate maintenance of other life support equipment. These include: life rafts and jackets and pressure and exposure suits. See basic Category 211 Supplement, Maintenance, Aircraft Spares for Marine Corps Aircraft Maintenance Facilities, for which special guidance is provided.

There are two types of shops.

A Type I shop provides facilities for inspecting, repairing, drying, repacking, and storing of personnel parachutes only.

A Type II shop has the additional facilities necessary for inspecting, repairing, washing, and drying aircraft (drogue), cargo, or other special purpose parachutes.

To determine the gross square footage requirements for a given air installation the number of assigned aircraft of each type is multiplied by the corresponding Intermediate Maintenance and Operations (I.M.O.) Factor for the aircrew survival equipmentman (PR) rating. Information pertaining to the I.M.O. factor will be released to approved requesters. The sum of the products for each type of aircraft becomes the "sizing factor". Referring to Table 211-75A, the sizing factor is then matched to the column that represents the predominant type of aircraft, and the required gross area is read from the gross area column.

TABLE 211-75A
Space Allowances for Parachute and Survival Equipment Shop Type I

Sizing Factor			Allowance
VA/VF	VP/VS/VR/ VMGR/HM	VT	Gross Area Square Feet
0-10	0-3	0-5	4,000
11-20	4-5	6-11	5,250
21-31	6-8	12-17	6,300
32-43	9-10	18-23	7,150
44-55	11-13	24-39	7,800
56-67	14-16	30-35	8,400
68-78	17-18	36-41	9,000
79-90	19-21	42-47	9,600
over 90	over 21	over 47	9,900

If only personnel parachutes are to be maintained, this becomes the gross square-foot area required. See Example 1 for a sample computation. If drogue, cargo, and/or other special purpose parachutes are to be maintained as well as personnel parachutes, a Type II shop is required, and the gross square-foot area for a Type II shop is computed by adding the applicable area from Table 211-7513 to the area determined from Table 211-75A. See Example 2 for a sample computation.

TABLE 211-75B
Additional Space Allowances for
Parachute and Survival Equipment Shop Type II

Nonpersonnel Chutes Assigned	Gross Area Square Feet
up to 100	1,200*
100 and over	2,200**

*Represents the addition of one 70-foot packing table, the addition of a wet loft, and increases in storage and issue and wash and test space.
**Represents the addition of two 70-foot packing tables and corresponding increases in the other spaces mentioned in the note above.

Example Computation 1 - Parachute and Survival Equipment Shop

A/C	No.	PR (I.M.O.)	Sizing Factor (I.M.O. x No. A/C)
Type A (VF)	96	.24	23.04
Type B (VF)	2	.35	.75
Type C (VA)	120	.14	16.80
Type D (VF)	76	.16	12.16
Type E (VF)	4	.08	.32
	298		53.02

The predominant aircraft type is VA/VF, none of the aircraft requires drogue chute support, and the station has no mission that requires other nonpersonnel parachute support. The sizing factor is matched to the VA/VF column in Table 211-75A, and the requirement for an area of 7,800 square feet is read from the gross area column.

Example Computation 2 - Parachute and Survival Equipment Shop

A/C	No.	PR(I.M.0.)	Sizing Factor (I.M.O. x No. A/C
Type W (VF)	193	.24	46.32
Type X (VF)	145	.17	24.65
Type Y (VT)	24	.14	3.36
Type Z (VT)	2	.08	.16
	364		74.49

The predominant aircraft is VF, the Type W aircraft requires the use of a drogue chute for landing, and the station has no other mission that requires nonpersonnel parachute support. The sizing factor is matched to the VA/VF column in Table 211-758 and the requirement for an area of 9,000 square feet is read from the gross area column. With a drogue chute requirement for over 100 chutes, the 2,200 square feet from Table 211-76B is added to the 9,000 square feet from Table 211-758, giving a requirement for a Type II shop with a gross area of 11,200 square feet.

Exterior paved areas are provided for vehicle access and for nonorganizational vehicle parking. See Category Code 852 10, Parking Area. If exterior pavement requirements for a particular shop are not known, an area approximately equal to 50 percent of the gross floor area of the properly sized parachute and survival equipment shop may be used for planning purposes. For design criteria, see NAVFAC DM-28.1.

The following category codes are for Naval Air Rework Facility (NARF) use only. Criteria are under development.

211 76 Miscellaneous Parts/Components Repair Shop (NARF)
211 80 Test and Calibration Shop (NARF)

211 81 ENGINE TEST CELL (NON-NARF ACTIVITIES) (SF)

An engine test cell provides an acoustically attenuated and fully instrumented enclosure in which uninstalled turbojet and turbofan engines are tested at installations where intermediate level maintenance engine repair work is performed. The structure includes engine mounts, fueling system, and provision for observation and control. Engine test stands and power check facilities, without sound suppression (Category Code 211 89) or with sound suppression (Category Code 211 88), are normally authorized for all stations or activities requiring jet engine test facilities. The number of cells which may be planned for an activity can be established from the Ground Support Equipment allowance lists for the aircraft to be assigned to the activity.

211 82 AIRCRAFT WEAPONS ALIGNMENT SHELTER (NON-NARF) (SF)

A minimum of one aircraft weapons alignment shelter is required at Navy and Marine Corps air installations having fighter or attack aircraft which require alignment of on-aircraft weapons systems. In addition to weapons systems alignment, which is the process of mechanically and electrically aligning aircraft weapons electronic systems to a common aircraft axis, this facility provides space for on-aircraft electronic maintenance of the weapons systems. For the mechanical alignment of guns attached to air craft, see Aircraft Boresight Range, Category Code 211 09. If vehicle and aircraft access pavement is required, see Category Code 851 10, Roads, and 113 40, Aircraft Access Apron.

To determine the square footage requirements for a given air installation, the number of assigned aircraft of the types that require weapons calibration is first determined. This number is used to enter column 1 of Table

211 82 in which column 2 shows the number of bays and column 3 the gross area of structure required.

TABLE 211 82
Space Allowances for Aircraft Weapons Alignment Shelter

Column 1	Column 2	Column 3
No. A/C	No. Bays	Gross Area Sq. Ft.
up to 20	1	5,246
21 to 41	2	10,423
42 to 63	3	15,503
64 to 87	4	20,583
88 to 114	5	25,663
115 to 145	6	30,743
146 to 181	7	35,822
182 to 223	8	40,902
224 to 272	9	45,983
over 272	10	51,063

See NAVFAC P-272 for single and multiple bay configurations of the facility and NAVFAC DM-28.1 for design criteria.

The following category codes are for Naval Air Rework Facility (NARF) use only. Criteria are under development.

211 83 Engine Test Cell (NARF)
211 84 Helicopter Blade Test Facility (NARF)
211 85 Radome Test Facility (NARF)
211 86 Radar/Antenna Test Facility (NARF)
211 87 Aircraft Weapons Alignment/Boresite Facility (NARF)

211 88 POWER CHECK PAD WITH SOUND SUPPRESSION (NON-NARF) (EA)

Power check pads provided with fixed or portable sound suppressors which meet desired noise criteria are categorized here. Planning is the same as in Category Code 211 89. NAVFAC P-970 provides an analytical method for evaluating location of the power check pad with respect to inhabited areas. It shows how to calculate the expected noise levels and estimate the probable response to the noise. This noise survey is essential for substantiating the requirement for a power check pad with sound suppression. For design criteria, see NAVFAC DM-21.1 and DM-28.1.

211 89 POWER CHECK PAD WITHOUT SOUND SUPPRESSION (NON-NARF) (EA)

Navy and Marine Corps air installations where aircraft are permanently assigned and aircraft maintenance is performed require power check facilities. The power check pad is used to test and adjust engines mounted in the aircraft and is planned on the basis of 1 per 35 assigned aircraft or portion thereof. Employing portable engine test stands, the power check pad is used for uninstalled engine testing. For this purpose, the planning factor is one facility per 120 installed engines, or portion thereof, base loaded on the station. A power check pad includes portland cement concrete airfield pavement with securing fittings, and, where required, protection walls and blast deflectors. When used for in-aircraft engine testing, the power check pad should be at least 2,000 feet from any other activity and preferably at greater distances from administrative, training, housing, and other inhabited buildings in order to reduce the sound suppression requirement. See Category Code 211 88 for a power check pad with sound suppression units. An access taxiway (Category Code 112 10) and vehicular access (Category Code 851 10) are required. When used for uninstalled engine testing, the power check pad includes provision for portable fueling and instrumentation equipment and must be located for ready accessibility from the engine maintenance shops. At existing airfields, maximum use shall be made of surplus airfield pavement which can be modified to satisfy the power check pad requirement.

The following category codes are for Naval Air Rework Facility (NARF) use only. Criteria are under development.

211 90 Other Support Facilities (NARF)
211 91 Uncovered Ramp (NARF)
211 92 Covered Ground Check/Flight Test Facility (NARF)
211 93 Engineering Laboratory (NARF)
211 94 Aircraft Power Check Facilities (NARF)
211 95 Material and Equipment Staging/Storage Facility (NARY)

211 96 MAINTENANCE - AIRCRAFT/SPARES STORAGE (SF)

Storage facilities for miscellaneous equipment/parts/goods, etc., will be provided only where it can be individually justified. In addition to the method of determining the gross square-footage requirement, the justification should include an explanation as to why the storage requirement cannot be met through storage space provided within hangars/shops or 440 series covered general supply facilities. No specific criteria are available for this type of facility; however, general information on normal stacking heights, SF per measurement ton, and other warehousing parameters are provided in Category Code 440 series.

The following category codes are for Naval Air Rework Facility (NARF) use only. Criteria are under development.

211 97 Plant Services for Aircraft Overhaul (NARF)
211 98 Aircraft Acoustical Enclosure (NARF)
211 99 Hazardous Material Storehouse (NARF)

211 SUPPLEMENT - MARINE CORPS AIRCRAFT MAINTENANCE FACILITIES

1. The basic requirements for aircraft maintenance at the intermediate maintenance level for both the Navy and the Marine Corps are set forth in OPNAVINST 4790 (latest issue) and are identical except that:

a. In the Marine Corps, a Marine Corps air installation may be assigned limited intermediate maintenance level responsibility for its own aircraft; however, most intermediate level aircraft maintenance is performed by a Headquarters and Maintenance Services (H&MS) Squadron for a Marine Corps Air Group. Each Marine Air Group is composed of from three to five squadrons and a Marine Corps air installation normally has from one to three air groups assigned. At Navy air installations, intermediate level maintenance is performed by an aircraft maintenance department for all aircraft based at the station.

b. Because of the expeditionary nature of the Marine Corps air support mission, many of the aviation maintenance support equipments which deploy with the air group are van-configured. For this reason, Marine Corps aircraft maintenance facilities in the continental United States must be a combination of permanent type construction and the mobile expeditionary type vans while Navy aircraft maintenance facilities are all of permanent type construction.

2. Marine Corps aircraft maintenance facilities are planned utilizing the basic criteria for comparable Navy facilities except that it is necessary to:

a. Provide one Type I hangar module for each Headquarters and Maintenance Squadron (H&MS) assigned to an installation. This hangar supports the intermediate maintenance program and is in addition to the hangars required for organizational maintenance. Marine Corps requirements for organizational maintenance hangars are computed in the same manner as Navy requirements (See Cat. Codes 211 05, 211 06, and 211 07).

b. Convert Marine Corps MOS numbers to the Navy Group IX aviation ratings in order to determine sizing factors.

c. Convert the van-configured space into equivalent permanent shop space and reduce the permanent space requirements accordingly. It has been determined that a factor of 3.3 represents the average of the increase in floor space that is required when the maintenance equipment is removed from the vans and located in permanent facilities. Based upon this factor, one standard 8-foot by 20-foot (160 square feet) expeditionary van is equivalent to 528 square feet of permanent-type construction.

d. Plan airframes shop requirements as a part of the H&MS hangar 01 space, and this space should be categorized as 211 06 rather than 211 08.

3. The following is an example of how to determine the amount of permanent intermediate maintenance shop space required for an H&MS squadron (in addition to one Type I hangar), with the gross requirements for each shop being computed utilizing the appropriate criteria. The number and the square footage of the vans to be utilized with each-shop should be determined, and this total square footage is then multiplied by the factor of 3.3. This

product is then subtracted from the gross shop space requirements previously computed and the resultant figure is the permanent shop space required.

Example: Taking an H&MS squadron which supports a group composed of 15 Type VMF aircraft, 12 Type A VMA aircraft, 20 Type B VMA aircraft, 1 Type VR aircraft, and 3 Type VT aircraft as being typical, intermediate maintenance level shop space requirements are computed for each basic shop. In this example, airframes, avionics, aviation armament, parachute and survival equipment, and ground support equipment shops are computed. Hangar space requirements for organizational maintenance are computed utilizing the same criteria as for Navy hangars. See Maintenance Hangar, Category Codes 211 05, 211 06, and 211 07. In addition, one Type I hangar is required for the H&MS squadron. For each of the following space determinations, the I.M.O. factors are utilized to determine the gross area required from the applicable sizing table for each shop as listed in Category Group 210.

Step 1:

(a) In order to develop the size of shop required, refer to the appropriate shop criteria in the 211 category codes. Convert the Navy Group IX aviation ratings shown to Marine Corps MOS numbers and then obtain the I.M.O. factors.

(b) Information pertaining to I.M.O. factors will be released upon request.

Step 2: (Airframes Shop)

(a) To obtain the sizing factor of the airframes shop use the same approach as in paragraph (a) of Step 1 above, but refer to basic Category Code 211 08, Airframes Shop.

Airframes Shop, Category Code 211 08

A/C	No.(n) A/C	I.M.O.	Sizing Factor (I.M.O. x N)
Type VMF	15	.40	6.00
Type A VMA	12	.34	4.08
Type B VMA	20	.37	7.40
Type VR	1	.62	.62
Type VT	3	.26	.78
Total	51		17.48

(b) Using the sizing factor of 17.48 in Column 1 of Table 211-08, Category Code 211 08, the requirement for 5,500 square feet is read from Column 2. Since it is planned to utilize one expeditionary van (hydraulics), the gross requirement is reduced by 528 square feet (1 x 160 x 3.3) which leaves a requirement for 4,972 square feet of permanent shop area. The Type I hangar configured for the H&MS squadron provides space for the Airframes Shop.

Step 3: (Avionics Shop)

(a) To obtain the sizing factor of the Avionics Shop, use the same

approach as in paragraph (a) of Step 1, but refer to basic Category Code 211 45, Avionics Shop, and use the format described therein.

Avionics Shop, Category Code 211 45

A/C	No.(n) A/C	I.M.O.	Sizing Factor (I.M.O. x n)
Type VMF	15	.66	10.00
Type A VMA	12	.75	9.00
Type B VMA	20	1.00	20.00
	47		39.00
Type VR	1	.50	0.50
Type VT	3	.40	1.20
Total	4		1.70

(b) Using a sizing factor of 39.00 for VMF/VMA in Table 211-45 B, a requirement of 15,400 square feet is read from Column 1. Using a sizing factor of 1.70 for VR/VT in Table 211-45, a requirement of 2,000 square feet is read from Column 3. The total requirement is then computed as 15,529 square feet using Equation (1) of Category Code 211 45. Since it is not planned to utilize any expeditionary vans with this facility at this particular installation, 15,529 square feet represents the area of permanent construction required.

Step 4: (Aviation Armament Shop)

(a) Same as paragraph (a) of Step 1 above, but refer to basic Category Code 211 54 Aviation Armament Shop.

Aviation Armament Shop, Category Code 211 45

A/C	No.(n) A/C	I.M.O.	Sizing Factor (I.M.O. x n)
Type VMF	15	.08	1.20
Type A VMA	12	.08	.96
Type B VMA	20	.08	1.60
Type VR	1	-0-	-0-
Type VT	3	-0-	-0-
Total	51		3.76

(b) Using the total sizing factor of 3.76 in Column 1 of Table 211-54, Category Code 211 54, the requirement for 7,500 square feet is read from Column 2. Since it is planned to utilize two expeditionary vans (missile checkout and test), the gross requirement is reduced by 1,056 square feet (2 x 160 x 3.3) which leaves a requirement for 6,444 square feet of permanent shop area.

Step 5: (Parachute and Survival Equipment Shop)

(a) Same as paragraph (a) of Step 1, but refer to basic Category Code 211 75, Parachute and Survival Equipment Shop.

Parachute and Survival Equipment Shop, Category Code 211 45

A/C	No.(n) A/C	I.M.O.	Sizing Factor (I.M.O. x n)
Type VMF	15	.24	3.60
Type A VMA	12	.08	.96
Type B VMA	20	.14	2.80
Type VR	1	.35	.35
Type VT	3	.14	.42
Total	51		8.13

(b) Using the total sizing factor of 8.13 in the VA/VF column of Table 211 75A, Category Code 211 75, the requirement for 4,000 square feet is read from the gross area column. Since the VMF type used in this typical mix utilizes a drogue chute and there are less than 100 such chutes assigned, an additional 1,200 square feet is authorized by Table 211 75B. Since there are no expeditionary vans planned for use with this shop, the total requirement for permanent shop space is an area of 5,200 square feet.

Step 6: (Ground Support Equipment Shop and Shed)

(a) Criteria for the Ground Support Equipment Shop and Shed are provided in Category Codes 218 60 and 218 61.

Step 7: (Summary)

(a) In summary the Intermediate Maintenance Shop space requirements for the typical Marine Corps Fighter/Attack Group used for this example are summarized as follows:

Steps	Shop Space	No. Vans	Area of Permanent Building
1	No computation involved		
2	Airframes	1	4,972
3	Avionics	0	15,529
4	Aviation Armament	2	6,444
5	Parachute and Survival Equip	0	5,200
6	Ground Support Equip Shop	See Category Code 218 60	
	Ground Support Equip Shed	See Category Code 218 61	

(b) In addition to shop space, one Type I hangar (configured for an H&MS squadron) is required for support of the H&MS squadron. This hangar requirement is in addition to the hangar modules for organizational maintenance as computed in Category Codes 211 05, 211 06 and 211 07.

4. See NAVFAC P-272 for definitive drawings of:

a. A Type I hangar configured for an H&MS squadron supporting a typical VMF/VMA group, including the intermediate level airframes space.

b. An H&MS Avionics Shop configured for a typical VMF/VMA group.

c. An H&MS Avionics Shop configured for a typical helicopter group.

d. A combined GSE shop and shed and Parachute and Survival Equipment Shop configured for a typical VMF/VMA group.

e. A combined Jet Engine Maintenance Shop and Armament Shop configured for a typical VMF/VMA group.

212 MAINTENANCE - GUIDED MISSILES

This basic category provides facilities and shops for maintenance and repair of guided missile systems, ground handling, and launching equipment. Under certain circumstances, the maintenance and storage for these missiles are integrated and the missiles are maintained where they are stored.

212 10 GUIDED MISSILE INTEGRATION FACILITY (SF)

The purpose of this facility is to assemble new-production components of air launched guided missiles and perform any required maintenance on fleet returned All-Up-Round (AUR) missiles or components. Missiles are returned from the fleet at service inspection time when the maintenance due date assigned to the missiles so require. This type of facility is primarily found at Naval Weapons Stations. However, it is also found at Naval Air Stations and other ordnance related activities.

A typical facility is capable of servicing four different types of missiles and is composed of six basic areas which are expressed in net square feet as follows:

1.	Decanning and Storage Area	3,050
2.	Open Work Area and Support Maintenance	3,050
3.	Assembly Area (Test Cell)	4,169
4.	Missile Storage	1,229
5.	Office/Library	1,160
6.	Mechanical Equipment Room & Toilet	1,146
	Total	13,804

The net to gross conversion factor for this facility is 1.24 to 1, or 13,804 NSF x 1.24 = 17,117 GSF.

In the event that more than four types of missiles are required to be serviced, the size of the facility may be increased by 3,451 NSF or 4,280 GSF per additional type of missile.

Additional information pertaining to the type of test performed and the amount of time required for each test involving the Sidewinder, Sparrow, Walleye, Shrike and Phoenix missile may be obtained from the Air Launched Missile Industrial Processing Guide (ALM-IPG) which is promulgated by Technical Manual Identification Number (TMIN) TW 800-AA-MMI-000/ALM - IPG.

The Guide consists of a general information volume and five additional volumes of data, each of which is dedicated to a particular missile. The Guide presently consists of the following volumes:

Volume 1 - General Information, TW 800-AA-MMI-010/ALM-IPG

Volume 2 - SIDEWINDER AIM-9G/H/L, TW 800-AA-MMI-020-/ALM-IPG

Volume 3 - SPARROW AIM-7E/F and RIM-7E/H, TW 800-AA-MMI-030/ALM-IPG

Volume 4 - WALLEYE Guided Weapon, TW 800-AA-MMI-040/ALM-IPG

Volume 5 - SHRIKE AGM-45A/B, TW 800-AA-MMI-050/ALM-IPG

Volume 6 - PHOENIX AIM-54A, TW 800-AA-MMI-060/ALM-IPG

Copies of the Guide may be ordered from Code 2242 of the Pacific Missile Test Center, Pt. Mugu, CA either as a completed set under TMIN-TW 800-AA-000/ALM-IPG or as individual volumes using the individual volume TMIN.

212 20 MISSILE EQUIPMENT MAINTENANCE SHOP (SF)

No planning factors are currently available for this facility- Activities with limited number of missile-handling equipment should consider performing their maintenance in Automotive Vehicle Maintenance Shop (Code 214 20).

212 30 MISSILE ASSEMBLY AND TEST BUILDING (SF)

This facility is required for intermediate level maintenance of surface launched guided missiles. Component sections of the missile are tested, assembled into a missile of the required configuration, and tested as an all-up-round. Missiles may be received/shipped as bare missiles or packaged in containers. Bridge cranes are needed to handle the missiles in the receiving/shipping area and onto the test beds in the test cells. Test cells should be constructed for an explosion hazard of 300 lbs net explosives weight.

TABLE 212 30
Space Allowances for Surface Launched Guided Missiles

Weapons System	Gross SF
Standard	
Assembly	9300
Control Cell	1045
4 Test Cells	2040
Packaging	2500
Warheading, SW	450
Component rework, stores	6600
Other	5755
TOTAL	27,690

HARPOON

Assembly and holding area	13,425
Control Cell	925
2 Test Cells	920
Office and stores	860
TOTAL	16,130

212 40 MISSILE COMPONENT SLING TEST TOWER (EA)

This facility is used to test the tensil strength of all forms of weapons handling equipment such as slings, beams, bars, etc. It is used in testing developmental equipment and the periodic testing of handling equipment. The tower is a requirement of any station that is involved with handling of heavy loads of ammunition, such as weapon stations and those activities that load and off load ammunition ships.

212 77 GUIDED MISSILES/SPARES STORAGE (READY ISSUE/SHOP STORES/MISC.) (SF)

Storage facilities for miscellaneous equipment or goods related to guided missiles will be provided only where it can be individually justified. There are no criteria for this type of facility. General information on normal stacking heights, SF per measurement ton requirements, and other parameters are provided in Category Code 440 series.

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213 MAINTENANCE - SHIPS AND FLOATING EQUIPMENT

This basic category provides facilities for maintenance of vessels of all types. These facilities include graving drydocks, fixed cranes, marine railways 9 ship repair shops, and amphibian vehicle maintenance shops.

For waterfront operational facilities, see Category Group 150. For administrative facilities, see Facility Class 600.

213 10 DRYDOCK (SF)

A drydock is a long narrow basin sited in the foreshore of a harbor. Its entrance is closed by a movable caisson or by gates. The basin is so constructed that a vessel may be placed in it and the water removed, allowing the vessel to settle on supports located on the dock floor. In this way the underwater portion of the vessel is exposed for routine maintenance and repair or for those coming into a drydock in a damaged condition. Drydocks vary in size in accordance with the dimensional characteristics of the vessels to be served. Hence, each dock is designed and constructed to satisfy the special requirements of a particular vessel or class of vessels.

The siting of a drydock at an existing naval shipyard entails the analysis of many vital factors. Some recommendations for siting are the following:

1. Locate the drydock near the shipyard shop area for access to piping, electrical, woodworking, metalworking, and similar shops.

2. Locate near sources of power and fresh water.

3. Orient the drydock to require the minimum length of track for gantry cranes.

4. Provide adequate ship approaches to the docks. The approach or turning basin should have a width in front of the dock of at least two times the dock length properly oriented for turning. The depth should be no less than that at the entrance sill of the drydock.

5. Clearance must be provided from structures flanking the approach path of the ship. A distance of not less than 150 feet should be planned between such structures and the side of the ship to provide space for tugs to operate while maneuvering the ship.

For design criteria, see NAVFAC DM-29.

213 20 MARINE RAILWAY (EA)

The function of marine railway is to bring a vessel out of the water for the purpose of making all parts available for overhaul, and to return the vessel to the water when the work is finished. The facility consists of rail trackage from a point on shore to an anchored position at a submerged depth; a railway beaching cradle or dolly for mating a vessel or small

boat; and hauling machinery (hoisthouse) to pull the cradle-mounted vessel up the inclined track to a position on shore.

The capacity of a marine railway is usually given as the weight (displacement) in long tons of the largest ship that can be lifted. The maximum size and capacity of Navy marine railways has been restricted to about 3,000 tons-- that required for the largest destroyer.

The sites chosen for marine railways should satisfy the following requirements:

1. Distance to the Channel. The distance from the highwater line or the bulkhead line to the navigation channels must be adequate for construction of the offshore end of the railway, and must provide a safe fairway for vessels approaching and leaving the cradle.

2. Inshore Area. The space available on land, including the frontage along the shore, must be sufficient for the inshore end of the railway, the hoisthouse, necessary clearances, spur tracks, roadways, cranes and working areas. Some of the larger marine railways will extend approximately 500 feet inshore.

3. Hydrographic Conditions. The natural slope of the bottom along the offshore end of the railway, to prevent silting, should be lower than the grade of the tracks.

4. Foundations. The soil conditions for the length of the railway must be of sufficiently high quality to make possible a design of foundations that will assure rigid control of settlement.

5. Favorable Climatic and Tidal Conditions. The proposed location should be protected as much as possible from strong winds and waves.

For design criteria, see NAVFAC DM-29.

213 30 SHORE INTERMEDIATE MAINTENANCE ACTIVITY (SF)

This facility (SIMA) provides space for the fleet intermediate level maintenance operations. A SIMA has two basic components: maintenance shops and administration. These components may be established separately or as a consolidated complex. Following is a partial list of functions in the maintenance component:

Machine shop and outside machine shop
Sheetmetal, shipfitter and welding shops; foundry
Sandblasting shop
Boiler shop; automatic combustion control shop
Internal combustion engine shop; gas turbine shop
Hydraulic shop; valve and regulator shop; pump and pipe shops
Air conditioning and refrigeration shop
Electrical, electronics and crypto equipment shops; battery shop
Optical shop; gyro compass shop; test equipment shop
Carpenter, pattern and boat repair shops; lagging and insulation shop

Riggers, canvas and paint shops
Chemical, metallurgical and non-destructive testing laboratories
Instrument repair and calibration laboratory
Noise and vibration-analysis laboratory

The administrative component provides space for:

Offices, central technical and study libraries; records storage
Classrooms, projection room, audio-visual aid preparation
Computer operations and analyst record storage

213 40 FIXED CRANE STRUCTURES (EA)

The principal types of fixed cranes are pillar, pillar-jib, and jib. The hammerhead and tower cranes are also classed as stationary when mounted on fixed towers.

See NAVFAC DM-38, for criteria and procedures to be followed in the selection of weight handling equipment for specific installations.

SHIP REPAIR SHOPS.

Ship repair shops and related facilities included in Basic Category 213, are codes as follows:

213 41 Central Tool Shop (06)(E)
213 42 Shipfitting Shop (11)(A)
213 43 Sheet Metal Shop (17)(B)
213 44 Forge and Heat Treat Shop (34)(F)
213 45 Welding Shop (26)(C)
213 48 Quality Assurance Office (V)(W)
213 49 Inside Machining Shop (31)(G)
213 50 Optical Shop
213 51 Weapons Shop (36)(L)
213 52 Marine Machining Shop (38)(H)
213 53 Boilermaking Shop (41)(D)
213 54 Electrical Shop (51)(M)
213 55 Pipefitting Shop (56)(J)
213 56 Woodworking Shop (64)(R)
213 57 Electronics Shop (67)(P)(Q)
213 58 Boat Shop
213 59 Abrasive Blast Facility
213 60 Paint and Blasting Shop (71)(S)
213 61 Rigging shop (72)(T)
213 62 Sail Loft
213 63 Foundry (81)(K)
213 64 Patternmaking Shop (94)(X)
213 65 Nuclear Repair Shop
213 66 Temporary Services Shop (99)(U)
213 67 Pumphouse, Drydocks

The following category codes have been deleted and the functions formerly performed therein have been reassigned to other shops as indicated:

213-46 Galvinizing Shop (now in 213-49); 213-47 Plating Shop (now in 213- 49). Category codes 213-50 Optical Shop, 213-58 Boat Shop, 213-59 Abrasive Blast Facility and 213-62 Sail Loft are not for shipyard use since these functions are included in other category codes for shipyards. These facilities are intended for other activities which support ships, such as ship repair facilities, etc.

Planning factors, standards, and guides for computing requirements for facilities under this basic category will be provided as they become available. Criteria for certain category codes are excluded from this publication because of the special provisions and variances in the application of criteria for planning ship repair shops. In the absence of specific criteria, the quantitative requirements for shop facilities in Basic Category 213 should be determined on an individual basis, based on the experience and knowledge of the activity involved and the Naval Sea Systems Command.

NOTE:

(1) Numerals 06, 11, 17, etc., refer to existing shop designations.
(2) Letters E, A, B, etc., are designations of major functional work grouping which are further subdivided to standard work centers, etc.
(3) In cases where standard shop descriptions are inconsistent with the existing shipyard organization, space requirements and assets will be included in the shop category code that is consistent with the shipyard organization.

213 41 CENTRAL TOOL SHOP (06)(E) (SF)

The central tool shop is responsible for design, development, manufacture and maintenance of prototype and conventional tooling such as cutting machines, dies, molds, cutters, jigs, fixtures, and special tools. Maintains calibration laboratory and operates the mechanical calibration program. The shop conducts the maintenance program for electrical and mechanical maintenance of numerically controlled and conventional machine tools and plant appliances. This includes installation, preventive maintenance, repair, analytical checkout, rehabilitation, and lubrication. Operates all toolrooms throughout the shipyard, including radiologically controlled areas.

213 42 SHIPFITTING SHOP (11)(A) (SF)

The shipfitting shop is responsible for accomplishment of all work assigned including the fairing and development of ship body plans and hull forms, the fabrication, erection, and installation of all hull strength structure, superstructure, access items, foundations, stowages, fittings, etc., for Naval vessels and systems. It has the primary responsibility for ensuring the structural strength and tightness integrity of the hull envelope and interior compartmentation for Naval surface and submarine vessels. It may also occasionally do structural metal work on tanks, buildings, bridges, cranes, or other structures.

213 43 SHEET METAL SHOP (17)(B) (SF)

The sheet metal shop is responsible for developing, fabricating, and installing ventilation and air conditioning ductwork, fabricating and installing store-room workshop, and stowage facilities, non-structural bulkheads and partitions, the manufacture and installation of label plates, and outfitting of galley, berthing, habitability and office space for Naval vessels.

213 44 FORGE AND HEAT TREAT SHOP (23)(F) (SF)

The forge and heat treat shop is responsible for heat treating, drop forging, hand forging, and other hot working of ferrous and non-ferrous metals; manufacture of heavy forging, rings, flanges, struts, and ships' miscellaneous heavy forgings; drop forging piping fittings of certified quality for nuclear work; and straightening of ships' propellers.

213 45 WELDING SHOP (26)(C) (SF)

The welding shop is responsible for all of the welding, flame cutting, carbon arc guaging, and related processes required by the various shops of the Production and Public Works Departments of the shipyard. In addition to the major involvements of cutting and welding the various structural, sheet metal, and piping materials, operations include repair of castings, cobalting of valves, hard-surfacing of materials subjected to abrasive wear, shooting and welding studs and fasteners, metal spraying, silver soldering, casting, bonding, and welding of lead shielding, and stress relieving of shipboard weldments.

213 48 QUALITY ASSURANCE OFFICE (V)(W)

The quality assurance office is responsible for inspection and tests to determine compliance with specifications, plans, orders, directives, and sound shop and marine practices; non-destructive testing services; and technical direction, consulting and advisory services on those processes, materials, and systems for fabrication and repair to shops. It is also responsible for providing chemical and metallic laboratory services; test instrument calibration; and technical support for test, analyses, evaluation, and procedures for use of metallic and non-metallic materials.

213 49 INSIDE MACHINING SHOP (31)(G) (SF)

The inside machining shop is responsible for performing horizontal boring mill, vertical boring mill, planer and heavy lathe work in manufacturing, alteration, and repair of ship machinery and shipyard manufactured items; performs engine lathe, horizontal and vertical turret lathe, boring, facing, and turning work; performs milling, grinding, hobbing, broaching, shaping, slotting, lapping, honing, balancing work; layout work and drilling on castings and fabrications; performs disassembly, inspection, repair, reassembly, and testing of main propulsion units, pumps, valves, turbines,

air compressors, propellers, and miscellaneous auxiliary machinery. This shop also assembles new manufactured equipment. This shop is responsible for all metal finishing processes including electroplating, dalic plating, galvanizing, and metal polishing.

213 50 OPTICAL SHOP (SF)

No criteria are currently available for this code. This facility is not for use by shipyards. See general discussion under "Ship Repair Shops".

213 51 WEAPONS SHOP (36)(L) (SF)

The weapons shop is responsible for the repair, overhaul, alignment, installation, checking out, testing and calibration of all weapons systems, integrated systems, such as missile systems and associated components, including gun mounts, turrets, saluting batteries, launching pads, mechanical components of fire control, radar antennas and sonar equipment. This shop is also responsible for the repair, overhaul, calibration, adjustments and testing of gunsights, range-finders, torpedo directors, telescopic gunsights, periscopes, binoculars, stereo-trainers, and other miscellaneous repair of instruments, etc.

213 52 MARINE MACHINING SHOP (38)(H) (SF)

The marine machining shop is responsible for the installation and testing of all main propulsion machinery, auxiliaries, rudders, shafting, sea valves, deck machinery, laundry and galley, arresting gear, and catapults on ships under construction or undergoing repair and conversion; repairs, installs, and performs necessary tests on main and auxiliary diesel engines and associated equipment, and hydraulic speed gears on ships; refuels, repairs, and tests nuclear reactor plants and associated systems and components.

213 53 BOILERMAKING SHOP (41)(D) (SF)

The boilermaking shop is responsible for the repair, conversion, or building of steam generating equipment used to furnish steam to main and auxiliary machinery, including the fabrication, assembly, installation, test, cleaning, and repair of the steam generators, uptakes, stacks, and blower ducts; the fabrication, repair and test of pressure vessels, incinerators, spark arrestors.

213 54 ELECTRICAL SHOP (51)(M) (SF)

The electrical shop is responsible for accomplishing the installation, repair, maintenance, alteration, troubleshooting, and test of all power, lighting, and interior communication systems and equipment aboard Naval ships and submarines; for manufacture of switchboards, electrical control equipment, and components; for the installation, repair and alteration of

nuclear electrical components and systems; for submarine battery assembly, overhaul, and installation; for repair and calibration of all electrical instrumentation; for installation, repair, and test of gyro compasses.

213 55 PIPEFITTING SHOP (56)(J) (SF)

The pipefitting shop is responsible for accomplishing the layout, fabrication, installation, dismantling, repairs, cleaning, testing, inspection, stress relieving of piping systems including nuclear systems in the shop and aboard ships and submarines, fabricates, installs and repairs insulation and lagging on piping, machinery, vent ducts, bulkheads, and decks; fabricates, repairs, and installs radar waveguide; and performs lead lining and burning for piping, tanks, boxes, and other projects; and installs, repairs, and tests refrigeration systems, air conditioning systems, and oxygen-nitrogen systems.

213 56 WOODWORKING SHOP (64)(R) (SF)

The woodworking shop is responsible for accomplishment of operations performed by boatbuilders, woodcraftsmen, and shipwrights in constructing and repairing wooden and plastic boats, wooden portable buildings and shelters, hollow booms, wooden tanks, practice torpedoes, and flight deck panels; repairing and manufacturing furniture and cabinets; laminating all sizes of wooden members; manufacturing or repairing accommodation ladders; performing dry kiln operations; and installing and repairing all types of acoustic and thermal insulation. Working from plans and specifications, arranges docking blocks to provide for the drydocking of all classes of Naval vessels and directs the positioning of the vessel for proper landing on the blocks. Repairs and installs wooden decks, erects pipe stagings and lifelines; fabricates and installs boat stowages, builds shipping cradles, shores and blocks cargo aboard ships, manufactures and repairs wooden gangways and platforms, fabricates and constructs refrigerated spaces aboard ships. Manufactures plastic items such as pipe, radomes, fairwaters, tanks, antenna cones, and submarine fairing plates. Makes resin foam pours in voids and grouting operations. Installs and repairs plastic laminates and hull damping materials on Naval vessels, installs polyethylene shielding around nuclear reactors. Provides reference lines used in construction, repair, and alteration of all types of ships; takes measurements, heights and locations of ships' characteristics. Applies plastisol coatings; installs linoleum, rubber, asphalt, and ceramic tile.

213 57 ELECTRONICS SHOP (67)(P)(Q) (SF)

The electronics shop is responsible for accomplishing installation, repair, overhaul, modification check-out, adjustment, test, and calibration of radar, sonar, communications, cryptographic data processing, antennas, navigation, and electronic countermeasure equipment and systems on and for surface and submarine vessels and shore stations. The electronics shop is

213 58 BOAT SHOP (SF)

MO criteria are currently available for this code. This facility is not for use by shipyards. See general discussion under "Ship Repair Shops".

213 59 ABRASIVE BLAST FACILITY (SF)

No criteria are currently available for this code. This facility is not for use by shipyards. See general discussion under "Ship Repair Shops".

213 60 PAINT AND BLASTING SHOP (71)(S) (SF)

The paint and blasting shop is responsible for surface preparation, including sandblasting, for and the application or installation of protective, decorative, and functional paints, coatings, films, and deck floor, and wall coverings. This includes design, layout, lettering, sign making and posters, silk screen processing, artificial and natural wood graining and finishing, all types of painting and preservation on board ship; operation of pickling and chemical cleaning plant for preservation of material; abrasive blasting services; and the laying or installation of terrazzo, magnesite, and concrete.

213 61 RIGGING SHOP (72)(T) (SF)

The rigging shop is responsible for operations performed by riggers, sailmakers, tank and component cleaners, laborers, upholsterers, fabric workers, and diving operations required for repair, overhaul, conversion, and construction of Naval vessels and equipment.

213 62 SAIL LOFT (SF)

No criteria are currently available for this code. This facility is not for use by shipyards. See general discussion under "Ship Repair Shops".

213 63 FOUNDRY (81)(K) (SF)

The foundry is responsible for manufacturing cores for iron, steel, and non-ferrous casting in the Core Unit; preparing and mixing sand, processing and making molds, steel castings, pouring steel from furnaces, melting, and manufacturing steel, and shaking out steel castings from molds after pouring in the steel foundry unit; pouring and melting non-ferrous metals and alloys, processing and making molds for brass castings, and shaking out non-ferrous castings in the non-ferrous unit; processing and making molds for iron castings, pouring iron, melting iron-alloys and shaking out iron castings from molds in the iron unit; clearing castings, shipping finished castings.

213 64 PATTERNMAKING SHOP (94)(X) (SF)

The patternmaking shop is responsible for the manufacture, repair, and alteration of wood patterns required to produce castings, manufacture of metal parts for wood and plastic patterns and metal patterns; manufacture of mock-ups for patterns; manufacture of sheet plastic by forming, fabrication, cementing, and dyeing; manufacture plastic patterns; and receives, stores and issues pattern mock-ups, and models.

213 65 NUCLEAR REPAIR SHOP (SF)

The nuclear repair shop is responsible for the repair of reactor plant components for nuclear ships.

223 66 TEMPORARY SERVICES SHOP (99)(U) (SF)

The temporary services shop is responsible for electrical, piping, and ventilation systems as related to temporary services. Temporary services include compressed air, water, steam, oxygen, electrical power and lighting, ventilation, telephones, inerting, air analysis, shipside sewage connections, communications systems, distilled water for ships' boilers, CO_2 fire extinguishers, static dehumidification, electric, steam, and induction heat; besides responsibility for radioactive waste collection systems, delivery and distribution of pure water systems, distribution of temporary electric power, breathing air systems for reactor plants, chilled water and air conditioning systems, filtering for reactor plants, ventilation systems, communications systems involved in nuclear refueling operations, and deoxygenating pure water nitrogen systems. This shop also manufactures and repairs rubber products.

213 67 PUMPHOUSE, DRYDOCKS (SF)

The drydock pumphouse is used to house drydock dewatering pumps and associated equipment.

213 68 DIVER CHANGE HOUSE (SF)

No criteria are currently available for this code.

213 70 SHIP SERVICES SUPPORT BUILDING (SF)

This facility provides all office and shop space to perform close-in support for maintenance and repair work on ships. The purpose of the off ice ared is to support those individuals involved in the progression of shop work on board the ships; i.e., the individual shop supervisor and progressmen as well as the design coordinator. Additionally, quality assurance inspectors responsible for ship work inspection operate from these facilities. The purpose of the shop area is to perform rapid minor work required to be accomplished to support the maintenance and repair

operations; i.e., rather than sending a small item requiring a minor modification back to the parent (home) shop, the modification would be made at the dry dock or pier site.

With the exception of shop space, all requirements are based upon the corresponding category codes providing those particular types of functions, for example, the administrative space for the office area is based on the criteria provided for in category code 610-10, Administrative Office. Required storage should be categorized under category code 213-77, Maintenance-Ship/Spares Storage (Ready Issue/Shop Stores/Miscellaneous). The quantitative requirements for shop facilities should be determined on an individual basis, based on the experience and knowledge of the activity involved and the Naval Sea Systems Command.

213 73 LANDING CRAFT WASH RACK (EA)

The primary function of this facility is to wash down Landing Craft Air Cushions (LCAC) vehicles after every mission in order to remove sand and salt spray. However, this type of washdown pit may be used for other types of amphibious landing craft requiring similar purging. Wash water treatment is incorporated into the design of the facility.

The following criteria applies to JEFF type craft and can be modified to suit other amphibious landing craft as well:

Size of JEFF wash rack:	75 ft wide
	150 ft long

For all other type of amphibious landing craft requiring similar cleaning, select largest craft at facility and add 27 feet to width and 30 feet to overall length, with all ramps, doors, etc., extended to determine size of washdown pit.

213 75 AMPHIBIAN VEHICLE MAINTENANCE SHOP (SF-)

The amphibian vehicle maintenance shop provides special work areas for performing all organizational maintenance functions on the amphibian vehicles of the Marine Corps Amphibious Tractor Battalion and in the case of the Navy, all organizational and intermediate level maintenance on Landing Craft Air Cushion (LCAC) vehicles. In the case of the latter, the depot level maintenance is performed at a Naval Air Rework Facility or contractor plant.

The maintenance shop for the amphibian vehicles of the Marine Corps Amphibious Tractor Battalion includes administrative and training areas as well as storage space for OEM equipment, tools and mountout. Total shop area will vary depending upon the number of companies assigned to the Amphibious Tractor Battalion. A typical Marine Corp facility that would accommodate one battalion, i.e., four companies, would have a space requirement of 42,600 gross square feet of which 700 gross square feet would be dedicated to the mechanical equipment room. The size of the facility would be adjusted accordingly as the number of companies in the battalion increase

215 MAINTENANCE - WEAPONS, SPARES

This group includes facilities for maintenance of small arms, automatic weapons, mortars, artillery guns, launchers, flamethrowers, torpedo tubes, harbor protective nets, and nonelectronic equipment. For missile maintenance facilities, see Category Group 212.

215 10 SMALL ARMS SHOP (SF)

A small arms shop is used to support small arms maintenance and repair for various Marine Corps activities or units. This shop is required in order to perform the pre-fire inspection (LTI) of all small arms weapons issued and recovered and to repair those weapons which are damaged or which malfunction. The weapons are broken down, visually inspected, inspected by use of various gages, magnifying glasses, etc., repaired, lubricated, etc., and reassembled.

The criteria indicated fur category code 143-45, Armory, should provide adequate space allocation for any type of small arms shop provided: (a) the armory services only the activity at which it is located and (b) the small arms weapons are limited to those personnel physically stationed at that activity.

This shop is a small arms maintenance and repair facility and the weapons serviced here are not limited to those handled by the personnel assigned to the activity at which it is located. Accordingly, the size of the shop is based upon the number of weapons repaired per month and not like the armory, whose size is determined by the number of personnel stationed at the activity.

A small arms shop shall meet the following requirements:

a. Positive weapon security in a humidity controlled, secure environment.

b. A rapid, individual weapon issue/recovery system.

c. A quick, twice daily inventory capability of all weapons.

d. Weapon repair bench (es).

e. A weapon maintenance area for individual weapon maintenance by the person to who the weapon is assigned.

f. Space for a technical library.

g. Space for the storage of sensitive or highly pilferable emergency supplies for assigned react ion forces.

h. Parts storage.

i. Weapons cleaning and coating area.

j. Secured flammable storage area.

The size of the shop is governed by the average number of weapons serviced during an average month. See Table 215-10 for gross square foot allowance to determine the area requirement.

Table 215-10

Number of Weapons Serviced per Month	Gross Square Feet per Weapon
up to 1,000	1.25
1,000 to 2,000	1.10
2,000 to 5,000	1.00
5,000 to 10,000	0.74
For each weapon over 10,000	add 0.20

Example: The number of gross square feet required for a small arms shop servicing 10,350 weapons per month is:

10,350 x 0.20 + 2,070 gross square feet.

215 20 LIGHT GUN (20 nun to 5 in) SHOP (SF)
215 30 HEAVY GUN (6 in to 16 in) SHOP (SF)
215 40 HARBOR PROTECTIVE NET SHOP (SF)
215 50 LAUNCHER AND PROJECTOR MAINTENANCE SHOP (SF)

At present there are no criteria for Category Codes 215 20 through 215 50.

215 60 FIELD MAINTENANCE SHOP (ORDNANCE) (SF)

This field maintenance shop provides specialized work areas for performing 3rd and 4th echelon maintenance on all items of ordnance equipment authorized repaired by the Service Battalion of the Marine Division and the Force Service Regiment. The shop space includes administrative and training areas as well as storage space for tools, parts, and maintenance float equipment.

For other field maintenance functions, see Category Codes 214 53, 217 30, and 218 80.

See Definitive Designs, NAVFAC P-272, Part 4, for appropriate space allocations.

or decrease. See Definitive Designs, NAVFAC P-272, Part 4 for appropriate space allocations.

Criteria for a typical LCAC maintenance facility with 54 assigned craft is as follows:

(a) Provide maintenance bay space for 15% of assigned craft. Note: LCAC craft is 48 ft x 90 ft with 15 ft ramps on each end. Accordingly, bay space is increased to 75 ft x 150 ft or 11,250 net square ft. to allow sufficient work area around each craft. Net to gross conversion is 1:1.15, or:

11,250 NSF x 1.15 = 12,937.5 GSF
12,937.5 GSF/craft x 8 craft = 103,500 GSF

(b) Maintenance shops capable of providing organizational and intermediate level support are as follows:

Propeller shop	3,642 SF
Engine shop	1,101 SF
Hydraulic shop	522 SF
Skirt repair shop	2,216 SF
Welding shop	720 SF
Sheet metal shop	1,260 SF
Gluing shop	726 SF
Electrical shop	1,050 SF
Electronics shop	1,041 SF
Battery shop	396 SF
Tool room	1,185 SF
Locker room	5,375 SF
Maintenance control	900 SF
	20,134 SF

Net to Gross Conversion: 1:1.25 or

20,134 x 1.25 = 25,168 GSF

(c) Control Tower/Operations Room is an additional requirement for a LCAC Operational Base and can be an integral part of the maintenance facility by providing an additional 190 GSF. This facility should have an unobstructed view of the parking apron, taxiway, ramp and waterfront in order to allow coordination of operations to preclude accidents. Communications equipment and traffic controllers are housed in this facility.

(d) Squadron Operations/Training Space requirements are met by providing space for classrooms briefing room and a structural maintenance laboratory. The following areas are provided to meet the requirements for a LCAC Operational Base having 54 assigned craft.

(1) Classroom Requirements: Using criteria for category code 171-10 for one 20 person operational class and one 20 person maintenance class = 2 x 20 PN x 22 SF/PN = 880 NSF

(2) Briefing Room: A large classroom is required for general

briefing and combined classes. Maximum loading is 40 persons.
Accordingly: 40 PN x 21 SF/PN = 840 NSF

(3) Structural Maintenance Laboratory: Three mock-up equipment modules for skirt, prop, turbine, gear box and electronic bench = 219 NSF x 3 = 657 NSF

Therefore:

Classroom	880 NSF
Briefing Room	840 NSF
Structural Maintenance Laboratory	657 NSF
	2,377 NSF

Net to gross conversion factor = 1:1.33 or
2,377 x 1.33 = 3,160 GSF

(4) Administration space for 27 officers and 69 enlisted personnel = 96 personnel x 150 GSF/PN = 14,400 GSF

Composite space equipment:	3,140 GSF
	+14.400 GSF
	17,560 GSF

Accordingly, the total requirement for a LCAC maintenance facility supporting 54 craft is:

Maintenance Bay Space	103,500 GSF
Maintenance Shops	25,168 GSF
Control Tower/Operations Room	190 GSF
Squadron Operations/Training Space	17,560 GSF
Total	146,418 GSF

213 77 MAINTENANCE - SHIPS/SPARES STORAGE (READY ISSUE/SHOP STORES/MTSC.) (SF)

Storage facilities for miscellaneous equipment or goods related to ship maintenance facility support will be provided only where it can be individually justified. There are no criteria for this type of facility. General information on normal stacking heights, SF per measurement ton requirements, and other parameters are provided in Category Code 440 series.

214 MAINTENANCE - TANK, AUTOMOTIVE

Facilities for maintenance and repair of combat and noncombat motorized vehicles. For weapons see Code 215, for tracked amphibious vehicles see Code 213, for construction equipment see Code 218.

214 10 COMBAT VEHICLE MAINTENANCE SHOP (SF)

This facility provides specialized work areas, equipment, and storage for overhaul of combat vehicles such as self-propelled gun carriages and tanks. For Marine Corps Organizational Maintenance Shop see Code 214 51, for Field Maintenance Shop see Code 214 53.

214 20 AUTOMOTIVE VEHICLE MAINTENANCE SHOP (SF)

1. Purpose and Function. Automotive vehicle maintenance facilities are required to provide covered work areas for inspection, maintenance, and repair of all transportation equipment assigned to an installation, and as applicable, its supported activities. For reasons of overall efficiency and economy, the maintenance and operations function for automotive, construction, materials handling, and railroad equipment are combined. In areas where combined facilities are not feasible, special facilities for construction equipment maintenance and railroad equipment maintenance will be provided. See Code 218 20 and 218 40 for planning data for separate shop facilities.

2. Requirements. The number and types of the equipment maintained by the activity will govern the size of the facility required, that is, the size is directly proportional to the number of general repair bays required to perform the assigned maintenance task. General repair space requirements are computed from the productive space factors contained in Tables 214-208, 214-20B and 214-20C. A 2-bay facility will be considered as the minimum requirement. After the repair bay requirements have been computed, the area required for administrative and indirect as well as direct support functions can be determined from Table 214-20D.

Space requirements for an automotive vehicle maintenance shop are computed as follows:

Step 1. Prepare an inventory listing by equipment costs codes for all of the equipment supported (see Column 1 of Tables 214-2OA, 214-20B, and 214-20C). If a combined automotive/construction equipment/weight-handling maintenance shop is planned, consider all equipment codes; if a separate construction/weight-handling equipment shop is planned under Code 218 20, omit equipment cost codes 2300 to 2840, 3100 to 3720, 4210 to 4952, and 8120 to 8800 (to be used for determining Code 218 20 requirements).

Step 2. Multiply the total equipment inventory as listed in Step 1 for each equipment code group by its corresponding space factor, (shown in Column 3 of the tables) to determine the repair bay requirements for that specific code group.

Step 3. Total the individual code computations to determine the number of repair bays required for all of the equipment supported. For example:

Equipment code	Number of pieces	Productive space factor	Repair bay requirements
0061-0099	1	.063	.063
0102-0299	11	.015	.165
0300-0700	60	.023	1.380
0800	25	.016	.400
1000	26	.020	.520
2000	2	.016	.032
3000	1	.025	.025
4000	26	.020	.520
5000	47	.016	.752
7000	6	.030	.180
8000	3	.092	.276
		Total repair bay requirements	4.313 (or 4 bays)

The interpolation and the selection of the number of repair bays in Table 214-20D, Column (1) is done in even numbers. If the calculation of the number of repair bays is less than the odd number 5 as shown in the example, round down to the next even number 4. If the calculation is more than the odd number of bays (i.e., 5.313), round up to the next even number of bays (i.e., 6).

To determine the total square-footage of area required for general repair bays multiply the number of bays determined in Step 3 by 480 (the square footage of a single 16 by 30 foot general repair bay). The number of square feet of administrative and indirect support area requirements is directly proportional to the number of repair bays, as shown in Column 3 of Table 214-20D.

The administrative and indirect support area includes the following facilities:

1. Administrative office for maintenance and operations personnel.
2. Drivers and operators training, licensing, and ready room.
3. Locker, lunch, and conference room.
4. Toilet facilities.
5. Parts supply, issue, and storage room.
6. Tool room.

In addition to repair bay and administrative area requirements, consideration must also be given to such direct support facilities as tire shop, body shop, battery shop, engine and accessories overhaul shop, paint shop, dynamometer test bay, steam cleaning and wash bay, and lube storage. Engine overhaul and paint and body shops should be provided.

The direct support facility requirements shown in column 4 of Table 214-20D provide for complete shop facilities. The total gross space allowance in

column 5 is the maximum allowed for the indicated number of repair bays.

General Work Bay Space Factors

TABLE 214-20A
Automotive Equipment
Codes 0061 Through 0905

Equipment Cost Code (Column 1)	Abbreviated Description (Column 2)	Productive Space Factor (Column 3)
0061 to 0099	Buses	.063
0102 to 0299	Sedans, station wagons, and ambulances	.015
0300 to 0745	Trucks	.023
0800 to 0897	Trailers	.016
0900 to 0905	Motorcycles, scooters, etc.	.004

TABLE 214-20B
Materials Handling Equipment
Codes 1100 Through 1900

Equipment Cost Code (Column 1)	Abbreviated Description (Column 2)	Productive Space Factor (Column 3)
1100 to 1900	Tractors (warehouse) Trucks (fork-lift, crane platform and side loaders)	.020

TABLE 214-206
Construction and Allied Equipment
Codes 2300 Through 8800

Equipment Cost Code (Column 1)	Abbreviated Description (Column 2)	Productive Space Factor (Column 3)
2300 to 2840	Crushing, mixing, batching and paving equipment (mixers, pavers, distributors, spreaders, heaters)	.016

(Table continued on next page.)

TABLE 214-20C (Continued)
Construction and Allied Equipment
Codes 2300 Through 8800

Equipment Cost Code (Column 1)	Abbreviated Description (Column 2)	Productive Space Factor (Column 3)
3100 to 3720	Drilling, blasting, and driving equipment (compressors and drills)	.025
4210 to 4952	Excavating and grading equipment (crawler cranes, graders, loaders, rollers, scrapers, tractors, etc.)	.020
5110 to 5930	Miscellaneous construction and maintenance equipment (generators, pumps, cleaners, sweepers, mowers, snowplows, garbage trucks, mobile shops)	.016
7100 to 7501	Firefighting equipment (trucks, pumps, etc.)	.030
8120 to 8800	Weight handling equipment (truck mtd., cruiser, and boat cranes)	.092

3. Site Location. In choosing a site for a new transportation equipment maintenance facility a number of conditions should be given careful consideration. The facility should be located adjacent to or within the major industrial area which it serves. Caution should be exercised to ensure that the site selected has adequate land area to accommodate all support facilities, equipment holding and parking area, and sufficient room for employee parking. Site location may be influenced to some degree when railroad equipment is involved because of the track location and approach.

When available sites for the automotive vehicle maintenance facility prove to be either inadequate or inappropriate for the inclusion of construction and/or railroad equipment maintenance, separate shop structures for the service and maintenance of these types of equipment will be provided. See Code 218 40 for planning criteria for a special railroad equipment maintenance shop. Four sizes of public works transportation shops are shown in Definitive Designs, NAVFAC P-272.

TABLE 214-20D
Space Requirements for Automotive
Vehicle Maintenance Facility

Repair Bays		Administrative and Indirect Support Area (Sq ft.) (Column 3)	Direct Support Area (Sq ft) (Column 4)	Total Gross Space Allowance (Sq ft) (Column 5)
(Sq ft.) (Column 1)	(Sq ft.) (Column 2)			
2	960	600	1,440	3,000
4	1,920	1,500	2,720	6,140
6	2,880	1,950	3,480	8,310
8	3,840	2,400	4,230	10,470
10	4,800	3,100	4,270	12,170
12	5,760	3,800	5,210	14,770
14	6,720	4,200	6,000	16,920
16	7,680	4,700	6,070	18,450
18	8,640	5,100	6,080	19,820
20	9,600	5,500	6,170	21,270
22	10,560	5,900	6,210	22,670
24	11,520	6,300	6,250	24,070
26	12,480	6,850	6,290	25,620
28	13,440	7,400	6,330	27,170
30	14,400	7,750	6,370	28,520
32	15,360	8,100	6,480	29,940
34	16,320	8,400	6,520	31,240
36	17,280	8,700	6,560	32,540
38	18,240	9,000	6,580	33,820
40	19,200	9,300	6,600	35,100
42	20,160	9,600	6,640	36,400
44	21,120	9,900	6,680	37,700
46	22,080	10,200	6,720	39,000
48	23,040	10,500	6,780	40,320

214 30 REFUELING VEHICLE SHOP (SF)

Aircraft refueler trucks and other portable fuel dispensing equipment are not serviced or repaired in the automotive vehicle maintenance shop because of the explosive hazard involved. Accordingly, a separate explosion proof and fire-resistant maintenance/repair facility is provided. The facility is located a minimum of 100 feet from other structures. See Table 214-30 for the refueling vehicle shop space allowances.

TABLE 214-30
Space Allowances - Refueling Vehicle Shop

No. of Refuelers Supported	No. of Repair Stalls	Gross Area (Sq ft)
up to 8	1	1,080
9 to 16*	2	1,800

*One additional 720-square-foot (16 x 45 ft) stall may be planned for each increment of eight refuelers above sixteen.

One 16 x 45 foot pad for purging fuel tanks should be provided for each facility. See DM-28 for design criteria and P-272 for a definitive drawing of a 2,520-square-foot facility (3 stalls).

214 40 VEHICLE HOLDING SHED (AWAITING PARTS AND REPAIR) (SF)

This facility is a part of the automotive vehicle maintenance shop with the main purpose of providing a covered area for holding deadlined equipment awaiting repairs. Whenever possible, it should be located near the main repair shops. Space requirements are computed as follows:

> Provide one bay or stall for every 30 pieces of self-propelled equipment supported up to 1,000 units and one additional bay for every 50 units. supported over 1,000. Bays will be 12 feet by 35 feet or 420 square feet in area.

For typical siting of this facility, see Definitive Designs, NAVFAC P-272, Drawing No. 1038013.

214 51 AUTOMOTIVE ORGANIZATIONAL SHOP (SF)

This facility provides work areas for Fleet Marine Force (FMF) units to perform maintenance on items of organizational equipment. The shop space includes administrative and dispatching areas as well as storage for OEM equipment, tools, and parts.

This category code includes requirements previously given in Category Code 214 52, Combat Organizational Shop (now deleted).

See Definitive Designs, NAVFAC P-272, Part 4, for space allowances.

214 53 FIELD MAINTENANCE SHOP (COMBAT/AUTOMOTIVE/TRACK) (SF)

This facility provides specialized work areas for performing 3rd and 4th echelon maintenance functions on items of tactical equipment involving primarily rolling stock items of motor transport and engineer equipment. These are limited to use by the Service Battalion of the Marine Division and appropriate elements of the Force Service Regiment. The shop space includes administrative and training areas as well as storage space for tools, parts, and maintenance float equipment.

For other field maintenance functions see Category Codes 215 60, 217 30, and 218 80.

See Definitive Designs, NAVFAC P-272, Part 4, for space allowances.

214 55 VEHICLE WASH PLATFORM (SF)

Vehicle wash platforms equipped with hose connections should be provided on the basis of one vehicle washing space for each 50 vehicles assigned to the motor pool.

214 56 GREASE RACK (EA)

One grease rack (two vehicles) will be provided for each 125 vehicles.

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215 MAINTENANCE - WEAPONS, SPARES

This group includes facilities for maintenance of small arms, automatic weapons, mortars, artillery guns, launchers, flamethrowers, torpedo tubes, harbor protective nets, and nonelectronic equipment. For missile maintenance facilities, see Category Group 212.

215 10 SMALL ARMS SHOP (SF)
215 20 LIGHT GUN (20 mm to 5 in) SHOP (SF)
215 30 HEAVY GUN (6 in to 16 in) SHOP (SF)
215 40 HARBOR PROTECTIVE NET SHOP (SF)
215 50 LAUNCHER AND PROJECTOR MAINTENANCE SHOP (SF)

At present there are no criteria for Category Codes 215 10 through 215 50.

215 60 FIELD MAINTENANCE SHOP (ORDNANCE) (SF)

This field maintenance shop provides specialized work areas for performing 3rd and 4th echelon maintenance on all items of ordnance equipment authorized repaired by the Service Battalion of the Marine Division and the Force Service Regiment. The shop space includes administrative and training areas as well as storage space for tools, parts, and maintenance float equipment.

For other field maintenance functions, see Category Codes 214 53, 217 30, and 218 80.

See Definitive Designs, NAVFAC P-272, Part 4, for appropriate space allocations.

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216 MAINTENANCE - AMMUNITION, EXPLOSIVES, TOXICS

This group includes facilities for maintenance of ammunition, rockets, bombs, mines, grenades, torpedoes, depth charges, demolition materials, pyrotechnics, missile fuels, and related chemicals.

216 05 CHANGE/RELIEF HOUSE (SF)
216 10 AMMUNITION REWORK AND OVERHAUL SHOP (SF)
216 20 ROCKET REWORK AND OVERHAUL SHOP (SF)
216 30 MINES AND DEPTH CHARGE REWORK AND OVERHAUL SHOP (SF)
216 40 TORPEDO SHOP (SF)
216 50 SPECIAL WEAPONS SHOP (SF)

No criteria are currently available for Category Codes 216 05 through 216 50.

216 55 AIR/UNDERWATER WEAPONS SHOP (AIRBORNE TORPEDOES/AIRDROP WPNS) (SF)

An Air/Underwater Weapons (AUW) Shop is required at Navy and Marine Corps air stations as designated by the Chief of Naval Operations. The AUW shop contains space and equipment for the storage, test, check, assembly, and limited maintenance of airborne torpedoes and other airdrop weapons.

When an AUW Shop is authorized, the standard shop as shown in NAVFAC P-272 establishes the following requirements:

Shop Building	7,192 square feet
Vehicle Shelter	1,550 square feet

For design criteria for the AUW shop, see NAVFAC DM-28.

216 60 QUALITY EVALUATION LABORATORY (SF)

No criteria are currently available for this code.

216 77 AMMUNITION/EXPLOSIVES MAINTENANCE STORAGE (SF)

Storage facilities for miscellaneous equipment related to ammunition/explosives maintenance facilities will be provided only where it can be individually justified. There are no criteria for this type of facility. General information on normal stacking heights, SF per measurement ton requirements, and other parameters are provided in Category Code 440 series.

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217 MAINTENANCE - ELECTRONICS AND COMMUNICATION EQUIPMENT

This basic category includes facilities and shops for maintenance and repair of radio and radar equipment, antennas, radiation aids, sonar equipment, transmission and reception equipment, and guided bombs.

217 10 ELECTRONICS/COMMUNICATIONS MAINTENANCE SHOP (SF)

Electronics maintenance shops at Naval and Marine Corps activities provide facilities for maintenance and repair of nonairborne equipment (see Category Code 211 45, Avionics Shop (Non-NARF) for airborne equipment repair facilities). Criteria for facilities of this type are currently under development.

217 20 COLLIMATION TOWER (EA)

Collimation facilities are required at shipyards for electronic and optical alignment of fire control and radar equipment aboard ships. This facility consists of a steel tower approximately 125 to 150 feet in height and a small instrument building at the lower base.

217 30 FIELD MAINTENANCE SHOP (COMMUNICATIONS/ELECTRONICS) (SF)

This field maintenance shop provides specialized work areas for performing 3rd and 4th echelon maintenance on all items of communications/electronics equipment authorized repaired by the Service Battalion of the Marine Division and the Force Service Regiment. The shop space includes administrative and training areas as well as storage space for tools, parts, and maintenance float equipment. For other field maintenance functions, see Category Codes 214-53, 215-60 and 218-80.

See Definitive Designs, NAVFAC P-272, Part 4, for appropriate space allocations.

217 40 ANTENNA TEST RANGE (EA)

This facility is for testing electronic equipment and communication antennas after completion of maintenance, repair and overhaul work. This range has to be individually planned. Standard planning factors are not available.

217 50 SENSOR ACCURACY CHECK SITE (SACS) (EA)

The primary purpose of this facility is to measure the performance of shipboard sensors in an in-port environment on completion of overhaul or during normal port upkeep of Navy ships. This facility can be planned for only when authorized by the Commander, Naval Sea Systems Command. The SACS is a unique test and evaluation facility which provides an independent, real-time measure of gyrocompass, sonar, echo sounder and sonar communications set performance and accuracy. The SACS design permits sensor

evaluations under test conditions especially favorable to the ship: (1) the ship is tested in port with all normal dockside facilities available; (2) measurements are external to the ship so that “at sea” performance is determined ; (3) data are analyzed in real-time providing immediate identification of sensor deficiencies and verification of corrective actions; and (4) all major sonar parameters are measured in a single comprehensive test.

The major components of this facility are:

1. Control Center: The building in which test points on the ship’s sensors are monitored, and control is maintained over all SACS equipment. The building contains signal generating, receiving and processing devices and automatic data acquisition and analysis equipment.

2. Pile Mounted Transducers: Transducers mounted to the 31 pilings of the SACS array. The transducers are spaced at 10 degree intervals and are used for sonar range and bearing error measurements.

3. Moveable Carriage with Transducer: A calibrated directional transducer that can be moved vertically and in azimuth; it is used for receiver and transmitter performance measurements.

4. Ship’s Transducer Location System (STLS): A system of three transducers used to continuously monitor the position of the ship’s sonar transducer to an uncertainty of less than one inch.

5. Automatic Ship’s Head Measuring System (ASHMS): A system of specially configured TV cameras that is used to provide ship’s heading to an accuracy of better than 0.01 degree.

6. Mooring System: A system of five hydraulic winches from which wire ropes are extended to the ship in order to maintain the ship’s sonar transducer near the center of the SACS array.

7. Inport Services: The ship is provided 800 amps, 440 volts, steam, fresh water, telephone connections and generous parking space.

8. Echo Sounder Test Array: An array of four transducers placed on the bottom of the bay directly below the ship’s fathometer.

A minimum depth of 50 feet MLLW is required at the site of the subject facility due to the variety of vessels that can be expected to be serviced.

217 77 ELECTRONICS - SPARES AND STORAGE (READY ISSUE/SHOP STORES/ MISCELLANEOUS) (SF)

218 MAINTENANCE - FACILITIES FOR MISCELLANEOUS PROCURED ITEMS AND EQUIPMENT

218 10 CONTAINER REPAIR AND TEST BUILDING (SF)

A container repair and test facility services only empty containers. The size of the facility is predicated upon processing approximately 1 percent of the containers and chassis involved in the handling and shipping operations. The facility provides for structural testing, minor repairs, and cosmetic services for damaged or structurally marginal containers.

Assuming a 750 container throughput capability per 24-hour day, the number of bays in the repair facility can be estimated as follows:

1% x 750 = containers per day
Assume 4 hours work per container - 4 x 7.5 = 30 hours
Assume 8 hours working day - 30 / 8 = 3.75, say 4 bays

A typical 4-bay facility with supporting tool room, administrative space, and personnel support area is shown in Figure 218-10. The bays are serviced by a bridge crane with a lifting capacity of 5 tons. Storage space of 2,130 square yards for 16 empty containers should be provided adjacent to the facility. The 4 bays testing and repair area is 1,920 square feet. The administrative space is 800 square feet for a total gross area of 2,720 square feet.

218 20 CONSTRUCTION/WEIGHT HANDLING EQUIPMENT SHOP (SF)

Special shop structures for the maintenance and repair of construction/weight-handling equipment are planned only for areas where combined automotive, weight-handling, railroad and/or construction equipment maintenance facilities are not feasible. Construction/weight-handling equipment shop requirements are based on the space factors contained in Code 214 20, Automotive Vehicle Maintenance Shop.

Included in this category are special construction and utility shops for Marine Corps units. These shops are normally part of the Headquarters Battalion, Force Service Regiment, and the Fleet Marine Force (FMF) Engineer Battalions. For space allocation, see Definitive Designs, NAVFAC P-272, Part 4.

218 25 MARINE AIR-BASE SQUADRON (MABS) FACILITY (SF)

This category code is used for inventory purposes only.

218 30 DRUM RECONDITIONING PLANT (SF)

The drum reconditioning plant is planned for those fuel facilities where fuel drums are returned for refilling or storage before reissue. Normal drums that require reconditioning at frequent intervals are the 55-gallon steel type. The drum reconditioning facility requires a minimum of two

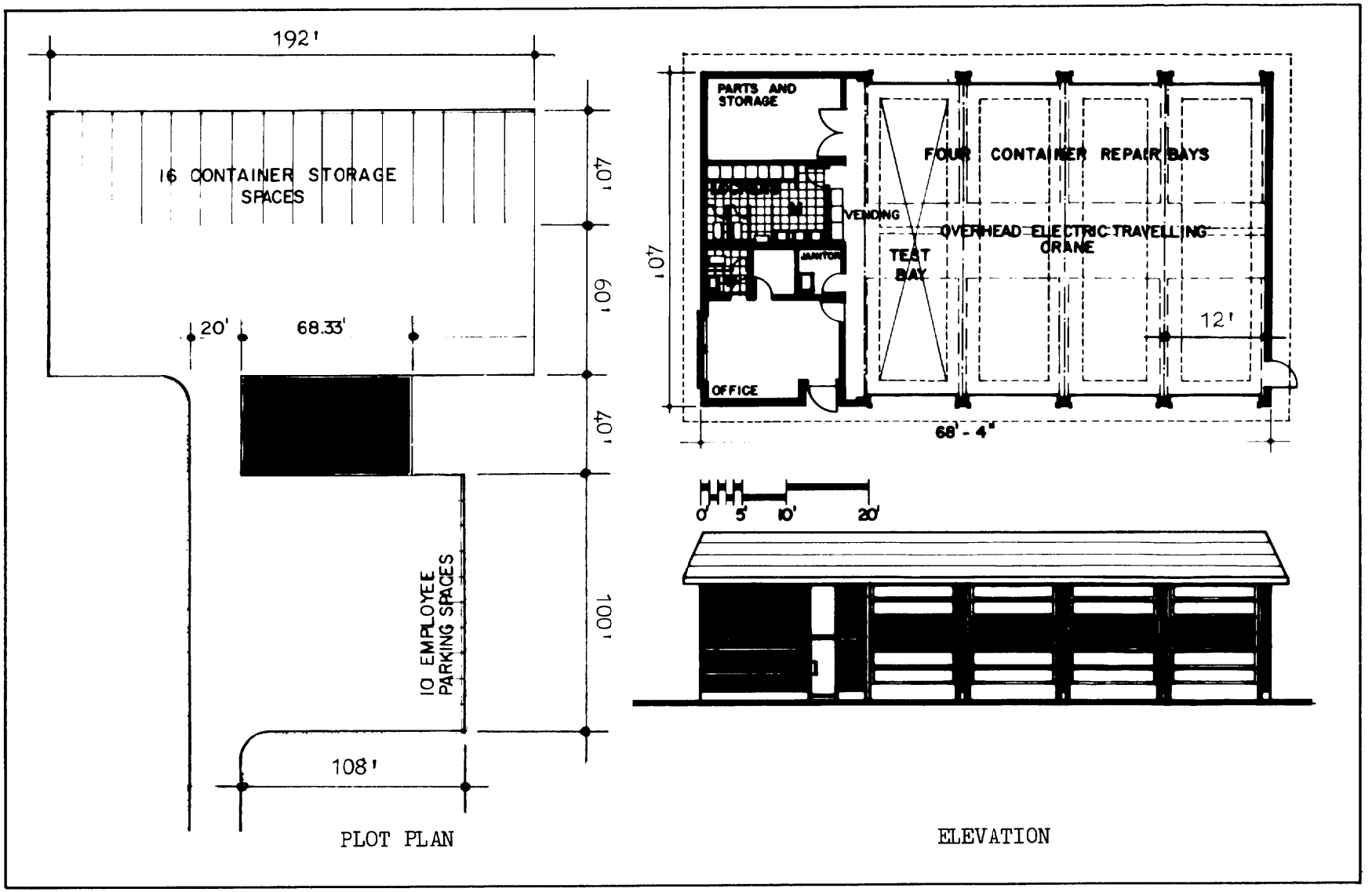

FIGURE 218-10
Container Repair and Test Building

buildings; one for the boiler plant and the other housing the reconditioning facilities. The boiler house will be approximately 800 square feet, and the reconditioning building housing the internal washing, dedenting, internal chaining, external wire brushing, chime rolling, testing, welding, internal preservation, and painting will be approximately 3,600 square feet. This plant has a capacity of approximately 3,000 55-gallon drums per month.

218 35 CABLE REPAIR HOUSE (SF)

No criteria are currently available for this code.

218 40 RAILROAD EQUIPMENT SHOP (SF)

The railroad equipment maintenance facility is a special shop structure to house material and equipment for the service and maintenance of railroad locomotives and locomotive cranes. The facility is required where installations operate and maintain railroad equipment for the handling of supplies. In areas where it is practicable, the railroad equipment maintenance shop will be combined with the Automotive Vehicle Maintenance Shop and/or the Construction/Weight-Handling Equipment Shop and the number of repair bays (with pits) may be determined as follows:

Locomotives Supported	Repair Bays	Area SF
1-5	1	960
6-12	2	1,980
13 and over	3	2,880

If a separate repair facility is required, see Definitive Designs, NAVFAC P-272 for a basic l-bay maintenance shop. The numbers of additional bays are similarly determined from the above table.

218 45 INSTRUMENT CALIBRATION SHOP (SF)

This shop performs calibration, repair, and certification of all measurement instruments assigned to an activity. Space requirements are governed primarily by the number of pieces of equipment requiring calibration. The facility should be dust-free, temperature and humidity controlled and protected from electromagnetic interference. It is essential that the site selected for the location of this facility be free of ambient vibration to avoid interference with calibration operations. Normally the following spaces are included:

1. Calibration Laboratory

2. Cleaning Room is used for cleaning and drying equipment to be calibrated.

3. Utilities Room is required so that utilities components can be isolated from the laboratory working area.

4. Storage Areas for incoming and outgoing items, spare parts and equipment.

5. Administration Area provides office space, technical library, and file storage. Space allowances are planned in accordance with Category Code 610-10.

For specific guidance, see Joint Systems Commands publication Calibration Facility Requirements (NAVAIR 17-35 FR-02 NAVSEA OD 45842 and NAVELEX 0967-LP-465-8010) and Naval Shore Electronics Criteria (NAVELEX 0101,114) calibration program.

218 50 BATTERY SHOP (SF)

A battery shop is required to service and charge batteries. As an example, typical batteries serviced at an air installation are lead-acid batteries used for ground support equipment (GSE) and nickel-cadmium and silver-zinc batteries for aircraft at the intermediate maintenance level. A shop is normally required at each Navy and Marine Corps air installation having approximately 75 or more aircraft. The gross area of the battery shop is 1,110 square feet. This shop size can accommodate a maximum workload of eight nickel-cadmium and 40 lead acid batteries per work shift. The shop size should be modified for other work loads, with the major change being in the amount of space needed for charging benches.

218 51 BATTERY RECHARGING SHOP (SF)

This category code is for use at activities which have a requirement to recharge battery powered equipment such as forklift trucks used at supply centers. The requirement is a function of the number and size of the equipment being serviced and must be determined on an individual basis or in the case of forklift trucks, the following criteria may be used: 100 square feet per forklift which includes 40 square feet for the average vehicle itself and 60 square feet for aisle and workspace, based on a 1.5:1.0 ratio. In all instances, compliance must be maintained to OSHA regulations regarding the venting of hydrogen gas, floor drains, flush facilities, explosion proof wiring and lighting, etc.

218 60 GROUND SUPPORT EQUIPMENT SHOP (SF)

The intermediate level maintenance of aircraft ground support equipment (GSE) is performed in this shop. Ground support equipment, often referred to as yellow gear, includes such items as tow tractors, trucks, fork lifts, trailers, compressors, power generators, maintenance stands, jacks and other ground equipment which support aircraft operations.

The GSE shop requirement is based on the average number of on-board aircraft and is sized in accordance with Table 218 60 with the following modifications:

(1) The areas shown in the table were developed for base loadings

comprised mainly of VF, VA, VP, VS and VEW aircraft. Activities supporting primarily helicopter or basic propeller training operations normally would not require a shop size greater than 12,500 square feet regardless if the station loading exceeds 100 aircraft.

(2) Stations which have a Fixed Point Utility System (FPUS) installed in the aircraft parking apron shall reduce the shop requirement by 640 square feet for each full increment of 75 aircraft spaces equipped with FPUS. See the example at the end of this category code.

(3) Stations having less than 40 aircraft shall individually justify a requirement for a GSE shop. Consideration shall be given to maintaining the GSE gear in the Automotive Vehicle Maintenance Shop (Category Code 214 20) prior to requesting a separate GSE shop.

TABLE 218 60 GROUND SUPPORT EQUIPMENT SHOP

NO. OF AIRCRAFT	SHOP AREA (SF)
40-50	6,250
51-75	9,400
76-100	12,500
101-125	13,950
126-150	15,400
151-175	16,850
176-200	18,300
201-250	21,200
251-300	24,100

The above shop allowance includes work space for: battery shop, engine shop, paint shop, tire and wheel repair, jack repair, and vehicle frame work. Supporting space for ready issue of parts, tool storage, classrooms, locker room, offices, and a mechanical equipment room are also included. A covered storage area for GSE gear is planned in conjunction with the GSE shop (see Category Code 218-61, Ground Support Equipment Holding Shed). See NAVFAC P-272, Part 4 for definitive designs. A sample computation for a GSE shop is given below:

EXAMPLE-GSE SHOP

GIVEN - Average on board aircraft - 179
- Fixed point utility system (FPUS) provided to 90 apron parking spaces.

From Table 218 60, shop area to support 179 aircraft equals 18,300 SF.

REDUCTION FOR FPUS

- 90 apron spaces with FPUS divided by 75 = 1.2, use 1.0
- Reduce area by 1.0 x 640 SF
- Requirement equals (18,300-640) 17,660 SF

218 61 GROUND SUPPORT EQUIPMENT HOLDING SHED (SF)

The ground support equipment (GSE) holding shed is planned in conjunction with the Category Code 218-60, GSE shop. The shed provides protective cover for GSE year awaiting and undergoing intermediate level maintenance and is an integral part of the GSE shop compound. See NAVFAC P-272, Part IV for a typical site plan showing the location of the shed with respect to the GSE shop.

The GSE shed requirement is based on the average number of on board aircraft and is sized in accordance with Table 218 61 with the following modifications:

(1) The areas shown in the table were developed for base loadings comprised mainly of VF, VA, VP, VS and VEW aircraft. Activities supporting primarily helicopter or basic propeller training operations normally would not require a shop size greater than 19,500 square feet regardless if the station loading exceeds 100 aircraft.

(2) Stations which have a Fixed Point Utility System (FPUS) installed in the aircraft parking apron shall reduce the shop requirement by 640 square feet for each full increment of 75 aircraft parking spaces provided with the FPUS. See 218 60 for example of application of similar reduction to GSE shop.

TABLE 218 61 GSE HOLDING SHED

NO. OF AIRCRAFT	SHED AREA (SF)
40-50	9,750
51-75	14,625
76-100	19,500
101-125	19,967
126-150	20,435
151-175	20,902
176-200	21,370
201-250	22,300
251-300	23,230

218 62 SHIPBOARD AIRCRAFT SUPPORT EQUIPMENT FACILITY (SF)

No criteria are currently available for this code.

218 65 EQUIPMENT HOLDING SHED (For Code 218 20) (SF)

This facility is required in conjunction with Construction/Weight-Handling Equipment Shop, Code 218 20 for the purpose of protection of equipment awaiting repairs. The number and size of holding bays has to be determined on an individual basis and is dependent upon the type of equipment to be supported.

218 68 PRODUCTION EQUIPMENT MAINTENANCE SHOP (SF)

No criteria are currently available for this code.

218 70 OFFICE EQUIPMENT/APPLIANCE REPAIR SHOP (SF)

Appropriate facilities may be provided to perform maintenance and repair of office equipment and small appliances. The space requirement for this facility is governed by the number of machines supported by the activity. See Table 218-70.

TABLE 218-70
Space Allowance - Office Equipment/Appliance Repair Shop

Number of Machines Supported	Gross SF Area	Number of Machines Supported	Gross SF Area
500	400	2,500	1,200
1,000	600	3,000	1,400
1,500	800	5,000	1,600
2,000	1,000		

218 71 DENTAL EQUIPMENT MAINTENANCE BUILDING (SF)

No criteria are currently available for this code.

218 77 REPAIR SHOP STORAGE (SF)

No criteria are currently available for this code.

218 80 FIELD MAINTENANCE SHOP (GENERAL SUPPLY) (SF)

This field maintenance shop provides specialized work areas for Fleet Marine Force (FMT) units performing 3rd and 4th echelon maintenance on all items of general supply equipment. This function is performed primarily by the General Supply Maintenance Company, Maintenance Battalion, of the Force Service Regiment. The shop space includes administrative and storage space for tools, parts, and maintenance float equipment.

For other field maintenance functions see Category Codes 214 53, 215 60, and 217 30.

See Definitive Designs, NAVFAC P-272, Part 4, for appropriate space allocation.

219 MAINTENANCE - INSTALLATION, REPAIR AND OPERATION

This basic category includes maintenance shops for repair and overhaul of installation facilities (public works and public utilities), including installed shop and other equipment, and utility distribution systems, used in support of maintenance operations at military and/or industrial installations. The maintenance and repair of vehicles and weight-handling and construction equipment, utility plant, and maintenance shops are not included in this category. For the former, see Basic Category 214 and 218, and the latter see 811.

219 10 PUBLIC WORKS SHOP (SF)

NOTE: For shop planning in Public Work Centers, individual guidance will be provided by NAVFAC (Code 15).

This facility supports the Maintenance Division of the Public Works Department. This Division is responsible for management of the Preventive, Maintenance Inspection (PMI) program and is tasked to perform maintenance on:

1. All buildings, grounds and ground structures.
2. Utilities plants and distribution systems when requested by the Utilities Division.
3. Heating, air-conditioning and refrigeration systems.
4. Internal communications and alarm systems.
5. Roads and trackage.

This work includes repairs, alterations and new construction incident to maintenance; except work that may be accomplished by private contract. In addition the Maintenance Division is responsible for the following services:

6. Respond to emergency and/or service work requests.
7. Provide caretaking services.
8. Provide upkeep to all grounds of the activity.
9. Provide for solid waste collection.
10. Provide pest control service.

Certain Public Works Department functions are not performed at the Public Works Shop as defined for code 219 10, such as:

11. Administration when not in direct support of a maintenance shop. This includes offices for the Public Works Officer (PWO), Assistant PWO, Maintenance Control Division, Maintenance Division supervisor and staff, Engineering Division, Administrative Division and Housing Division.
12. Work performed by the Utilities Division such as operating utilities plants and distribution systems.
13. Maintenance and repair of automotive equipment.

Facilities for these functions are categorized under the following category groups as appropriate: 610- Administration, 218- Maintenance - Facilities for Miscellaneous Procured Items and Equipment, 214- Maintenance - Tank, Automotive, and the applicable code groups in the 800 series - Utilities and Ground Improvements.

The maximum allowable gross area for public works shops, including space for heating and mechanical equipment, is based on the number of military and civilian maintenance personnel permanently assigned to the maintenance organization. This does not include those personnel involved in functions not directly performed by the shop as outlined above. Table 219-10 lists the gross area for the various sizes of maintenance shops including category code 219-20, Pavement and Grounds Equipments Shed and 219-25, Public Works Shops Expendable/Work-in-Process Store.

TABLE 219-10
Space Allowance - Public Works Shops*

Shop Type	Total Maintenance Personnel	Gross Area (SF)*
A	10 - 30	8,700
B	31 - 50	12,100
C	51 - 100	16,700
D	101 - 150	21,100
E	151 - 300	28,300
F	301 - 500	34,800
	Over 500	100 SF/Pers.

*The areas indicated in Table 219-10 represent the entire composite area for the Public Works Maintenance Shop. Included within these figures are the areas allocated for category codes 219 20, Pavement and Grounds Equipment Shed, Table 219-20, and 219-25, Public Works Shops Expendable/Work-In-Process Store, Table 219-25. The requirement for the last two codes must not be added to this code but rather are considered an integral part of it. The figures indicated in the tables for these two codes are provided as a guide as to how category code 219 10 may be subdivided. In the event the requirement for category codes 219 20 and 219 25 are less than indicated, it is not necessary to reduce the figures indicated in Table 219-10 but rather, this difference in area may be used for other functions performed by this shop.

The gross areas listed in Table 219-10 provide for the following functions: (1) the woodworking shop, including furniture repair, packing, and crating, excluding the packing and crating in Basic Categories 441 and 442); (2) the electrical shop, refrigeration and air conditioning shop; (3) plumbing and heating shop; (4) metal work shop, including machine shop, sheet metal, iron work, welding, and blacksmith facilities; (5) paint shop; (6) routine maintenance and service shops, including custodial, preventive maintenance, refuse collection, insect and rodent control, road maintenance facilities, moving and rigging, and emergency service shops; (7) central tool issue, shop stores and shop toilets, and locker rooms, and (8) administrative spaces in direct support to shop operations, corridors, and necessary service space directly related to the shop. If other than the foregoing functions are required, space may be appropriately increased if justifications are documented.

219 20 PAVEMENT AND GROUNDS EQUIPMENT SHED (SF)

The pavement and grounds equipment shop will provide holding space and minor maintenance space for tractors, lawnmowers, snowplows, and other miscellaneous equipment used for roads and ground maintenance. This shop can be independent of the Public Works Maintenance Shop (219 10) but is related for space allowances to the corresponding PW shop type. The gross square foot allowances on Table 219-20 are provided for planning guidance only and are not additive to the Public Works shop allowances. See footnote to Table 219-10.

TABLE 219-20
Space Allowance - Pavement and Grounds Equipment Shop

Shop Type	Gross Area (SF)
A	525
B	700
C	850
D	1,100
E	1,800
F	2,200

219 25 PUBLIC WORKS SHOPS EXPENDABLE/WORK-IN-PROCESS STORE (SF)

The public works shops expendable/work-in-process store holds the ready-issue items for public works daily maintenance, job order materials for the maintenance of station facilities and materials that are considered critical items for emergencies/service. It is independent of the General Supply Storage (Code 441 10). The shop can also be independent of the Public Works Shop (Code 219 10) but is related for space allowances to the corresponding PW shop type. See Table 219-25. The gross square foot allowances on Table 219-25 are provided for planning guidance only and are not additive to the Public Works shop allowances. See footnote to Table 219-10.

TABLE 219-25
Space Allowances - Public Works Shop Store

Shop Type	Gross Area (SF)
A	650
B	1,000
C	1,100
D	1,400
E	2,200
F	2,500

Definitive Designs, NAVFAC P-272, show the Public Works Shop Stores (Code 219 25) and Pavement and Grounds Equipment Shop as integral parts of the public works maintenance shops.

219 30 PAINTING AND RELATED OPERATIONS BUILDING (SF)

The function of the painting and related operations building is to provide space for painting and other operations which may not be functionally compatible or hazardous to the building or types of operation conducted in the public works shop, category code 219 10. This facility is considered as an integral part of category code 219 10 but may, in some instances, be a separate building if safety or functional requirements so dictate. However, in all cases, the area allocated for this facility must be considered as part of the area for the corresponding shop types listed in Table 219-10 and must not be considered as an additional requirement.

219 31 PAINTING AND RELATED OPERATIONS STRUCTURE (EA)

The painting and related operations structure is a facility used for painting and those operations which are not suitable to be carried on in category code 219 30, Painting and Related Operations Building. This code may include structures like a sandblast scaffold, paint spray booth, preservation dip tank, pickling tank, sandhopper, sandblasting facilities, open paint canopy, sand handling bin, etc. There are no specific planning criteria for these structures, each requirement must be individually justified.

219 77 PUBLIC WORKS MAINTENANCE STORAGE (READY ISSUE/SHOP STORES/MISC.) (SF)

This facility is a general warehouse for the storage of items and materials required for the maintenance of station buildings and grounds. It is independent of the ready-issue storage facilities required in direct support of the public works shops (use Code 219 25).

Shed storage space is required to provide covered storage for certain items of equipment and supplies needed for base operation and maintenance, which do not require regular warehouse storage, yet must be protected from the weather. Table 219-77 may be used to determine covered storage requirements for various sizes of public works facilities.

TABLE 219-77
Public Works Storage Areas

Shop Type	Gross SF Area	
	Covered	Shed
A	3,400	2,300
B	3,400	2,300
C	3,400	2,300
D	6,000	4,000
E	12,500	8,300
F	19,200	12,800

NOTE: For Public Works Storage supporting PW shops larger than type F, add the following areas for each maintenance craftsman over 500: covered 40 SF; Shed - 25 SF

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220 PRODUCTION

Production facilities for the construction and assembly of new weapons, equipment and components under category group 220 are excluded from this publication. For listing of five-digit category codes under this group, see NAVFAC P-72.

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SECTION 3

FACILITY CLASS 300 - RESEARCH, DEVELOPMENT, TEST AND EVALUATION FACILITIES

Research, development, test and evaluation facilities include the buildings and other scientific structures and facilities used directly in theoretical and/or applied research, development, test and evaluation operations. Category code groups pertaining to these facilities are:

Category Code 310 thru 321	Research, Development, Test and Evaluation Buildings
Category Codes 371 and 390	Research Development, Test and Evaluation Structures

Associated facilities assigned function in support of research, development, test and evaluation are assigned appropriate codes such as Code 200 for normal maintenance, repair and overhaul purposes, Code 400 for warehouse, as opposed to storage functions, Code 600 for administrative facilities, Code 800 for utilities, and Code 900 for real estate.

DEFINITION OF TERMS:

The following definitions of terms are used in the research criteria:

Gross Floor/Building Area. The total areas of all floors, measured between the exterior faces of outside walls. It includes full areas of basements, on-grade and above grade floors, service and equipment rooms, boiler plants and heater rooms, mezzanines, penthouses, enclosed passages and raised covered platforms. Excluded is all enclosed space with an average ceiling height of less than seven feet.

Net Floor Area. This is total gross floor area, less space taken up by outside walls, stair towers, elevator shafts, interior partitions, toilets, basements unsuited for specific use, permanent hallways, elevator machinery and machinery or equipment used for heating and/or ventilating the building. The net floor area does include special equipment bays peculiar to a particular laboratory function.

Prime Unit Generator. A special object (e.g., tow tank, wind tunnel, environmental chamber, multi-axis rate table) which tends to have the room built around it, rather than fitting into an existing room. Prime unit generators usually require "high bay" areas and often have overhead cranes or other heavy handling equipment associated with them.

Module. A basic unit that can function independently or be combined to form larger sizes. This term can be applied to an interior space such as a room, or to a piece of equipment, such as an Automatic Data Processing module.

NTG Factor (net to gross conversion factor) That factor which is used to convert a net floor area to a gross floor/building area (net floor area x NTG factor = gross floor/building area).

OVERALL METHODOLOGY:

The basic problem in planning any research facility is the same: how to meet an existing need while at the same time providing for flexibility and growth. Research by its very nature ranges from microscopic investigations to factory type testing set-ups. The methods described below provide a good prediction of the type and quantity of space that should be built to satisfy a specific program need, while at the same time allowing for flexibility to accommodate future RDT&E program.

In approaching any research facility planning project, it is advisable to break down the facility requirements into basic functional components. These components consist of:

1. Research Offices
2. Research Support
3. Bench Type Labs
4. Specialized Research Facilities

Not all of these components will be present in all research facilities. To arrive at total requirements for a facility, each of the components which are present should be looked at separately, using the appropriate method described in succeeding paragraphs. Net floor areas should be developed first for each component, and gross floor/building areas calculated for each by multiplying the net areas by the appropriate NTG conversion factor. The total space requirement for the research facility is obtained by adding the gross floor/building areas for each of the components, as diagrammed below:

TOTAL AREA (GROSS)	=	RESEARCH OFFICE(S) (NET SF x NTG)	+	RESEARCH SUPPORT (NET SF x NTG)	+	BENCH TYPE LAB(S) (NET SF x NTG)	+	SPECIALIZED RESEARCH FAC(S) (NET SF x NTG)

There are three basic methods for developing and justifying net floor areas for research facilities. These consist of:

1. Architectural Method - This method consists of the development of scaled floor plans which depict a layout of equipment items within a required "envelope" of space. Such layouts should show the equipment as it should be placed within the space, which may not necessarily correspond to the manner in which such space is actually arranged in existing facilities. Such layouts should strive to be as efficient as possible, i.e., to include no space for which full utilization cannot be demonstrated.

2. Industrial Method - This method consists of identifying in a tabular format the net floor area required for each item of required equipment. When this method is used, the table should include three columns of information: (a) name of equipment item; (b) actual floor area occupied by the item, i.e., the size of its "footprint"; (c) size of the required working area within which the item sits, which permits all normal operations associated with the equipment as well as required services access to all sides. The sum of all the areas shown in item (c) will be the total net floor area for the space as a whole, and is equivalent to the "envelope" which would be shown graphically if the architectural method were used.

3. Use of Criteria - For many types of facilities, approved rules of thumb (criteria) may be used to generate net floor areas. These are identified in terms of space per person, space per module, etc., and have been incorporated wherever possibl e into the P-80 guidance. Use of criteria generally requires less time and effort than either of the other methods.

In developing requirements for research facilities, any of the above methods may be used or a combination of these methods to develop the net floor areas for each functional component of the research facility.

RECOMMENDED PROCEDURES, BY FUNCTIONAL COMPONENT:

RESEARCH OFFICE. Net floor areas for office spaces should be calculated by utilizing the criteria and guidance contained in category code 610 10. Gross floor/building areas should be developed using the NTG factors shown under this code. In utilizing the criteria, care must be taken to identify by administrative component, which personnel require office type space.

RESEARCH SUPPORT. The term "research support" is used to include lunch/locker spaces, libraries, auditoriums, etc., which may be required in direct support of an RDT&E function. It does not include storage, since requirements for this type of space are handled elsewhere. Studies have shown that space requirements for these types of space are similar, whether in support of a laboratory or other Navy uses. Therefore, the appropriate criteria may be used to calculate the requirements. If these criteria are to be used, refer to the appropriate category codes for guidance. Examples of such codes are:

Installation Restaurant	Category Code 740-26
Academic Instruction Building	Category Code 171-10
Applied Instruction Building	Category Code 171-20
Auditorium	Category Code 171-25

Net to gross conversion factors to be used for research support spaces are the same as for research offices.

BENCH TYPE LABS. The bench lab component of research facilities tends (if present) to be organized into repetitive modules. Because of the nature of research, one scientist may share a laboratory module with another scientist or, in some instances, one scientist may have a need for two or more dedicated labs. For planning purposes it is reasonable to identify what constitutes the basic lab module and justify the number of these modules on the overall number of scientists involved. (Note that photographic darkrooms and control rooms are treated as bench labs, not as support space.)

The basic laboratory module that is most adaptable to various types of research and which also works well within modern structural systems is 11.5 x 24 feet in size. This design allocates 276 square feet for net floor area per laboratory module.

The net to gross conversion factor to be used for bench type laboratories contains a built-in allowance for storage space, and laboratory support shop space. These are as follows:

For buildings supported by a central heating/cooling plant	1.35
For buildings containing their own HVAC equipment	1.65

SPECIALIZED RESEARCH FACILITIES. Specialized research facilities can be subdivided into three types: (1) Large Set-Ups of bench lab type activities which are too big to fit into a single bench lab module; (2) Systems Simulation, including automatic data processing laboratories, and data processing centers in support of other lab activities, and (3) One-of-a-kind facilities such as tow tanks, environmental chambers, and wind tunnels, etc.

A. For Large Set-Ups of relatively small and ordinary laboratory items arranged into a combination too large to fit into a single laboratory module, space allocation should be in multiples of a single 276 square foot bench lab module. These multiples usually range from 1 to 4 modules, only rarely exceeding 4 modules is size.

Large set-ups of a more-or-less permanent nature or involving only a few pieces of large equipment may be treated as one-of-a-kind items (see below). This is true even if the large set-up does not require the high ceiling typical of most one-of-a-kind facilities.

Net to gross conversion factors for large set-ups are the same as for bench labs spaces, and contain built-in allowances for storage and shop space. NTG factors to be used for large set-up spaces are as follows:

For building supported by a central heating/cooling plant	1.35
For buildings containing their own HVAC equipment	1.65

B. For Systems Simulation Facilities, allow 28 square feet of net floor area for each automatic data processing unit such as disc pack, tape drive, printer, and each relay rack of the processing units or console. Do not count supplemental air handlers, programmers' desks, or storage racks for tapes or cards--allowance for these is already included in the 28 square foot module. Specialized equipment associated with the ADP equipment (if any) is treated as one-of-a-kind equipment (see below). The net floor area for any specialized equipment should be added to that for the ADP units, and the same NTG factor applied as for office space (see category code 610-10).

C. One-of-a-Kind Facilities are built to house large and unique equipment such as wind tunnels, flow channels, shaker tables, environmental chambers, autoclaves, etc. A method for allocating space for one-of-a-kind facilities involves identifying the "Prime Unit Generator".

The prime unit generator is the item or assemblage of equipment which is the primary justification for the facility. Because of the specialized nature of these items, (which can be as small as a 6′ diameter pressure vessel, or as large as a 20 x 30 x 50 foot space shuttle avionics test fixture) it is necessary to have some special rules for defining prime unit generators. These rules include the following:

1. Internal wind tunnels (where the entire tunnel is contained in a large room): Include compressors and/or suckers or reservoir vessels inside the building along with the tunnel tube itself.

2. External wind tunnels (where most of the tube is outside and only a working chamber is housed inside the building): Do not include any mechanism which is outside the building. Do include the entire working chamber, even if one wall of the chamber constitutes or is in contact with the outside wall of the building.

3. Tow tanks/flow channels/turning basins: Include in the prime unit generator all fundamentally necessary equipment which is inside the building and essential to the operation of the tank, channel, etc. Examples are pumps with flow channels, and wave making mechanisms with turning basins.

4. Irradiation equipment including X-ray: Include as a part of the prime unit generator power generation equipment, (as with wind tunnels), flow channels, etc. For track mounted units, include the entire track as part of the prime unit generator. For remote controlled units operating in a shielded room, treat the room only as a prime unit generator, and the controls as bench lab if in a control "booth", or a control console if freestanding outside the shielded irradiation room proper.

5. Control consoles: If freestanding in an otherwise open area, add 4 feet or clearance to working side and use the bench lab NTG. If in a separate room devoted exclusively to the control function, treat the entire room as a bench laboratory.

6. Internal aisles and walk space in specialized research facility areas, and within bench labs are not counted as circulation corridors, but are allowed for in the NTG factor.

7. General case. For RDT&E equipment and installations not specifically discussed above, treat the primary functional unit, and any unique "custom tailored" ancillaries as the prime unit generator. Other support items of a more nearly off-the-shelf nature are not counted as part of the prime unit generator but allowed for in the NTG factor.

After the footprint (floorplan area) of the prime unit generator is identified, a 6 foot working clearance is provided on all sides. For irregular shaped items some smoothing of the outline should be allowed to simplify calculation.

Note that the 6 foot working clearance is a theoretical space allocation tool, not intended to reflect realistic working requirements. Note, too, that in cases where the equipment is close to a building wall, the 6 foot clearance may extend outside the building wall, but is still counted in determining the required net floor area.

The total area of the prime unit generator, and its 6 foot working clearance is called the "Working Net" for that item.

The net to gross conversion factor applied to the working net of one-of-a-kind facilities depends upon the type of heating service provided to the building:

For buildings support by a central heating/cooling plant	1.5
For buildings containing their own HVAC equipment	2.2

As an alternative to the above procedure, a scaled floor plan (Architectural Method) may be developed and provided as justification for the space requirement.

SUMMARY OF RECOMMENDED PROCEDURES:

For convenience, a brief summary is provided:

1. Offices - Use criteria for category code 610 10.

2. Research Support - Use criteria for the appropriate category codes to obtain net floor area. Use NTG factor for the category code 610 10 administrative space.

3. Bench Labs - Use 276 square foot module. Treat darkrooms and control rooms as bench lab space. The NTG factor includes allowance for storage and direct shops support, and varies with the type of building heating system.

4. Specialized Research Facilities -

   (a) Large Set-Ups: Use multiple of bench lab module. Use same NTG factors as for bench labs.

   (b) Systems Simulation: Use 28 square foot module for each piece of ADP equipment. Add area for any specialized equipment (which is treated as one-of-a-kind equipment). Use the same NTG factor as for category code 610 10 space.

   (c) One-of-a-kind facilities: Identify prime unit generator. Add 6 foot working space to obtain working net. The NTG factor will vary with the type of building heating system.

5. Alternative Methods: The Architectural Method and the Industrial Method may also be used, if applicable, to a particular research requirement.

CATEGORY CODE DESIGNATION:

After a determination is made of the gross floor/building area, a specific category can be assigned to the total space, based on the primary anticipated use for the facility. As a general guideline, offices and support areas which are directly related to a particular type of research activity, carry the same category code as the laboratory areas themselves.

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310 SCIENCE LABORATORIES

Buildings used directly in theoretical or applied research, development and testing operations related to basic research such as chemistry, materials, medical, biological, sonic, physics, geophysics, etc.

310 11 ASTRONOMY AND ASTROPHYSICS LABORATORY (SF)

A facility required to support the investigation of radio astronomy equipment, satellite research, and development for navigational and communication programs. The facility is also utilized in conducting research and development in the fields of atmospheric physics, astrophysics in radio, radar and meteor astronomy, upper air physics, rocket astronomy, solar spectroscopy, and cosmic radiation, etc.

310 13 CHEMISTRY AND TOXICOLOGY LABORATORY (SF)

The facility required to support the conducting of research, development, test and evaluation in the areas of physical, organic, inorganic, nuclear, and biological chemistry, directed towards problems concerning fuels, lubricants, corrosion, protective coatings, electrochemistry, submarine atmosphere purification, protection against biological and chemical warfare agents, polymers, molecular structure, etc., and related programs. This facility is further utilized to support the application of chemicals to explosives, propellants, pyrotechnics, etc., and the effects of the chemistry of the ocean as it affects acoustic absorption, sound speed, thermocline and water mass identification.

310 15 MATERIALS LABORATORY (SF)

This facility is used for research, development, test and evaluation of static, pneumatic non-destructive as well as destructive testing of components and assemblies for Navy weapons, vehicles, engines, ships and aircraft. Includes testing such as Zyglo, ultra violet light, sonic, X-ray, magna-flux and other techniques for accomplishing non-destructive testing of metals, plastics, etc.

This facility also supports research in the areas of physical, mechanical, chemical and structural metallurgy directed towards marine corrosion, high temperature flow and fracture mechanics, irradiation effects on metals, fracture-safe design, etc., and in developing materials for use in transducers, underwater structures, sensing devices, weapons ships and

aircraft. Also supports the synthesizing, modifying, fabricating and studying of metallic and nonmetallic materials such as plastics, rubber, adhesives, ceramics, resins, etc., but excluding explosives and propellants, with emphasis on resistance to unusual conditions such as high and low temperatures, stresses, aerodynamic heating, etc.

310 17 OPTICS LABORATORY (SF)

This facility is used in conducting research, development, test and evaluation programs in quantum optics, optical propagation, laser physics, optical materials and optical warfare. The facility is also used in efforts directed at discovering and understanding the basic physical principles and mechanisms involved in optical devices and phenomena.

310 19 PHYSICS LABORATORY (SF)

This facility is used in research, development, test and evaluation studies in the applied science of matter and energy. It includes research in such areas as acoustics, mechanics, light, thermodynamics, electromagnetism, atomic and nuclear physics, cryogenics, solid state physics, particle physics and plasma physics, etc.

310 21 RADIATION EFFECTS LABORATORY (SF)

This facility is used in conducting research, development, test and evaluation on radiation characteristics of various devices and their effect on performance of various systems in the air and in the ocean environment. The facility is also used in the study of effects of radiation on people and marine life (e.g., acoustic pollution, hearing damage, radioactivity, etc.) and the accomplishment of studies to determine reliable methods for detecting radiation sources.

310 23 COMBINED RESEARCH LABORATORY (SF)

This facility is used for research, development, test and evaluation of naval systems which utilized several of the sciences in a combined system applied directly to a Fleet problem-or area of RDT&E. It is also used to support research, development, test and evaluation of naval systems which do not logically fit the other categories of RDT&E.

310 25 BIOLOGICAL LABORATORY (SF)

This facility is used in research, development, test and evaluation in terrestrial and marine biology as related to structure capabilities, functioning habitat, health, growth environmental indicators, ecological relationships, etc., of living organisms and association of biological phenomenon to man's existence and operations in the land, ocean and space environment. Includes research in microbiology and environmental biology and the life process or characteristic phenomena of any group.

310 27 ENVIRONMENTAL LABORATORY (SF)

This facility is used to support the research, development, test and evaluation of instrumentation and computer systems for measurement and analysis of the evaluation of environmental effects on various equipment, weapons systems, facilities, etc. The principle thrust of research and development in this area is in the fields of mechanical shock, vibration, pressure, and in the natural environments of temperature, humidity, corrosion, etc. Also includes working mock-ups of environmental studies relating man to the test environment.

310 29 ANIMAL APPLICATIONS LABORATORY (SF)

This facility is used to support the research, development, test and evaluation on non-human animals in pure research and ocean support applications. This would include the use of whales, dolphins, etc., as trained deep sea divers, seals for shallow water tool recovery, dogs as sentries, etc. Includes research and development in application and knowledge of animal capabilities in sensing, homing, identification, etc., to improve the operation of man-made ocean devices. Provides veterinary medical support for marine mammal projects including applied research on diagnosis, treatment, surgery, husbandry and nutrition.

310 31 MEDICAL LABORATORY (SF)

This facility is used in conducting research toward methodology for diagnosis, treatment, or prevention of disease or damage to the body or mind.

310 33 COMPUTATION AND ANALYSIS LABORATORY (SF)

This facility supports research, development, test and evaluation in the areas of information processing and data handling, especially when concerned with identification of conditions responsible for given data configurations. Mathematical data analysis utilizing both digital and analog computers to research, develop, test and evaluate new naval systems from simulated and real time data.

310 37 OCEAN SCIENCES LABORATORY (SF)

This facility is used to accomplish research, development, test and evaluation in marine biosystems, environmental protection and management, development of analytical systems for evaluation of the ocean environment, studies of wave dynamics, current flow, thermoclines, chemical variances, bottom sampling, as well as development of new techniques and equipment to increase man's knowledge and utilization of the total ocean environment.

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311 AIRCRAFT

Buildings used directly in the research, development and testing of air frames and related assemblies and spares, and other aircraft equipment. Do not include aircraft or missile engines,

311 10 AIRCRAFT AND FLIGHT EQUIPMENT LABORATORY (SF)

This facility is utilized in conducting research, development, test and evaluation of aerodynamic design of aircraft and weapons systems to assure optimum flight performance, stability, and control characteristics and on airborne equipment. The facility is also used in conducting RDT&E in aerodynamic science in support of advanced aircraft and weapon concepts.

311 15 AIRCRAFT NAVIGATIONAL EQUIPMENT LABORATORY (SF)

This facility is used to support the research, development, testing and evaluation of aircraft navigation systems, and associated equipment. The facility is also an operating test facility for air navigation systems, equipment and component acceptance testing, design and performance analysis, and diagnostic and analytic evaluation to ensure proper system equipment and component function.

311 20 AIRCRAFT GROUND SUPPORT EQUIPMENT LABORATORY (SF)

This facility is used to research, development, test and evaluation of aircraft ground support equipment, systems and techniques for the takeoff, recovery, maintenance, and test of aircraft. The facility is used to test and evaluate ground support equipment for aircraft armament and weapons, aircraft handling, servicing and inspection equipment and aircraft avionics equipment. This does not include missile and missile system ground handling equipment.

311 25 AIRCRAFT SYSTEMS INTEGRATION LABORATORY (SF)

This facility is used for research, development, test and evaluation of various groupings and collections of interacting aircraft systems such as the effects of airframe, structure, flight control, electrical, environmental control, fuel, hydraulic, mechanical, pneumatic, propulsion, gun, life support and related ground support systems on ECM, air to air missile launch, etc. This does not include work on aircraft engine design characteristics.

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312 MISSILE AND SPACE

Buildings used directly in the research, development and testing of missiles, missile system, related ground handling, and launching equipment, and other aerospace equipment.

312 10 GUIDED MISSILE LABORATORY (SF)

This facility is used in support of research, development, test and evaluation of advance simulation, instrumentation, environmental test techniques and improved serviceability and reliability characteristics of guided missile weapon systems. Includes assembly, disassembly, test modification and analysis of test firing results of guided missiles, as well as RDT&E in determining advanced missile systems.

312 15 MISSILE NAVIGATIONAL EQUIPMENT LABORATORY (SF)

This facility supports research, development, test and evaluation of missile navigation systems and related equipment. Includes design and testing of guidance and control systems for guided missiles and launch and arming systems for ballistic missiles. Includes component testing, error diagnosis, and performance analysis as applied to missiles and missile systems.

312 20 MISSILE SUPPORT EQUIPMENT LABORATORY (SF)

This facility is used for research, development, test and evaluation of equipment and techniques for the launching, recovery, maintenance, transport and testing of missiles and guided missile support equipment.

312 25 SPACECRAFT/SATELLITE LABORATORY (SF)

This facility supports research, development, test and evaluation of spacecraft, satellites or components of each not otherwise classified as a missile weapon system. This facility would include related ground support/launching equipment.

312 30 MISSILE SYSTEMS INTEGRATION LABORATORY (SF)

This facility is used for research, development, test and evaluation of related and interconnected systems that are necessary for launching, etc., and in direct support of guided missile systems.

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313 SHIP AND MARINE EQUIPMENT

313 10 SHIP AND MARINE LABORATORY (SF)

This facility is used in conducting research, development, test and evaluation on ships, by use of models in high and low speed tow tanks, maneuvering and seakeeping basins, water tunnels, circulating water channels, fluid phenomenon basins, etc. The facility is also used in conducting fundamental and applied research related to the efficiency of ship structures, other marine vessels, including tracked amphibious vehicles, and the development of methods to assist the effect of static and dynamic loads imposed by submergence depth, wave and submarine structures.

313 15 SHIPS AND MARINE NAVIGATIONAL EQUIPMENT LABORATORY (SF)

This facility is used to support the research, development, test and evaluation of ship and other marine vessel navigational systems and related equipment. The facility is also an operating test facility for ship and marine vessel navigation systems, equipment and component acceptance testing, design and performance analysis and diagnostic and analytic evaluation to ensure proper system equipment and component function.

313 20 SHIPS AND MARINE EQUIPMENT LABORATORY (SF)

This facility is used to conduct research, development, test and evaluation of ships and marine support requirement. This includes repair and maintenance equipment as well as equipment for direct support and operation of ships and marine vessels such as periscopes, towed arrays, etc. It is further utilized to support the study of methods for designing shipboard and other marine equipment for resistance to service loads, attacks, and combat reliability.

313 25 SHIPS AND MARINE SYSTEMS INTEGRATION LABORATORY (SF)

This facility is used for research, development, test and evaluation of related and interconnected ships and marine systems such as the ship platform integrated with the weapons systems, communication systems, command and control systems, surveillance systems, navigation systems, etc. The facility would include mock-up facilities for establishing adaptability, compatibility and space requirements for both man and machine.

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314 TANK AND AUTOMOTIVE

314 10 GROUND TRANSPORTATION EQUIPMENT LABORATORY (SF)

This facility is used in conducting research, development, test and evaluation in the field of automotive design as applied to tanks, APC's, and related military automotive equipment.

314 15 OTHER GROUND EQUIPMENT LABORATORY (SF)

This facility is used in conducting research, development, test and evaluation in ground equipment in direct support of tank and automotive equipment such as power units, mobile maintenance, test equipment, heavy handling, lifting equipment, etc.

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315 WEAPONS AND WEAPON SYSTEMS

RDT&E facilities for guided missiles and related items are included under category code 312.

315 10 AIRCRAFT WEAPON SYSTEMS LABORATORY (SF)

This facility supports the research, development, test and evaluation of aircraft weapon systems including projectiles, mines and bombs, and defensive countermeasures devices/weapons.

315 15 SHIP WEAPON SYSTEM LABORATORY (SF)

This facility is used for research, development, test and evaluation of weapons and weapon systems deployed from a surface ship. This would include guns, fire control, etc. This does not include aircraft or missile systems.

315 20 UNDERWATER WEAPON SYSTEM LABORATORY (SF)

This facility is used for research, development, test and evaluation of undersea weaponry such as mines and torpedoes. This would include submarine mounted guns but not submarine launched missiles.

315 25 GROUND WEAPON SYSTEMS LABORATORY (SF)

This facility is used for research, development, test and evaluation of weaponry in use on or deployed from a ground base platform and would include small arms, automatic weapons, mortars, artillery, flame throwers, etc.

315 30 WEAPON SYSTEMS INTEGRATION LABORATORY (SF)

This facility is used to accomplish research, development, test and evaluation associated with the integration of weapon systems with the weapons platform and with other interfaces between other weapons systems, guidance systems, surveillance systems, etc., as may impact upon the weapons performance.

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316 AMMUNITION, EXPLOSIVES AND TOXICS

316 10 AMMUNITION, EXPLOSIVES AND TOXICS LABORATORY (SF)

This facility is used to support the research, development, test and evaluation of ammunition, rockets, bombs, mines, grenades, torpedoes, depth charges, demolition materials, pyrotechnics, AT0 units, related chemicals, etc., and their components and materials. Do not include facilities for guided missiles, guided bombs, or commercial type petroleum products.

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317 ELECTRONIC, COMMUNICATION AND ELECTRICAL EQUIPMENT

Buildings used directly in the research, development and testing or radio and radar equipment, signal equipment, radiation aids, electrical equipment and its controls, transmitting and receiving equipment, avionics equipment, sonar, and guided bombs.

317 10 COMMUNICATIONS SYSTEMS LABORATORY (SF)

This facility is used in conducting research, development, test and evaluation in the areas of radio communication, instrumentation, satellite communication, electromagnetic propagation, radio antennas, underwater sound systems, optical systems (infrared), etc.

317 15 DETECTION SYSTEMS LABORATORY (SF)

This facility is used in conducting research, development, test and evaluation in basic physical phenomena of importance to radar, sonar, and related sensors, also the development of systems analysis and evaluation of the sensors used in satellites, ships, submarines, and aircraft, etc. Includes surveillance for detection, localization, identification and classification of surface, aerospace and sub-surface objects.

317 20 ELECTRICAL AND ELECTRONICS SYSTEMS LABORATORY (SF)

This facility is used in conducting research, development, test and evaluation in the areas of electrical power and its control, magnetic fields and ship's control systems. Research in this area involves development of motors and generators, frequency converters, voltage and current control devices, and shipboard power distribution systems. In the magnetic fields, studies are conducted in the reduction of stray fields produced by naval equipment, methods of determining ship's magnetic signature and new concepts in degaussing systems.

This facility is also used in the fields of electronics and electromagnetic phenomena in support of components, subsystems, and systems in detection, communication, navigation, countermeasures, acoustics, electromagnetics, identification, classification, etc., as they apply to naval ordnance, submarine weapons systems, surface ships and aircrafts.

317 25 ELECTRICAL, ELECTRONICS AND COMMUNICATION SYSTEMS INTEGRATION LABORATORY (SF)

This facility is used to accomplish research, development, test and evaluation associated with the integration of related systems and subsystems of electrical, electronics and communications systems with the platform (air, sea, ground, etc.) upon which they will operate and to verify interface consideration with other systems operating on the respective platform.

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318 PROPULSION

318 10 PROPULSION SYSTEMS LABORATORY (SF)

This facility is used to support research, development, test and evaluation of propulsion systems in order to determine operational capabilities and in studying the acoustics and electromagnetic noise effects on performance and efficiency of drive units.

318 15 PROPULSION FUEL LABORATORY (SF)

This facility is used to support research, development, test, and evaluation of propulsion fuels in order to maximize a propulsion system's operational characteristics. This facility would also support investigation into new fuels and propulsive energy systems including controlled nuclear energy.

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319 MISCELLANEOUS ITEMS AND EQUIPMENT

319 10 MISCELLANEOUS EQUIPMENT AND ITEMS LABORATORY (SF)

This facility supports research, development, test, and evaluation of miscellaneous military equipment such as clothing, landing mats, valves (e.g., safety, pressure reducing, fuel regulating, globe, gate, etc.) hyperbaric facilities not appropriate in another category code, etc.

319 15 RDT&E STORAGE LABORATORY (SF)

This building is a storage facility for research, development, test, and evaluation equipment and materials directly related to RDT&E programs.

319 20 CIVIL ENGINEERING LABORATORY (SF)

This facility is used to support research, development, test and evaluation in the area of civil engineering. This would include military type bridging, hand tools, construction equipment, construction techniques, etc., on land, in and under the ocean.

319 25 HUMAN FACTORS LABORATORY (SF)

This facility is used to determine the effects of wartime atmosphere and material on military personnel and non-combatants. This facility would also deal with man-man interfacing (morale, command control, and the like) and man-machine interfacing (console design, payload design, work area requirements, etc.)

319 30 SURVIVAL EQUIPMENT AND CLOTHING LABORATORY (SF)

This facility supports research,,development, test and evaluation of pilot's and sailor's need for special equipment, clothing and techniques for survival in various hostile environments.

319 35 METROLOGY AND CALIBRATION LABORATORY

This facility will be used in direct support of research, development, test and evaluation programs where precise weights and measures are required in calibrating RDT&E equipment. This facility would include the metrology and calibration equipment and space for calibrating applicable equipment.

319 40 RANGE OPERATIONS AND INSTRUMENTATION LABORATORY (SF)

This facility is used in support of research, development, test and evaluation of range operations to include command center, communications, surveillance, instrumentation, data collection/reduction/display, etc.

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320 UNDERWATER EQUIPMENT

320 10 UNDERWATER EQUIPMENT LABORATORY (SF)

This facility is used in conducting research development, test and evaluation of underwater acoustics, ship vibrations and various types of underwater devices to increase man's capabilities in the ocean. The facility is also used to support RDT&E in hydro-acoustics, structural acoustics, mechanical vibration and signal processing, and conducting acoustic and vibration trials and instrumentation devices for sound and vibration attenuation, the RDT&E of deep ocean tools, equipment and work systems as well as support equipment for divers, submersibles and marine systems of all types.

320 15 UNDERWATER NAVIGATIONAL EQUIPMENT LABORATORY (SF)

This building supports the research, development, test and evaluation of undersea navigational systems and related equipment. This would include component design, error diagnosis, and performance analysis for location sensing, direction control, and depth control for undersea vessels. It would include devices for manned and unmanned vehicles as well as divers navigational equipment.

320 20 UNDERWATER SYSTEMS INTEGRATION LABORATORY (SF)

This facility will be used for research, development, test and evaluation of various interacting underwater systems, equipment, tools, techniques and operators working together in an underwater environment. The integration of several systems to accomplish a greater total effort will be accomplished in this facility.

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321 TECHNICAL SERVICES

321 10 TECHNICAL SERVICES LABORATORY (SF)

Buildings used directly in RD&T manufacturing of one-of-a-kind prototype models and parts for systems or subsystems from wood, plastic, fiberglass and other materials by molding, casting, extruding and machining.

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371 RANGE FACILITIES

Structures used directly in research, development and testing of small arms, artillery, weapons systems, avionics, protection equipment, shelters, etc.

371 10 SCIENCE SYSTEMS RANGE FACILITY (EA)

Facilities used in the conduct of tests and evaluations of items identified under category code 310.

371 11 AIRCRAFT SYSTEMS RANGE FACILITY (EA)

Facilities used in the conduct of tests and evaluations of items identified under category code 311.

371 12 MISSILE AND SPACE SYSTEMS RANGE FACILITY (EA)

Facilities used in the conduct of tests and evaluations of items identified under category code 312.

371 13 SHIPS AND MARINE SYSTEMS RANGE FACILITY (EA)

Facilities used in the conduct of tests and evaluations of items identified under category code 313.

371 14 TANK AND AUTOMOTIVE SYSTEMS RANGE FACILITY (EA)

Facilities used in the conduct of tests and evaluations of items identified under category code 314.

371 15 WEAPONS AND WEAPON SYSTEMS RANGE FACILITY (EA)

Facilities used in the conduct of tests and evaluations of items identified under category code 315.

371 16 AMMUNITION, EXPLOSIVES AND TOXICS RANGE FACILITY (EA)

Facilities used in the conduct of tests and evaluations of items identified under category code 316.

371 17 ELECTRONIC, COMMUNICATION AND ELECTRICAL SYSTEMS RANGE FACILITY (EA)

Facilities used in the conduct of tests and evaluations of items identified under category code 317.

371 18 PROPULSION SYSTEMS RANGE FACILITY (EA)

Facilities used in the conduct of tests and evaluations of items identified under category code 318.

371 19 MISCELLANEOUS ITEMS AND EQUIPMENT RANGE FACILITY (EA)

Facilities used in the conduct of tests and evaluations of items identified under category code 319.

371 20 UNDERWATER SYSTEMS RANGE FACILITY (EA)

Facilities used in the conduct of tests and evaluations of items identified under category code 320.

390 RDT&E OTHER THAN BUILDINGS AND RANGE FACILITIES

Scientific structures and facilities other than buildings used directly in theoretical or applied research, development, and test operations related to such items as test tracks, wind tunnels, etc. Do not include structures and buildings used for normal maintenance, repair, and overhaul purposes.

390 10 SCIENCE SYSTEMS FACILITY (EA)

Facilities used in the conduct of research, development, test and evaluation of items identified under category code 310.

390 11 AIRCRAFT SYSTEMS FACILITY (EA)

Facilities used in the conduct of research, development, test and evaluation of items identified under category code 311.

390 12 MISSILE AND SPACE SYSTEMS FACILITY (EA)

Facilities used in the conduct of research, development, test and evaluation of items identified under category code 312.

390 13 SHIPS AND MARINE SYSTEMS FACILITY (EA)

Facilities used in the conduct of research, development, test and evaluation of items identified under category code 313.

390 14 TANK AND AUTOMOTIVE SYSTEMS FACILITY (EA)

Facilities used in the conduct of research, development, test and evaluation of items identified under category code 314.

390 15 WEAPONS AND WEAPONS SYSTEMS FACILITY (EA)

Facilities used in the conduct of research, development, test and evaluation of items identified under category code 315.

396 16 AMMUNITION, EXPLOSIVES AND TOXICS FACILITY (EA)

Facilities used in the conduct of research, development, test and evaluation of items identified under category code 316.

390 17 ELECTRONIC, COMMUNICATION AND ELECTRICAL SYSTEMS FACILITY (EA)

Facilities used in the conduct of research, development, test and evaluation of items identified under category code 317.

390 18 PROPULSION SYSTEMS FACILITY (EA)

Facilities used in the conduct of research, development, test and evaluation of items identified under category code 318.

390 19 MISCELLANEOUS ITEMS AND EQUIPMENT FACILITY (EA)

Facilities used in the conduct of research, development, test and evaluation of items identified under category code 319.

390 20 UNDERWATER SYSTEMS FACILITY (EA)

Facilities used in the conduct of research, development, test and evaluation of items identified under category code 320.

SECTION 4

FACILITY CLASS 400 - SUPPLY FACILITIES

The planning information under this facility class is provided in three distinct supply groupings:

410 LIQUID STORAGE FUEL AND NONPROPELLANTS

This group covers bulk tanks and associated equipment for liquid fuel storage and storage for liquids other than water, fuel and propellants.

420 AMMUNITION STORAGE

This group covers magazines, specialized warehouses, tanks and open pads for storage of ammunition, inert ammunition components, liquid propellants and weapon-related batteries.

430, 440, 450 GENERAL SUPPLY FACILITIES

These category groups consist of the following types of storage facilities:

(a) Refrigerated (cold) storage
(b) General purpose warehouse
(c) Specific purpose warehouse
(d) Controlled humidity warehouse
(e) Hazardous and flammable storehouses
(f) Shed storage
(g) Underground storage
(h) Open storage

See "Storage and Warehouse Planning Guidelines", page 440-3, for criteria in determining space requirements for these storage facilities.

BASIC FACILITIES REQUIREMENTS (BFR):

The Supply Facility Management Report (SFMR) is the principal source document for all pertinent BFR's having supply facilities under the cognizance of a supply officer. The data provided by the SFMR relates directly to the planning factors and criteria for category code series 420, 430, 440 and 450. However, the supply space reported under the "77" series is not included in this document. This report is prepared on a cyclic/situation basis under the direction of the Naval Supply Systems Command by all Navy and Marine Corps storage activities having 20,000 or more gross square feet of covered Ammunition and/or General Supply Storage Facilities (Category Groups 420, 430, and 440). It is prepared at the activity level, submitted to NAVSUPSYSCOM for review and approval and then forwarded to NAVFACENGCOM for inclusion into the appropriate activity's BFR. See Section 440B of this document for additional guidance.

UNIQUE STORAGE CONSIDERATIONS:

(a) Storage of Gas Bottle Cylinders and Drummed POL. When planning facility requirements for flammables/hazardous materials, be certain that bottle gas cylinders and drummed petroleum, oils and lubricants (POL) are not planned for storage in flammables/hazardous warehouses. These items should be planned for storage in shed space. If POL drums have been hot dip galvanized for protection, they may be planned for storage in open storage facilities. DOD Regulation 4145.19-R-1, "Storage and Materials handling" should be used for guidance in providing the appropriate types of storage facilities for materials to be stored.

(b) Administration Space in High Rise Warehouse. Administration space that is not directly involved in the day to day operation of the warehouse should be classified as category code 610-10.

The mezzanine area over the loading/unloading portion of high rise warehouses often becomes suitable for such purposes and should not be classified as part of the storage code.

(c) Storage of Farinaceous and High Acid Food Products. These food products are properly stored in an environment where the temperature is between 50 and 70 degrees fahrenheit. A cold storage warehouse will be required to provide chill storage at those activities where climatic conditions preclude the use of a general purpose warehouse. However, formal written approval must be obtained by the activity from COMNAVSUPSYSCOM, Navy Warehouse Utilization Program Manager, prior to establishing a deficiency and requirement for chill storage in lieu of general purpose storage. This request/approval procedure will permit revising the SFMR to reflect this requirement and provide the required justification.

Facility planners will ensure that the data inputs to the Integrated Cube Storage Space Reporting System (as delineated by NAVSUPINST 4450.22) are compatible with the corresponding inputs to the Shore Facilities Planning System (as delineated by NAVFACINST 11010.44 or 11010.12A).

TECHNICAL AND OPERATIONAL ADVICE FOR CNO COMMANDED ACTIVITIES

This information can be obtained as follows:

Naval Supply Systems Command (NFMS/SUP40) - Bulk Fuels
Naval Sea Systems Command (SEA 04511) - Ammunition
Naval Supply Systems Command (SUP 0621) - General supply

Commandant of the Marine Corps (CMC) commanded activities may obtain technical and operational advice from the cognizant CMC department.

410 LIQUID STORAGE - FUEL AND NONPROPELLANTS

Liquid storage utilizes bulk tanks and associated stationary equipment for:

1. Liquid fuel storage
2. Liquid storage other than water, fuel and propellants

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411 LIQUID FUEL STORAGE - BULK

1. General Storage Requirements. The types and sizes of storage tanks required for depot storage facilities will be determined by safety considerations, the availability of commercial facilities, and intended services. Depot fuel storage facilities must be of sufficient capacity to provide an adequate operating and reserve supply of fuel for the activities served. The different types of fuel in storage will be segregated, and in the larger installations, the tanks will be separated into two or more subgroups.

2. Site Planning. Fuel storage facilities should be located on gently rolling terrain. A site with an elevation slightly above that of the facilities to be served, is preferred for both the aboveground and underground storage. Where military or safety considerations govern, tanks should be placed underground. Aboveground tank spacing will be staggered as much as possible to minimize alignment, to aid concealment, and to provide maximum protection from enemy attack.

3. Quantities. The quantities of petroleum products to be stored are based on the total requirements of the activities served. Bulk storage may be as much as 1,000,000 barrels in a large fuel depot or facility designed for a reserve supply.

For planning purposes the capacities of individual tanks should be approximately 25 percent of the ultimate storage for each type of fuel, subject to the following:

1. The minimum capacity of a tank for fuel depot bulk storage shall not be less than:
   (a) Diesel oil -- 13,500 barrels
   (b) Fuel oil -- 27,000 barrels
2. The maximum capacity of an individual tank for bulk storage shall normally be limited to 100,000 barrels. (The barrel is the standard 42 U.S. gallon capacity.)
3. A minimum of two tanks will be provided for each type of fuel. One will serve as the working tank and the other the receiving tank for new deliveries.
4. The time necessary for impurities in MoGas, AvGas and jet fuels to settle prior to the use of these fuels will be a factor in determining the size and number of tanks required for bulk storage. Allow a minimum settling time of two hours.

The planning information contained in Basic Category 411 pertains to the bulk storage of fuel oils and lubricants in the following codes:

Code 411 10	Ship Fuel Storage
Code 411 20	Aviation Gasoline Storage
Code 411 30	Diesel Fuel Storage
Code 411 40	Motor Gasoline Storage
Code 411 50	Jet Engine Fuel Storage
Code 411 60	Liquefied Petroleum Fuel Gas Storage
Code 411 70	Vapor Collection/Recovery System
Code 411 82	Contaminated Fuel Storage
Code 411 84	Bulk (Depot) Heating Fuel Storage

Codes 411 10 through 411 50 (BL). The fuel products in these codes may be stored in bulk quantities and will be protected as indicated in Basic Category 411, Liquid Fuel Storage--Bulk. Plans for the bulk storage will include only those fuel products required by an activity to perform its assigned mission, plus a specified reserve supply.

The maximum capacities for the aboveground storage tanks and the safety spacing distances for both the aboveground and the underground storage tanks for these fuel products are shown in Basic Category 124, herein. The capacities and uses for the underground storage tanks for these fuel products are shown in Tables 411-l and 411-2.

Codes 411 60 through 411 84 (BL). Planning information pertinent to the storage and handling of liquefied petroleum gases, contaminated, and heating fuel is as follows:

411 60 LIQUEFIED PETROLEUM FUEL GAS STORAGE (BL)

The Navy uses liquefied petroleum gas, commonly known as LPG, for heating, metal cutting, brazing, in dental laboratories, aboard ships, and in similar installations. LPG consists predominantly of propane, propylene, with minor amounts of butane, isobutane, and butylene. LPG is normally supplied in 100-pound cylinders or may be procured by tank car or tank truck for bulk storage. The bulk storage capacity requirements for LPG depends on activity requirements, frequency of deliveries, and dependability of supply. A multi-tank system should be considered because it provides for a more dependable supply. For aboveground storage of up to 30,000 gallons of LPG tank capacity, or at locations where underground storage is required or is economically desirable, use horizontal steel tanks. For bulk storage requiring over 30,000 gallons tank capacity, use spherical or spheroidal steel tanks. For design information pertaining to storage tanks, see Mechanical Engineering, NAVFAC DM-3; for berms and accessory piping, see Liquid Fueling and Dispensing Facilities, NAVFAC DM-22; and for fire protection and fire fighting, see Fire Protection Engineering, NAVFAC DM-8.

411 70 VAPOR COLLECTION/RECOVERY SYSTEM (EA)

The vapor collection and recovery system is used to eliminate continued vapor emissions to the atmosphere during AVGAS and MOGAS storage and transfer operations. This facility is usually constructed in order to comply with local county air pollution control requirements. No criteria is currently available.

TABLE 411-1
Underground Fuel Storage Tanks, Vertical, Steel
(Sizes and Uses)

Capacity (bbl)	Diameter (ft)	Height (ft)	Normal Use
5,000	53-1/2	13	Aviation gas
7,500	65	13	Aviation gas
13,500	88	13	Fuel oil
13,500	88	13	Diesel
13,500	88	13	Aviation gas
13,500	88	13	Jet
27,000	100	20	Fuel Oil
27,000	100	20	Diesel
27,000	100	20	Jet
27,000	100	20	Ship fuel
50,000	122	24	Ship & Jet fuel

TABLE 411-2
Underground Fuel Storage Tanks, Vertical, Concrete
(Sizes and Uses)

Circular Tanks				
Capacity	Type	Diameter (ft. in.)	Height (ft. in.)	Normal Use
Gallon				
25,000	N	24	8	Fuel oil or gas
25,000	P	24	8	Aviation gas
50,000	N	33	8	Aviation gas
100,000	P	42	10	Aviation gas
250,000	P	56	13-6	Aviation gas
Barrel				
13,500	P	88	13	Fuel oil
13,500	P	88	13	Diesel
13,500	P	88	13	Aviation gas
13,500	P	88	13	Motor gas
27,000	P	99-6	20-2	Fuel oil
27,000	P	99-6	20-2	Diesel
27,000	P	99-6	20-2	Jet
27,000	P	99-6	20-2	Ship fuel
50,000	P	134-8	20	Fuel oil
50,000	P	134-8	20	Diesel
50,000	P	134-8	20	Jet fuel
50,000	P	134-8	20	Ship fuel

Table continued on next page

TABLE 411-2 (Continued)
Underground Fuel Storage Tanks, Vertical, Concrete
(Sizes and Uses)

Rectangular Tanks					
Capacity (gal)	Type	Length (ft.)	Width (ft.)	Height (ft.)	Normal Use
5,000	N	14	7	7	Fuel oil and diesel
10,000	N	20	10	7	Fuel oil and diesel

Note: Dimensions are internal.
P = Prestressed
N = Non prestressed

411 82 CONTAMINATED FUEL STORAGE (BL)

A fuel storage facility requires temporary storage for off-specification (contaminated fuel). Separate installations may be required for each major type of fuel. For details of renovation tanks and equipment see Liquid Fueling and Dispensing Facilities, NAVFAC DM-22.

411 84 BULK (DEPOT) HEATING FUEL STORAGE (BL)

Heating fuel oil storage may include storage tanks for kerosene and several different grades of diesel oil. The quantity of any type of heating fuel oil stored will be determined by the station requirements and mission. See Structural Engineering, NAVFAC DM-2 and Liquid Fueling and Dispensing Facilities. NAVFAC DM-22.

TABLE 411-3
ABOVEGROUND VERTICAL STEEL
STORAGE TANKS (SIZES)

COLUMN A Capacity in Barrels	(U.S. Standard) Tank Dimensions In Feet		COLUMN B Capacity in Cubic Meters	(Metric Standard) Tank Dimensions (Meters)	
	Diameter	Height		Diameter	Height
5,020	33.6	32	799	10.21	9.75
5,040	30.0	40	801	9.14	12.19
5,480	35.0	32	872	10.67	9.75
6,020	36.8	32	957	11.18	9.75
6,040	30.0	48	961	9.14	14.63
6,860	35.0	40	1,090	10.67	12.19
7,160	40.0	32	1,139	12.19	9.75
7,520	36.8	40	1,196	11.18	12.19
8,950	40.0	40	1,423	12.19	12.19
10,110	42.6	40	1,607	12.95	12.19
10,310	48.0	32	1,640	14.63	9.75
11,330	45.0	40	1,801	13.72	12.19
12,110	52.0	32	1,928	12.95	14.63
12,130	42.6	48	1,924	15.85	9.75
12,890	48.0	40	2,050	14.63	12.19
13,600	45.0	48	2,162	13.72	14.63
13,990	50.0	40	2,224	15.24	12.19
15,060	58.0	32	2,394	17.68	9.75
15,130	52.0	40	2,405	15.85	12.19
15,470	48.0	48	2,460	14.63	14.63
16,790	50.0	48	2,669	15.24	14.63
20,150	60.0	40	3,203	18.29	12.19
24,170	60.0	48	3,843	18.29	14.63
25,120	67.0	40	3,993	20.42	12.19
27,420	70.0	40	4,359	21.34	12.19
30,090	73.4	40	4,784	22.35	12.19
30,140	67.0	48	4,792	20.42	14.63
32,900	70.0	48	5,231	21.34	14.63
35,810	80.0	40	5,693	24.38	12.19
40,430	85.0	40	6,427	25.91	12.19

(Continued)

TABLE 411-3 (Continued)
ABOVEGROUND VERTICAL STEEL
STORAGE TANKS (SIZES)

COLUMN A Capacity in Barrels	(U.S. Standard) Tank Dimensions In Feet		COLUMN B Capacity in Cubic Meters	(Metric Standard) Tank Dimensions (Meters)	
	Diameter	Height		Diameter	Height
42,970	80.0	48	6,832	24.38	14.63
44,760	100.0	32	7,117	30.48	9.75
45,320	90.0	40	7,206	27.43	12.19
50,130	80.0	56	7,971	24.38	17.07
54,390	90.0	48	8,647	27.43	14.63
54,160	110.0	32	8,611	33.53	9.75
55,950	100.0	40	8,896	30.48	12.19
67,140	100.0	48	10,675	30.48	14.63
67,700	110.0	40	10,764	33.53	12.19
78,340	100.0	56	12,454	30.48	17.07
80,570	120.0	40	12,810	36.58	12.19
81,250	110.0	48	12,917	33.53	14.63
96,690	120.0	48	15,372	36.58	14.63
100,470	134.0	40	15,974	40.84	12.19
109,670	140.0	40	17,436	42.67	12.19
112,800	120.0	56	17,934	36.58	17.07
120,570	134.0	48	19,168	40.84	14.63
125,900	150.0	40	20,016	45.72	12.19
131,600	140.0	48	20,923	42.67	14.63
143,240	160.0	40	22,774	48.77	12.19
151,080	150.0	48	24,019	45.72	14.63
153,540	140.0	56	24,411	42.67	17.07
171,890	160.0	48	27,329	48.77	14.63
181,290	180.0	40	28,823	54.86	12.19
200,540	160.0	56	31,883	48.77	17.08
217,550	180.0	48	34,588	54.86	14.63
223,820	200.0	40	35,584	60.96	12.19
253,810	180.00	56	40,352	54.86	17.07
268,580	200.0	48	42,701	60.96	14.63
313,340	200.0	56	49,818	60.96	17.07

(Continued)

TABLE 411-3 (Continued)
ABOVEGROUND VERTICAL STEEL
STORAGE TANKS (SIZES)

COLUMN A Capacity in Barrels	(U.S. Standard) Tank Dimensions In Feet		COLUMN B Capacity in Cubic Meters	(Metric Standard) Tank Dimensions (Meters)	
	Diameter	Height		Diameter	Height
324,980	220.0	48	51,668	67.06	14.63
379,140	220.0	56	60,279	67.06	17.07
386,750	240.0	48	61,489	73.15	14.63
451,210	240.0	56	71,737	73.15	17.07
453,900	260.0	48	72,164	79.25	14.63
526,420	280.0	48	83,694	85.34	14.63
529,550	260.0	56	84,192	79.25	17.07
604,300	300.0	48	96,077	91.44	14.63
614,150	280.0	56	97,642	85.34	17.07
672,500	293.0	56	106,920	89.31	17.07
687,560	320.0	48	109,314	97.54	14.63
750,020	300.0	56	112,090	91.44	17.07
776,190	340.0	48	123,405	103.63	14.63
789,950	343.0	48	125,593	104.55	14.63

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412 LIQUID STORAGE OTHER THAN WATER, FUEL, AND PROPELLANTS

This group includes tank storage, accessories and piping for organic liquids such as cottonseed, linseed or soybean oils and other non-fuel liquids. The individual codes in this group are:

412 15	Road Oil Storage (GA)
412 25	Lubricant Storage (GA)
412 35	Ballast and Sludge Storage (GA)
412 40	Organic Oil Storage (GA)
412 45	Miscellaneous Liquid Storage (GA)
412 50	Industrial/POL Waste Storage Facility (GA)

No specific planning factors for these codes are currently available.

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420 AMMUNITION STORAGE

Ammunition storage utilizes magazines, general purpose and refrigerated storehouses, tanks, open storage pads and associated stationary equipment for storage of Ammunition, Inert Ammunition Components, Liquid Propellants and Weapon-Related Batteries.

Category groups pertaining to these facilities are as follows:

Code 421 Ammunition Storage at Weapons and Other Stations (Tables 420-l thru 420-19)
Code 423 Ammunition Storage - Liquid Propellants (Tables 420-20 thru 420-25)
Code 424 Weapon-Related Battery Storage
Code 425 Open Ammunition Storage

1. GENERAL STORAGE REQUIREMENTS. Ammunition and bulk explosives should be stored in magazines of approved design, sited and designated for specific purposes. The type and amount of material that may be stored in any magazine is dependent on the quantity-distance requirements and permissible storages as established by the Department of Defense Explosives Safety Board (DDESB) and as approved by the Naval Sea Systems Command. These safety distance requirements are designed to provide the inhabitants of nearby communities, military personnel, and adjacent public and private property reasonable safety from injury or destruction from possible fires or explosions, and to keep to a minimum the loss of valuable ammunition stores through fire or explosions.

2. MAGAZINE AREA. The magazine area is the area surrounding a magazine or group of magazines, where personnel movements are restricted in the interest of safety. Magazines must be sufficiently remote from inhabited buildings, passenger railroads, and public highways, including navigable waters, so that the dangers and risks involved in storing explosives and ammunition are confined primarily to the magazine area. In order to insure this safety zone the Department of Defense Explosive Safety Board has spacing criteria for magazines, based on the type of hazard involved and the quantity of explosives stored. See Naval Sea Systems Command Publication NAVSEA OP-5 Volume 1 (current revision) for Quantity-Distance Requirements. In the case of existing facilities, spacing criteria may limit the amount of explosives stored in a magazine to less than full capacity. In addition, limits have been set on the maximum amount of explosives that can be stored in certain types of magazines. This information is listed in the category code descriptions.

3. SEGREGATION OF MATERIALS. The dangers or hazards involved in the storage of ammunition or explosives are not measured solely by the quantity of explosives stored, but also by its sensitivity - explosives that present similar hazards may generally be stored together.

Tables showing compatibility relationships can be found in the Naval Sea Systems Command Publication OP-5, Vol. II (current revision).

4. WEIGHT MEASUREMENT. Two systems of weight measurement are significant in planning for ammunition storage:

(a) Net Explosive Weight. (hereafter referred to as NEW). This is the weight of explosive material, and is measured in pounds. In items of ammunition with a high explosive main charge, fuses containing ignition explosives, and a propelling charge of smokeless powder, the NEW is calculated in accordance with NAVSEA OP-5 Vol. I, Chapter 5. It is the net explosive weight in a stow of ammunition or bulk explosives that is used in application of explosive safety quantity-distance (ESQD) tables.

(b) Gross Explosive Weight. The gross explosive weight of an item of ammunition, bomb, rocket, etc., is the total weight of the packaged round and is measured in short tons or pounds when quantities are fractional tons. Packaging may vary, therefore, planning factors, too, may vary slightly in published data. Attention must be given to the unit of measure as long tons and measurement tons may be used by other services and in ship loading.

5. PLANNING FACTORS. Planning factors, where available, are listed under the appropriate category code number. All planning factors in the 421 category code are given in terms of net area which is the nominal inside area of a structure. The planning factors listed are average figures based on large volumes of explosives of variable composition. Where a facility has a small amount of ammunition storage or a limited diversity in types of ammunition, the planning factors may give inaccurate results. Under these circumstances, planning factors may be developed in the field. Naval Sea Systems Weapons Requirement WR Series contain data listing size and weight of ammunition in storage containers, and may be useful in developing planning factors. Only the magazine space that can be utilized without exceeding the explosive limit shall be considered when evaluating existing magazines for planning purposes. Caution must be exercised in the planning process because Real Property Inventory and Shore Facilities Planning System (SFPS) documentation will show the actual facility asset quantities.

6. APPROVED BASIC STOCK LEVEL OF AMMUNITION (ABSLA) is a document prepared by the Naval Sea Systems Command, Code NSEA 04511, for major ammunition stock points, such as torpedo stations, weapon stations, etc., and secondary stock points such as naval stations, naval air stations, etc. The quantity of ammunition detailed within this document constitutes the ABSLA for a particular activity, and is compiled in accordance with the guidance set-forth in OPNAVINST C 8010.12C. In addition to this instruction, guidance is also provided by the current CINCPACFLT, CINCLANTFLT and or CINCUSNAVEVR Non-Nuclear Ammunition Distribution Plan, whichever is applicable to the activity.

Ammunition storage capacity in the activity's ABSLA is tabulated in terms of standard equivalents and is based on a comparison of the actual floor area with a standard square footage developed for each magazine type: High explosive magazine type A, 25' x 80'; smokeless powder and projectile magazine type L/P, 50' x 100'; fuse and detonator magazine type F, 25' x 20'; and inert storehouse type SH, 50' x 200'. See NAVSEA OP-5 Vol. I, Chapter 6. The starage capacity analysis in the ABSLA is based on generalized planning factors. Actual capacity is dependent upon the mix of ammunition on hand and the locally developed storage plan which must consider hazard classes of ammunition, compatibility, quantity distance constraints, type of stow utilized and other local patterns of operations. Storage requirements for the items included in the ABSLA are computed utilizing the definition for access stow, i.e.; every

pallet accessible for observation and every stack attainable with a fork lift truck after moving not more than three other stacks of pallets. Twenty percent of the net storage space is allocated for aisles, explosives compatibility, lot control, etc., coastal POE or tidewater activities due to periods of volume transactions of ammunition which require additional "elbow room". This space allowance allows for constant turnover and restorage operations inherent in ammunition handling which makes the utilization of the full space of the magazines unattainable as a practical matter. This analysis assumes that bombs and mines are "JAM", or maximum stowed versus access stow. The space utilization factors used in the ABSLA should be considered upper limits of utilization.

The ABSLA for a specific activity provides the following information for the storage of non-nuclear ammunition:

a. Amount and type of ammunition to be stored.
b. Type of magazines used for storage: high explosive, smokeless powder and projectile, fuze and detonator and inert storehouse.
c. Theoretical number of magazines required for each type.
d. Magazines available for each type.
e. Net magazine space for each type of magazine that is available after 10% - 20% has been deducted. Percentage of availability depends upon mission of activity.
f. Excess/Deficit (net available facilities minus total facilities required) requirements for each type of magazine.

Stow factors can be developed for H.E. munitions in H.E. magazines, SP&P munitions in SP&P magazines; etc., which express in percent utilization of the net magazine space, or tons/sq. ft. or other factors. For example, the Indian Island ABLSA, less bombs and missiles, has a density of 51.4 lbs/cu.ft., i.e., S/T ratio, M/T is 1.03 which is commensurate with shiploading experience. Inert material density is 35.2 lbs/cu.ft.

Definitions:

a. Gross storage space - outside dimensional area of storage structure.
b. Net storage space - inside dimensional area of storage structure.
c. Available storage space - net space X factor which allows for handling room, stow configuration, aisles, etc. Factor varies from 0.4 to 0.75.

Reports of utilization of magazines should compare available storage space with actual stow. However, in reporting un-utilized space, care must be taken not to add fractional magazines of different or non-compatible ammunition. Missile magazine utilization should be based upon area rather than volume since stack heights are controlled and the void above a missile stack is not available space.

7. SPACE UTILIZATION. Utilization of igloo and magazine space will seek optimum occupancy level of 90 percent of net storage space available when such occupancy is not in conflict with regulatory directives concerning compatibility and safety distances. However, in performing fleet service operations at coastal weapons stations, magazine net space utilization factors of 25% to 60% may be considered good. Comparable cube efficiency would be 58% for inert

material stows in SH structures. An average density of ammunition can be computed from the ABSLA applicable to a given ammo storage facility and planning factors (sq.ft./ton) determined. A density of 64.2 lbs/cubic ft is representative of gun ammunition carried as cargo by AE/AOE ships. A useful storage factor thus derived is: 8.5 to 11 square feet per ton per standard size magazine for SP&P type material. Additionally, ammunition storage space occupancy will attain the following storage densities:

(1) Conventional ammunition - 10 square feet of gross storage space per short ton.

(2) Special munitions - 10 square feet of net storage space per short ton.

(3) Chemical, biological and radiological munitions - 29 square feet of gross storage space per short ton.

(4) Guided missiles and large rockets - 26 square feet of gross storage space per short ton.

8. TYPES OF MAGAZINES. In the past, a distinction was made between depot and installation magazine storage requirements. At most ammunition activities, with a combined depot and installations mission, the ammunition stored in sup port of such dual missions was commingled and stored in the same magazines in a single location. Consequently, it was usually difficult to feasibly separate the two functions for inventory and evaluation of existing facilities purpose. Therefore the 422 Basic Category series has been discontinued and all ammunition magazines and storehouses in the 420 category group will be classified under Basic Category 421.

9. CONTAINERIZED AMMUNITION. Implementation of directives for containr erizing ammunition for shipment is now underway at certain ordnance activities, initially at coastal POE's. For these activities, new category codes and planning factors have been developed to facilitate proper identification and sizing of the facilities that are in support of containerized ammunition shipments. The following new category codes and planning factors are established for handling of ammunition by containers. As warranted, additional category codes and planning factors will be developed.

149 82	Container Holding Yard (Loaded)
149 83	Container Transfer Facility
149 84	Rail/Truck Receiving Station
151 70	Ordnance Container Handling Pier
152 70	Ordnance Container Handling Pier
153 30	Container Stuffing Building
218 10	Container Repair and Test Building
425 20	Container Holding Yard (Empty)
860 20	Explosive Barricade for Suspect Trucks and Railroad Cars

10. QUANTITY-DISTANCE REQUIREMENTS. See Naval Sea Systems Command publication NAVSEA OP-5, Volume 1 (current revision) for quantity-distance requirements.

421 AMMUNITION STORAGE DEPOT AND INSTALLATION

Ammunition storage utilizes magazines or other suitable structures to store ammunition for the ultimate user's logistic flexibility at an activity. Planning factors are provided for the following types of ammunition storage facilities:

421 12	Fuze and Detonator Magazine
421 22	High Explosive Magazine
421 32	Inert Storehouse
421 35	Ready Magazine
421 42	Smokedrum Storehouse
421 48	Small Arms/Pyrotechnic Magazine
421 52	Smokeless Powder Projectile Magazine
421 62	Special Weapons Magazine
421 72	Missile Magazine

421 12 FUZE AND DETONATOR MAGAZINE (SF)

Primers, fuzes, detonators, and boosters of all types are stored in fuze and detonator magazines. These magazines are of three types:

(1) 10' x 14' box-type, earth covered and barricaded. 15,000 lbs NEW Type H.

(2) 25' x 20' arch-type, earth covered. 70,000 lbs NEW Type F.

A planning factor of 7.9 SF net storage space per short ton gross weight of explosives may be used for storage or tidewater activities, provided the conditions are as stated in paragraph 5, under general narrative for basis Category Group 420. Planning for installation storage is done on an individual activity basis with space requirements being determined from the particular components to be stored at an activity. In the absence of adequate data the total area of installation fuze and detonator magazines can be planned as between 4 and 6% of the total area of high explosive magazines at the activity.

421 22 HIGH EXPLOSIVE MAGAZINE (SF)

A high-explosive magazine is used for the storage of mass-detonating explosives. Bomb, warheads, naval mines, demolition charges are examples of munitions generally stored in high explosive magazines. Types of magazines commonly found at coastal depots are:

(1) 25' x 80' arch-type, earth covered and barricaded. 500,000 lbs NEW Type A.

(2) 39' x 44' and 32' and 44' box-type, earth covered and barricaded. 500,000 lbs NEW Type W. Especially developed for torpedo storage in racks.

(3) 25' x 50' arch-type, earth covered and barricaded. 250,000 lbs NEW Type B.

A planning factor of 7 square feet net storage space per ton gross weight of ammunition may be used.

421 32 INERT STOREHOUSE (SF)

Storehouses for inert material are usually 50 x 200 ft. or 106 x 204 ft. or multiples of these basic dimensions, and are similar to commercial warehouses. These storehouses are used for the storage of such nonexplosive items as bomb tails, machine gun links, empty cartridge cases, and packing materials. Although the height of stowage in these storehouses depends on the type materials, the average stacking height is about 10 feet. Storage space available for storage will meet a minimum criteria of 60 percent of net storage space used for storage operations. The net storage capacity of the 50 x 200 ft. storehouse is approximately 60,000 cubic feet.

For planning of installation inert storehouses use only the 50 x 200 ft. storehouse.

421 35 READY MAGAZINE (SF)

This category code and nomenclature encompasses three specific types of magazines whose requirements are determined by the function performed. The three types of magazines within this category code are identified as:

(a) Ready Service Magazine: When shore establishments require certain types of ammunition to be stored in a ready service condition, in order to reduce the arming time, the ammunition may be stored in designated Ready Service Magazines. This facility is usually located at an air station and is used to hold ammunition and/or weapons that are built up from a storage configuration ready for arming an aircraft, or to receive for temporary storage, ammunition and/or weapons from aborted aircraft. The average utilization of available floor space is traditionally 40 percent since the material stored is varied and not packaged for storage. A planning factor of 40 square feet of net storage space per ton of gross weight of ammunition is used for this type of magazine. A 12' x 17' box-type magazine is suit able for performing this function.

(b) Ready Service Locker: This type of magazine is generally used to store small quantities of belted or boxed small-arms ammunition, certain pyrotechnics, and similar fire, no blast hazard material. It is not practical to derive a meaningful square foot per ton planning factor for the material that might temporarily be stored in this facility. However, a 6' x 8' Keyport magazine is quite suitable to perform this function and has the added benefit of being able to be secured. Historical data should be used to determine the number of these facilities required which is not only dependent upon the amount of explosives stored but also the compatibility of the explosives themselves.

(c) Special Service Magazine: This type of magazine is provided in or near such facilities as loading plants, filling houses, weapon assembly buildings, ammunition maintenance buildings and Weapon Quality Evaluation Laboratories. The magazine can be a special size and construction, depending upon the material(s) stored therein. However, a 6' x 8' Keyport magazine has been found to be most suitable for this application. The need to provide segregation of non-compatible, open explosives frequently gives rise to a requirement for separate magazine structures, irrespective of any loading factor. Consequently, no meaningful planning factor relating to square feet to a quantity of ammunition are available for this type of magazine. Historical data should be used to determine the number of these facilities required which is dependent upon both the amount of explosives stored and the compatibility of the explosives themselves.

421 42 SMOKEDRUM STOREHOUSE (SF)

Chemical and smoke mixtures are stored separately in fire-hazard type magazines or in buildings especially designed for such storage. Drums of smoke mixture may be stored in surface buildings with special racks for support, and overhead equipment for handling. Smokedrums storehouses are of the sizes and capacities shown in Table 421-42.

TABLE 421-42
Smokedrum Storehouses

Size Number	Capacity (DRUM)	Approximate Bldg Dimensions in Feet				
		W		L		H
1	120	25	X	17	X	14
2	240	25	X	34	x	14
3	360	25	X	51	X	14
4	480	25	X	58	X	14

For more than 480 drums, two or more buildings should be provided. For a typical smokedrum storehouse, see Definitive Designs, NAVFAC P-272.

421 48 SMALL ARMS/PYROTECHNICS MAGAZINE (SF)

This structure may be used to store Class 1 Division 3 and 4 ammunition. This type of magazine may vary considerably in size and description. The standard earth-covered concrete arch magazine without barricade and the non-earth covered two compartment magazine are commonly used for this purpose. If the land area is limited and there is a large requirement for small arms/pyrotechnics storage space, the large triple arch magazine may be used. The triple and standard arch-type magazines shall be planned using a factor of 7.0 SF net storage space per ton gross weight of explosives, provided for the conditions are as stated in paragraph 5, under general narrative for basis Category Group 420. The two compartment

magazine is usually restricted to the storage of Class 1 Division 3 and 4 and is planned on an individual basis. For ammunition class descriptions, see OPNAVINST 8020.8.

421 52 SMOKELESS POWDER PROJECTILE MAGAZINE (SF)

The smokeless powder projectile magazine is used for the storage of smokeless powder, pyrotechnics, rocket motors, rocket heads, loaded projectiles, fixed ammunition, small-arms ammunition, and other fire (Class 1 Division 2) or missile hazard material. The magazines are of two general classifications:

(1) Rectangular, concrete earth-covered magazines:
Type I, 52 x 103 feet
Type IIA, 52 x 161 feet
Type ILB, 52 x 97 feet

(2) Concrete triplearch earth-covered magazine which consists of three barrels, each 25 x 80 feet.

A planning factor of 11.0 SF net storage space per ton gross weight of explosives shall be used provided the conditions are as stated in paragraph 5, planning factors under general narrative for basic Category Group 420.

421 62 SPECIAL WEAPONS MAGAZINE (SF)

The special weapons magazine is the same type of structure as the high explosive magazine and differs only in that it is used for the storage of nuclear weapons. Magazines used for the storage of special weapons are subject to quantity-distance requirements and are limited to the maximum amount of nuclear material that can be stored in any one magazine. This information, along with the sizes and weights of nuclear weapons and security requirements can be obtained from:

1. (S) SWOP 20-7, NUCLEAR SAFETY CRITERIA (U)
2. (S) SWOP 50-1, NUCLEAR ORDNANCE GENERAL INFORMATION (U)
3. (C) OPNAVINST C5510.83 SERIES, CRITERIA AND STANDARDS FOR SAFEGUARDING NUCLEAR WEAPONS (U)

Planning data for Category Code 421 62 related to specific locations will be classified in accordance with cognizant Navy directive.

A planning factor of 10 SF net storage space per ton gross weight of explosives shall be used provided the conditions are as stated in paragraph 5, planning factors under general narrative for basis Category Group 420.

421 72 MISSILE MAGAZINE (SF)

Missile magazines are generally rectangular earth-covered concrete magazines in which assembled missiles are stored. When missiles are stored unassembled, guided missile motors are stored in the smokeless powder

projectile magazine and the warheads are stored as high explosives. Missile magazines have special door sizes and interior column spacing to facilitate ease of storage and handling of the assemble missiles. The smokeless powder projectile and high explosive magazines can be used for the storage of assembled missiles but their layout and size may physically restrict the number of missiles stored. Table 421-72 lists the common Navy surface and air-launch guided missiles along with the sizes of storage containers and appropriate planning factors. The example in figure 421 72 illustrates the use of Table 421 72.

The gross area per stack of containers is derived from the following assumptions:

1. walls of magazine occupy 10% of total area
2. 63% of magazine is available for storage
3. 80% of available storage utilized

The conversion from net area to gross area is:

$$\text{SF (Gross) per stack} = \frac{\text{SF (Net) per stack}}{.63 \times .8 \times .9}$$

See Figure 421-72 for sample computation.

EXAMPLE: Determine the gross area required to store 38 PHOENIX MISSILES. Containers used will store two missiles.

Refer to TABLE 421-72:

Using the columns (1) and (4) locate row which contains factors for PHOENIX MISSILE when stored two missiles to a container.

Moving across this row, the table indicates that three containers may be stacked (Column 6) and that each stack requires a gross area of 97.7 SF/stack (Column 8).

COMPUTATIONS:

$$\frac{2 \text{ missiles}}{\text{container}} \times \frac{3 \text{ containers}}{\text{stack}} = \frac{6 \text{ missiles}}{\text{stack}}$$

$$38 \text{ missiles} \div \frac{6 \text{ missiles}}{\text{stack}} = 6.33 \text{ stacks}$$

Need 7 stacks (rounded to next whole number)

$$\text{Gross Area} = 7 \text{ stacks} \times \frac{98.4 \text{ SF}}{\text{stack}} = 689 \text{ SF}$$

FIGURE 421-72
Sample Computation for Missile Magazine

TABLE 421-72

Planning Factors - Missile Storage

(1)	(2)	(3)			(4)	(5)	(6)	(7)	(8)
Missile	Container MK-MOD	Storage Container Dimensions (inches)			No. of Missiles per Containers	Gross Weight Containers Plus Missile (pounds)	No. of Containers Stacked (recommended)	SF (NET) per Stack	SF (GROSS) per Stack .45
		L	W	H					
ASROC RUR-5 MODS	183-2	195.0	29.0	33.0	1	1,700	4	39.3	87.3
BULLPUP/A	MK 441	147.0	24.0	26.0	1	1,100	2	24.5	54.4
BULLPUP/B	MK 443	182.0	29.0	33.0	1	2,370	3	36.7	81.6
CONDOR	CNU-228/E	178.0	29.0	34.0	1	2,597	2	35.8	79.6
HARM G.M. AGM-88	CNU-295/E	178.0	36.0	28.0	1	2,500	2	44.5	98.9
HARPOON ASROC RGM-84A-1	608-0	207.0	29.0	32.0	2	2,500	3	41.7	92.7
HARPOON TARTAR RGM-84A-2	632-0	193.5	28.0	28.5	1	2,500	3	37.6	83.6
HARPOON CANISTER RGM-84A-3B	631-0	217.0	45.5	47.0	1	3,200	2	68.8	152.4
HARPOON CAPSULE UGM-84A-1	630-0	271.5	44.0	36.0	1	3,667	2	83.0	184.4
HARPOON G.M. AGM-84A-1	607-0	168.0	37.8	32.6	2	3,400	2	44.1	98.0
PHOENIX AIM-54A	CNU-124/E	168.0	38.0	29.0	2	2,649	3	44.3	98.4
PHOENIX AIM-54	CNU-242/E	168.0	38.0	30.0	2	2,975	3	44.3	98.4
SHRIKE AGM-45	Cradle 14-0	141.0	36.0	28.0	3	1,710	6	35.3	78.4
SHRIKE AGM-45	399-0	142.0	16.0	18.0	1	665	10	15.8	35.1
SHRIKE AGM-45	CNU-167/E	141.0	36.0	25.0	3	1,796	6	35.3	78.4
SIDEWINDER AIM-9	16-0	136.0	36.0	19.0	4	1,159	5	34.0	75.6
SPARROW III AIM-	Cradle MK 12-0	160.0	36.0	28.0	3	1,703	6	40.0	88.9
SPARROW III AIM-7 (BPDSMS)	CNU-166/E	159.0	36.0	26.0	3	1,972	6	39.8	88.4
SPARROW	MK 470-0	156.0	21.0	21.0	1	777	3	22.8	50.7
STANDARD/APM	MK 372-4	203.0	28.0	29.0	1	2,020	4	39.5	87.8
STANDARD/ARM	CNU-183/3	194.0	28.0	29.0	1	2,050	4	37.7	83.8
STANDARD/ARM AGM-78 A,B,C,D	CNU-121/E	203.0	29.0	32.0	1	2,100	4	40.9	90.9
STANDARD/MR	MK 372-2&3	203.0	28.0	29.0	1	2,210	3	39.5	87.8
TALOS	MK 264-0	276.0	46.0	50.0	1	4,900	2	88.2	196.0
TALOS BOOSTER	MK 576-0	155.0	40.0	48.0	1	5,435	1	43.1	95.8
TARTAR RIM MK 61 MODS	372-3,4,5	203.0	28.0	29.0	1	2,110	4	39.5	87.8
TARTAR RIM-24 Missile Tactical	372-3,4	203.0	28.0	29.0	1	2,110	4	39.5	87.8
TARTAR RIM-66 Std. Missile (MR)	372-5	203.0	28.0	29.0	1	2,110	4	39.5	87.8
TARTAR Std. ARM SSM	372-5	203.0	28.0	29.0	1	2,110	4	39.5	87.8
TERRIER RIM-2 Missile	199-0,1	187.0	27.0	30.0	1	1,870	3	35.1	78.0
TERRIER BOOSTER MK 12	200-0,1	167.0	27.0	30.0	1	2,591	3	31.3	69.6
TERRIER RIM-67 Std. Missile	199-0,1	187.0	27.0	30.0	1	1,870	3	35.1	78.0
TOMOHAWK TASM	Not Assigned	276.0	36.0	42.0	1	6,000	-	69.0	153.3
TOMOHAWK TLAM	Not Assigned	276.0	36.0	42.0	1	6,000	-	69.0	153.3
WALLEYE MK 1-0	Cradle 13-0	150.0	38.0	34.0	2	2,075	2	39.6	88.0
WALLEYE MK 1-0	426-0	154.0	30.0	32.0	1	1,602	4	32.1	71.3
WALLEYE MK 5 MODS	CNU-154/E	172.0	29.0	33.0	1	2,005	2	34.6	76.9
WALLEYE MK 13 MODS	CNU-154-E	172.0	29.0	33.0	1	2,005	2	34.6	76.9
WALLEYE MK 23 MODS	CNU-154/E	127.0	29.0	33.0	1	2,005	2	34.6	76.9

423 AMMUNITION STORAGE - LIQUID PROPELLANTS

The siting of liquid propellant storage facilities and the amount of propellant that can be stored are subject to strict safety criteria due to the fire and/or detonation hazards involved. Factors such as the degree of hazard and the compatibility of propellants stored in close proximity to each other affect the spacing of storage facilities and the amount of propellant that can be stored. Criteria on hazard groupings, quantity-distance tables, storage compatibility, and explosive equivalents are provided by Naval Ordnance Systems Command Publication OP-5 (Vol. 1, Ammunition and Explosives Ashore).

423 10 LIQUID PROPELLANT STORAGE (GA)

Planning factors to be developed.

423 20 LIQUID PROPELLANT DISPENSING FACILITY (GA)

Liquid propellant storage and dispensing facilities shall satisfy the operational requirements of the particular command within whose jurisdiction the facilities are located.

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424 WEAPON-RELATED BATTERY STORAGE

Weapon-related storage utilizes refrigerated warehouses that are capable of maintaining temperatures below -10°F. This code is not to be used for other cold storage facilities.

424 10 WEAPON-RELATED BATTERY STORAGE (SF)

Planning factors to be developed.

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425 OPEN AMMUNITION STORAGE

Provides open hardstands (pavements or prepared/stabilized surfaces) for ammunition storage and excludes all other hardstands.

425 10 OPEN AMMUNITION STORAGE PAD (SY)

Criteria being developed.

425 20 CONTAINER HOLDING YARD (EMPTY) (SY)

An empty container holding yard should be capable of storing at least one full container shipload plus 1/3 more. As the pipeline becomes full of containers, each container ship will discharge one container for each one loaded. Additionally, empty containers awaiting testing, repairs, stuffing or shipment to inland points will be on hand. Assuming a single berth pier/wharf for a 750 container ship, planning for an empty container holding yard should be for 1,000 empty containers. See Figure 425-20 for a typical 1,000 container yard layout. Total area of the holding yard is 19,180 SY. Size is predicated on 8' x 8' x 20' containers stacked three high. Containers are handled with fork trucks or straddle carriers.

There are no inhabited buildings associated with this facility, therefore, it can be sited within the explosive quantity-distance umbrella of other facilities.

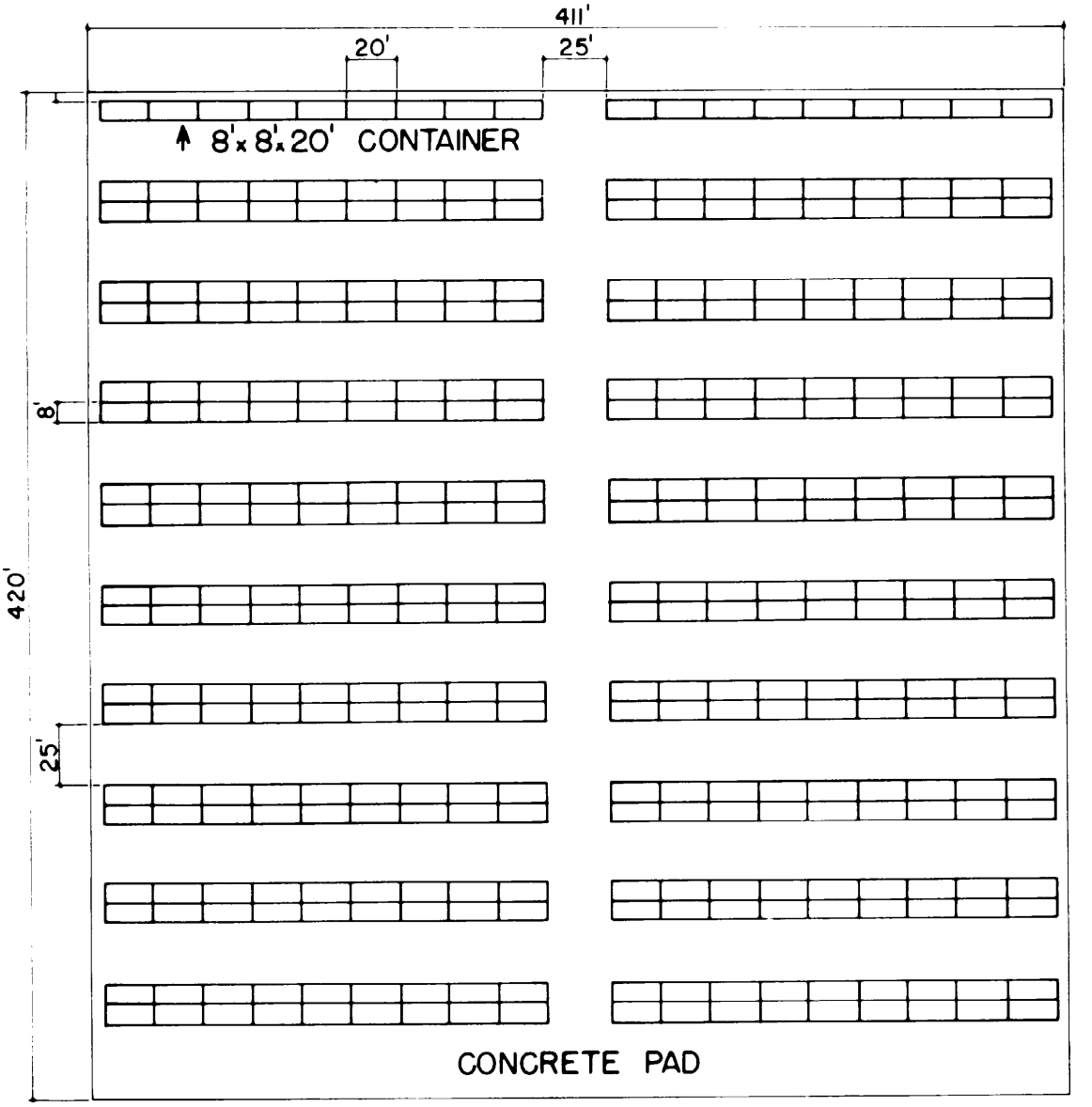


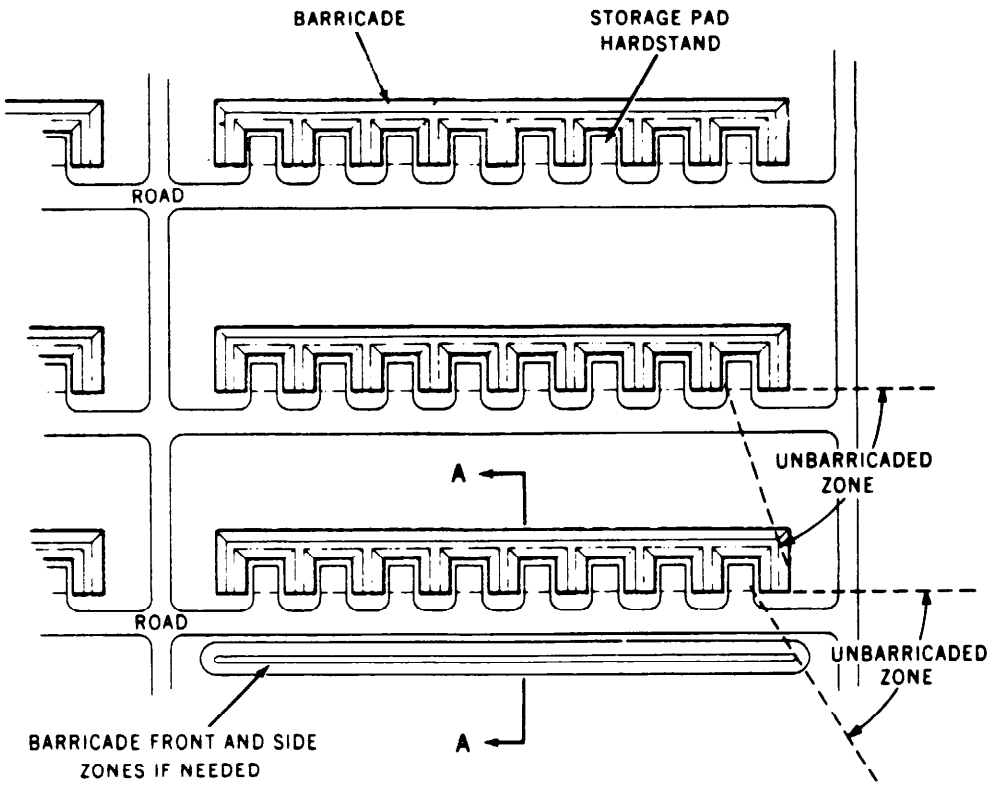
FIGURE 425-20
Container Holding Yard (Empty)

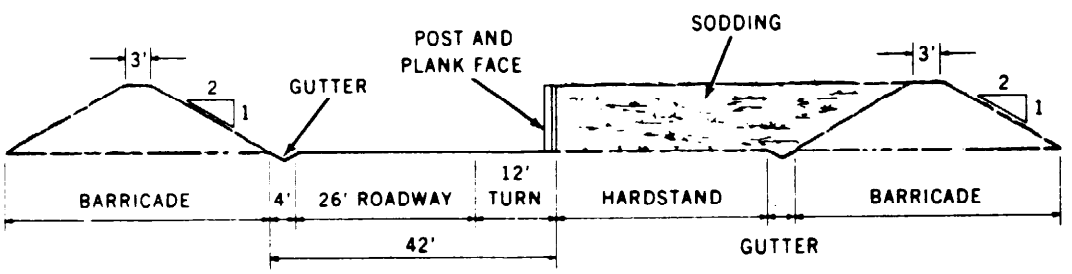
425 30 BARRICADED MODULE (SY)

A barricaded module is a barricaded area comprising of a series of connected cells with hard surface storage pads separated from each other by barricades. A light shed-type metal roof or fire retardant tarpaulin installed in a manner to provide sufficient ventilation between the tarpaulin and the stored ammunition may be used to cover the individual cells. Heavy structures or flammable materials will not be used for this purpose.

The maximum net weight of explosives permitted to be stored within each cell is 250,000 pounds. Storage pads should be hard surfaced, if possible, in order to minimize the effects of earth shock from an accidental explosion. No restrictions are imposed upon the arrangement of cells within a module or upon the arrangement of groups of modules, except that all cell openings will not be faced toward each other unless they are barricaded or meet the standard quantity-distance criteria for unbarricaded above ground magazines.

See Figure 425 30 for a typical arrangement of an eight-cell module. All barricades used in forming the module and its cells and the cell storage size itself, shall meet the requirements specified in paragraph 6.4.3.12 of NAVSEA OP-5, Volume 1, Fourth Revision.





SECTION A-A

Typical Arrangement of Eight-Cell Modules

FIGURE 425 30

430 COLD STORAGE

Cold storage is planned to provide refrigerated warehouses for storage of General Supply Materials which require temperatures ranging from -10°F to 60°F in the following categories:

Perishable Substances
Photosensitized Material
General Supply Batteries
Medical and Dental Supplies

Excluded from this category group are cold storage for weapons-related batteries (use category code 424 10) and cold storage spaces which are a functional part of another facility such as an open mess, club, hospital, commissary or exchange. These cold storage spaces are planned as part of the main facility and have to be accommodated within its space allowances.

Storage of Farinaceous and High Acid Food Products. These food products are properly stored in an environment where the temperature is between 50 and 70 degrees fahrenheit. A cold storage warehouse will be required to provide chill storage at those activities where climatic conditions preclude the use of a general purpose warehouse. However, formal written approval must be obtained by the activity from COMNAVSUPSYSCOM, Code 0621, Navy Warehouse Utilization Program Manager, prior to establishing a deficiency and requirement for chill storage in lieu of general purpose storage. This request/approval procedure will permit revising the SFMN to reflect this requirement and provide the required justification.

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431 10 COLD STORAGE WAREHOUSE (SF)

A cold storage warehouse is planned to preserve the quality of perishable foods and general supply materials that require refrigeration. The warehouse will include freeze and chill space and normal processing facilities and mechanical areas.

The space requirements are applicable to cold storage facilities of all sizes whether built as separate structures or in conjunction with other buildings and are determined by using the criteria furnished in Section 440B in conjunction with Tables 431-10A and 431-10B. The facility requirements are based upon the cubic foot space required per man per 30 days. This method utilizes subsistance consumption requirements for shore facilities and provides for two types of storage requirements. However, prior to using the criteria in Section 440B, it is highly recommended that the readers familiarize themselves with the “Storage and Warehouse Planning Guidelines” on page 440-3, which provides an introduction and outline to the supply criteria.

For additional information, see DM 32.2, "Covered Storage" and NAVFAC P-272, drawings 11404208 thru 1404214 and for Marine Corps Fleet Stock Account requirements, see NAVFAC P-272, Part 4, Definitive Designs.

TABLE 431-10A

TCF ALLOWANCES FOR REFRIGERATED WAREHOUSE FACILITIES PER MAN PER MONTH

Total Cu. Ft. (TCF)Allowances for Category Code 431-10

Type I Requirement: Allows 4 cubic feet (CF) of perishable subsistance per man per month when fresh milk and bread are received monthly.

Type II Requirement: Allows 3 CF of perishable subsistance per man per month when fresh milk and bread are received at least every other day.

TYPE	NET CUBIC FEET PER MAN PER MONTH	UNIVERSAL FACTOR**	TCF ALLOWANCES PER MAN PER MONTH*		
			TOTAL	CHILL	FREEZE
I	4	1.96	7.84	4.12	3.72
II	3	1.96	5.88	4.12	1.76

* All allowances represent average values. If historical data are available that differ from these allowances, such data may be used for requirements planning if fully justified/documented.

** See derivation of "Universal Factor" in Section 440A. This factor states that "1.96 TCF are required per cubic foot of material to be stored or 78.4 TCF are required per M/T of material to be stored". This ratio (1.96 to 1) applies equally to bin, rack and bulk storage areas.

TABLE 431-10B

SF PER NS MULTIPLIERS FOR TRADITIONAL LOW-RISE REFRIGERATED FACILITIES*

Total Sq. Ft. (SF) Multipliers Applicable to Net Sq. Ft. (NS) Allowances for Category Code 431-10

M/T of Material to be Stored	Allowable TCF Requirements**	SF Per NS Multiplier*
up to 75	Up to 5880	3.0
" " 100	" " 7840	2.63
" " 200	" " 15,680	2.3
" " 300	" " 23,520	2.22
" " 400	" " 31,360	2.20
" " 1,000	" " 78,400	2.18
" " 5,000	" " 392,000	2.04
" " 10,000	" " 784,000	1.94
" " 15,000	" " 1,176,000	1.84
Over 15,000	Over 1,176,000	1.80

* SF per NS Multipliers are average historical values based on traditional low-rise warehouses with wide aisles for counterbalanced forklift truck operations. For existing activities, these values are furnished to assist the planner in evaluating actual SF/NS Multipliers. Such actual values for activities reporting on the SFMR are determined an&printed by ADP on Line 21a of the SFMR. Line 21b of the SFMR exhibits Average SF/NS Multipliers for the "Type of Activity Group" of which the reporting/ planning activity is a part. The SF/NS Multipliers in this table and those appearing on Lines 21a and 21b of the SFMR are to be used in developing BFR documentation for traditional low-rise facilities. If new construction of high-rise, state-of-the-art facilities is planned, guidance in Section 440C applies.

** See Section 440A for Derivation of 'Universal Factor." This factor states that "1.96 TCF are allowed per cubic foot of material to be stored or 78.4 TCF are allowed per M/T of material to be stored." This ratio (1.96 to 1) applies equally to bin, rack and bulk storage areas.

440 GENERAL SUPPLY BUILDING

This category group consists of the various category codes indicated below which are supply-oriented covered storage and/or storage support facilities, that are assigned to the Supply/Material Department or assigned for storage of operational mount-out stocks.

Category Code		
	441 10	General Purpose Warehouse
	441 11	General Purpose Warehouse (Marine Corps Installations)
	441 12	Marine Corps Storage/Out-of-Stores/ Mount-Out
	441 13	Specific Purpose Warehouse, Marine Corps Logistics Support Base
	441 14	Specific Purpose Warehouse, Marine Corps SASSY Management Unit
	441 20	Controlled Humidity Warehouse
	441 30	Hazardous and Flammables Storehouse
	441 35	General Storage Shed
	441 40	Underground Storage
	441 71	Integrated Logistics Overhaul (ILO) and Outfitting Building
	441 72	SERVMART
	441 73	MTIS Building

Excluded from this category group are the following:

Type Facility	Applicable Code(s)
1. Ammunition and inert ammunition components under the cognizance of the Ordinance Officer	420
2. Weapon-related storage batteries requiring a storage temperature of less than -10°F	424 10
3. Perishable subsistence, dental, medical, photosensitive and battery supplies requiring storage temperatures of -10°F to 60°F	430
4. Air, water, and land Cargo Terminal Storage (for throughput operations)	141-12, 153-20 and 141-79
5. Shop stores, ready issue stores, storage for other retail functions and miscellaneous storage <u>not physically located in a Supply/Material Department facility</u> will be categorized under the basic category of the facility and appended with the Navy Code "77" except as otherwise indicated in codes as follows:	
(a) Operation Storage (Ready Issue/Shop Stores/Misc.)	143 77
(b) Aircraft Shops Stores (Expendable Work in process stores)	211 96
(c) Miscellaneous Storage (Ready Issue)	213 77
(d) Pavement and Grounds Equipment Shed	219 20

(e)	Public Works Shop (Expendable/Work in process stores)	219 25
(f)	Public Works Maintenance Storage	219 77
(g)	Maintenance/Production Storage (Ready Issue/Shop Stores/Misc.)	229 77
(h)	RDT&E Storage (Ready Issue/Shop Stores/Misc)	319 15
(i)	Hospital/Medical Storage (Ready Issue/ Shop Stores/Misc.)	510 77
(j)	Admin Storage (Ready Issue/Shop Stores/ Misc.)	610 77
(f)	Underground Admin Storage (Ready Issue/ Shop Stores/Misc.)	620 77
(l)	Troop Housing Storage (Ready Issue/Shop Stores/Misc.)	723 77
(m)	Personnel Support Storage (Ready Issue/ Shop Stores/Misc.)	730 77
(n)	Commissary (Including Back-up Storage)	740 23
(o)	Community Storage (Ready Issue/Shop Stores/Misc.)	740 77
(p)	Exchange Central Warehouse (For Code 740 01 and 740 86)	740 85
(q)	Exchange Installation Warehouse	740 86
(r)	Storage for Utility Systems (Ready Issue/ Shop Stores/Misc.)	890 77

6. Navy code “77” does not apply to Marine Corps Activities.

INTRODUCTION TO SUPPLY CRITERIA

STORAGE AND WAREHOUSE PLANNING GUIDELINES

The criteria and planning factors necessary for determining storage space requirements for general supply storage facilities in Category Groups 430, 440 and 450 are contained in the following four sections:

SECTION 440A: "PLANNING TERMS, SUPPLY FACILITY MANAGEMENT REPORT (SPMR) AND CONVERSION FACTORS"

This section contains the abbreviations used in the supply criteria, an update of definitions of terms, sample SFMR, the derivation of the Universal Factor for Cube losses in bin, rack and bulk storage areas, discussion of cube relationships, a list of density conversion factors and the MSC commodity conversion factors as used in the supply criteria.

SECTION 440B: “GUIDELINES FOR DETERMINING STORAGE SPACE REQUIREMENTS”

This section contains the procedural guidance for requirements planning for storage activities reporting on the Supply Facility Management Report (SFMR).

SECTION 440C: GUIDELINES FOR PLANNING AND SIZING WAREHOUSE CONSTRUCTION AND MODERNIZATION PROJECTS

This section contains general planning guidance, warehouse characteristics, project planning criteria, warehouse sizing procedures and sample problems, Equivalency Statement, and additional planning guidance.

SECTION 440D: STORAGE SPACE ALLOWANCES FOR PRE-POSITIONED WAR RESERVE MATERIAL STOCK (PWRMS)

This section contains the planning factors used in determining the storage space requirements for PWRMS vehicles.

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PLANNING TERMS, SUPPLY FACILITY MANAGEMENT REPORT AND CONVERSION FACTORS

The technical planning information provided in this section is as follows:

PART A. ABBREVIATIONS
PART B. DEFINITIONS OF TERMS
PART C. SAMPLE SUPPLY FACILITY MANAGEMENT REPORT (SFMR)
PART D. DERIVATION OF UNIVERSAL FACTOR FOR CUBE LOSSES IN BIN, RACK AND BULK STORAGE AREAS
PART E. DISCUSSION OF CUBE RELATIONSHIPS
PART F. DENSITY CONVERSION FACTORS
PART G. MSC COMMODITY CATEGORY CONVERSION FACTORS
PART H. WEIGHTS AND MEASURES

PART A. ABBREVIATIONS:

The following abbreviations are used throughout the 400 series and are supplied as a matter of convenience for quick reference and familiarization:

SF = Gross Square Feet - (external)

gsf = Gross Square Feet - (internal)

W = Wall Thickness of Outside Perimeter Walls (External Structural Loss)

NS = Net Square Feet - Areas Available for Storage of Material

S = Support Facilities

SA = Storage Areas

L = Internal Structural Loss in Storage Areas

A = Aisles in Storage Areas

SH = Average Clear Stacking Height

nsh = Average Net Stacking Height

TCF = Total Cubic Feet

ACF = Attainable Cubic Feet

SFMR = Supply Facility Management Report

PART B. DEFINITIONS OF TERMS:

The definitions of terms given below are used in determining the storage requirements for General Supply Facilities. Note that each definition below is followed by the applicable abbreviation symbol used by the Supply Facility Management Report (SFMR) line number on which data pertaining to the defined term is reported/printed.

1. Gross Square Feet (SF) (external)

a. External gross square feet is determined by using the outside dimensions of a storage facility in order to arrive at the gross area. That is, outside length times outside width equals total gross area. Loading platforms and ramps are excluded. This area can also be expressed as the sum of the Storage Areas (SA) plus the Support Facilities (S) plus the outside wall thickness (W). W is zero for open storage. For additional clarification see definition of "Area" in NAVFAC P-78, page 304.

b. SFMR - line 2a - SF.

2. Gross Square Feet (gsf) (internal)

a. Internal gross square feet is determined by using the outside dimensions of a storage facility minus the outside wall thickness (W) in order to arrive at the internal gross area. That is, internal length of the facility times internal width of the facility equals the internal gross area expressed as gross square feet (gsf). See "Gross Square Feet (SF)".

b. SFMR - line 7, gsf. This normally represents the total of all storage areas (SA) plus support (S) facilities and is identified as "Gross Space for Supply Operations" on line 7 of the SFMR. If there are any additional gsf ingranted, outgranted, unusable or in standby at an existing activity, such gsf amounts are reported on lines 3 through 6 of the SFMR. If there are no entries on lines 3 through 6, then lines 2 and 7 of the SFMR are equal.

3. Wall Thickness of Outside Walls (W)

a. This is the area represented by the thickness of the outside walls. It is zero for open storage areas. It is the difference between the external gross square feet (SF) and the internal gross square feet (gsf) and is considered an external structural loss.

b. SFMR - line 2b, W. This line gives the ratio of the outside dimensions (SF) to the inside dimensions (gsf). The difference between the two equals W. That is, line 2a divided by line 2 equals line 2b.

4. Net Square Feet (NS)

This is the sum of actual floor areas on which storage racks and/or bins are erected and on which bulk material is or can be stored.

b. SFMR - line 9 - NS

5. Support Facilities (S)

d. These facilities include all space used for preservation, packaging, assembly, packing, crating, container manufacturing, receiving, inspection, identification; shipping and supervisory/clerical offices located in warehouses or other facilities used for supply storage operations. General administrative offices, which are carried under Category Code 610 10 are not included. Also included are employee rest areas, rest rooms, locker rooms, training rooms, time clock areas, mechanical equipment rooms in refrigerated and controlled humidity warehouses; battery charging operations located in warehouses, and similar support functions. Support space also includes elevator shafts, stairwells, ramps and civil engineering (Public Works) functions that are in support of supply operations and are located in warehouses or other facilities used for supply storage operations. Aisles and internal structural loss that are contiguous to or within these support areas are classified as a part of such areas.

Support functions require traditional low rise facilities with clear heights normally ranging between 8 and 12 feet. Higher heights may be practical in shipping and receiving areas if racks are used for temporary holding of incoming material awaiting identification/processing and of outgoing material being staged by customer/destination/carrier.

b. SFMR - line 7d. -S. No data entered. ADP applies. The ADP generated data will reflect the gsf used for functions that support the supply storage operations.

6. Storage Areas (SA)

a. This is the total floor area that is dedicated for storage. It includes net storage areas expressed as net square feet (NS) plus contiguous main/cross/storage/personnel aisles plus any internal structural loss (L) within the perimeter of storage areas.

Many modern, state-of-the-art SA facilities are being constructed as single story structures to heights of between 18 and 90 feet within which high-rise bins and racks are erected and serviced by narrow aisle rail or electronic wire guided material handling equipment. Pallet rack and bin shelf modular layout drawings in NAVSUP PUB 529, "Warehouse Modernization and Layout Planning Guide" illustrate SA layouts and furnish data pertaining to square feet per SA module and square foot ratios of SA to NS.

b. SFMR - line 7c - SA

7. Internal Structural Loss in Storage Area (L)

a. This is the amount of space not usable as floor area within Storage Areas (SA) because of construction features or physical characteristics. It includes such items as building columns, fire walls, switch panels, sprinkler lines, and door clearances.

b. SFMR - line 7b -(L)

8. Aisles in Storage Areas (A)

a. This is the area dedicated to aisles in Storage Areas (SA). It includes main aisles, cross aisles/storage aisles and personnel aisles contiguous to the Net Square Feet (NS) area within the SA. All other aisles are considered to be a portion of the support facilities (S) space.

b. SFMR - line 7a - A

9. Average Clear Stacking Height (SH)

d. This is the planned or existing average height in feet within Net Square Feet (NS) areas available for stacking material while maintaining vertical safety clearances. This SH is defined as the distance between the floor and lowermost of either sprinkler heads, joists, rafters, beams or roof trusses, lighting fixtures or ductwork from which the following safety clearances as prescribed by DoD 4145.19 R-1, must be deducted:

1. One and one half feet when material heights do not exceed 15 feet.

2. Three feet when when material heights exceed 15 feet.

3. Three feet when hazardous materials are involved or in storage areas not equipped with sprinklers.

4. Exceptions: A clearance of only 14 inches is required for reclaimed drum storage regardless of stacking height, provided that the building is of all metal construction and contains no electric wiring. Also, under operating overhead craneways, allow a vertical safety clearance of 3 feet under the lowermost point of the load(s) representing the maximum vertical load dimension.

Note that the SH, as defined above, is an indicator of only the theoretical capacity of a facility. It does not allow for limitations which may be imposed by existing storage aids, material handling equipment or floor load limitations. Actual storage capacity indicator is designated as nsh (see Definition 10). If major problems are encountered in the planning or evaluation process, consult NAVSUPSYSCOM, Navy Warehouse Utilization Program Manager, or CMC for guidance.

The value for average clear stacking height is determined as follows: For Existing Activities the SH value for the entire activity is determined by calculating the total volume of available storage (multiply NS x SH for each warehouse segment and add results together to determine TCF for the activity) and dividing the result by the total NS for the entire activity.

Example - Assuming an activity has:

One warehouse - 4,000 NS, 10 feet stacking height
One warehouse - 8,000 NS, 20 feet stacking height
Then the SH for the activity will be:

$$\frac{14{,}000 \times 10) + (8{,}000 \times 20)}{(4{,}000 + 8{,}000)} = 16.6 \text{ feet SH}$$

Existing values for SH by types of space are computed/printed semiannually on line 1Od of the Supply Facility Management Report in consonance with NAVSUPINST 4450.22. Activity SFMR's are available at reporting activities and are also distributed by NAVSUP to cognizant activity subclaimants (Supply Officer) and NAVFAC Engineering Field Divisions (Code 201). Such existing value for SH shall be used on the Basic Facility Requirement (BFR). SH values for individual buildings compromising each composite average will be indicated in the Real Property Inventory (RPI). This is to ensure compatibility of units of measure when comparing requirements with available assets. When planning new construction or an acquisition by other means, a different stacking height may be used in accordance with the following formula:

NS x SH = NS' x SH' = TCF (total cubic feet) = a constant

In this formula, NS and SH represent BFR approved values and NS' and SH' (read as NS prime and SH prime) represent any other values that may be used in new construction planning or in planning for acquisition by any other means. See Section 440C for detailed guidance. For assistance in appraising and justifying SH values, consult NAVSUPSYSCOM, Navy Warehouse Utilization Program Manager, or CMC as appropriate. SH is understood to be nsh for Special Supply Operations Facilities and Open Storage Facilities. See note at end.

b. SFMR - line 10d - SH

10. Average Net Stacking Height (nsh)

a. This is the average height to which material can actually be stored. It is a function of the Average Clear Stacking Height (SH) and is modified to reflect limitations such as type of operation, existing storage aids, materials handling equipment, crushability and stackability of material and/or floor load capacity. SH is understood to be nsh for Special Supply Operations Facilities and Open Storage Facilities. See note at end.

b. SFMR - line 11d - nsh

11. Total Cubic Feet (TCF)

This is the volume obtained by multiplying the Net Square Feet (NS) times Average Clear Stacking Height (SH). It represents the theoretical cube storage capacity of the NS floor area since the SH factor does not consider the limitations of materials handling equipment, floor loads, storage aids and the crushability and stackability limitations of material. TCF is understood to be ACF for Special Supply Operations Facilities and Open Storage Facilities. See note at end.

b. SFMR - line 10 - TCF

12. Attainable Cubic Feet (ACF)

This is the volume obtained by multiplying the Net Square Feet (NS) times the Average Net Stacking Height (nsh). It is the actual usable volume of space that can be used for storage since it takes into account the limitations/requirements described for nsh. TCF is understood to be ACF for Special Supply Operations Facilities and Open Storage Facilities. See note at end.

b. SFMR - line 11, ACF

13. Supply Facility Management Report (SFMR). The purpose and use of the SFMR is:

a. Reporting gross, net, occupied and vacant storage space by type of storage facility, to the activity's claimant/subclaimant, the Secretary of the Navy, Secretary of Defense, Office of Management and Budget, the President and Congress.

b. Exchanging compatible storage space data among DoD components to foster optimum use of DoD owned space.

c. Immediate use in conducting Navy and DoD wide and federal government wide storage space management/distribution studies.

d. Evaluating major storage space, military construction or modernization projects.

8. Identifying future peacetime and contingency storage requirements.

f. Evaluating the extent to which storage space policies are being implemented.

g. Determining TCF analyses for facility management.

h. Computation for support of BFR documentation.

14. Installation Military Strength is basically defined as the entire complement of officers and enlisted personnel permanently assigned to an installation. If other military units are operating as tenants of the installat ion, their count may be included only if the host installation has the mission to provide supply storage support and if tenants' supply support requirements are included on the host BFR. The basic military strength may be modified if civilians, students, transient, or other personnel are authorized to receive supply storage support. (See note under Table 440-3 for Naval Air Reservists).

*NOTE: SERVMART, MTIS, IL0 and Outfitting Facilities are "Special Supply Operations Facilities" (CCN 441-70 Series) that normally require material to be in reach of users/operators at floor level. Therefore, facility capacity in terms of SH and TCF is not a performance indicator and nsh and ACF are applicable for requirements planning. In Open Storage Facilities (CCN 451-10), there is no building structure involved with SH and TCF parameters. Therefore, with Special Supply Operations Facilities and Open Storage Facilities, SH is equated to nsh and TCF is equated to ACF for requirements planning purposes.

PART C. SAMPLE SUPPLY FACILITY MANAGEMENT REPORT (SFMR)

The following pages 440A 8 through 440A-12, provide a reduced photocopy of the SFMR.

SUPPLY FACILITY MANAGEMENT REPORT

(1) FY	(2) QTR	(3) UIC	(4) SUFFIX	(5) TENANT SITE CODE	(6) NAME OF INSTALLATION	(7) CITY STATE COUNTRY CODE	(8) COMPLEX CODE	(9) COMPONENT CODE	(10) NAVAL DIST	(11) MAJOR CLAIMANT	(12) SUB CLAIMANT	(13) ACTY TYPE	(14) EFD	(15) GEO LOCATION CODE

Item (Unit of Measure is in Thousands except for Data on Lines preceded by an asterisk (*)): See General Note A	Covered Supply Facilities (Groups 420, 430 & 440)											Open Supply Facilities (425 & 451)	
	Total Covered	Covered General Supply Facilities (430 & 440)								Covered Ammunition Supply Facilities (Group 420)			
		Gen Purpose (C & D)				Refrigerated (G & H)							
	(Cols C thru L)	Heated 441-10	Unheated 441-10	Control Humidity 441-20	Flam Hazardous 441-30	Chill 431-10	Freeze 431-10	Shed 441-35	Special Supply OPs 441-70s	Magazine 421 and 423	Inert 421	Improved	Unimproved
A	B	C	D	E	F	G	H	I	J	K	L	M	N
SECTION A - Gross Storage Space - Square Feet (gsf - inside Dimensions, SF - Outside Dimensions)													
1. Total gsf on Line 2 of Prior 30 June Report													
2. Total host-owned gsf This Report (2a minus ext. wall thickness)													
a. SF from Real Property Inventory (RPI)													
b. Ratio of SF to gsf (2a÷2)													
3. Unusable gsf													
4. Recoupable gsf in Standby													
5. Total Outgranted gsf (5a+5b) 1/													
a. To Non-DOD Users													
b. To DOD Users													
c. Portion of 5b to Other Navy Users													
6. Ingranted DOD and Other gsf Used (not Reported on Line 2 or RPI) 1/													
a. Portion of 6 Ingranted from Other DOD Activities 1/													
b. Portion of 6a Ingranted from Other Navy Activities													
7. Total gsf Used for Supply Ops (2+6 minus 3, 4, and 5; also 7c+7d)													
a. gsf of Aisles in Storage Areas (SA)													
b. gsf of Structural Loss in SA													
c. Total gsf in SA (7a+7b+9)													
d. Total gsf in Support (S) Facilities (7 minus 7c)													
*e. Ratio of SA to NS (7c÷9)													
*f. Ratio of S to NS (7d÷9)													
*g. Ratio of S to TCF (7d÷10)													
h. Portion of 7 Used for Non-Stock Accommodation Storage (Detail in Format A)													
8. Structural Loss, Aisles & Support (S) Facilities (7 minus 9; also 7a+7b+7d)													

1/ NOTE: Detail in Remarks

Item (Unit of Measure is in Thousands except for Data on Lines preceded by an asterisk (*)): See General Note A	Total Covered	Covered Supply Facilities (Groups 420, 430 & 440)										Open Supply Facilities (425 & 451)	
		Covered General Supply Facilities (430 & 440)								Covered Ammunition Supply Facilities (Group 420)			
		Gen Purpose (C & D)				Refrigerated (G & H)							
	(Cols C thru L)	Heated 441-10	Unheated 441-10	Control Humidity 441-20	Flam Hazardous 441-30	Chill 431-10	Freeze 431-10	Shed 441-35	Special Supply OPs 441-70s	Magazine 421 and 423	Inert 421	Improved	Unimproved
A	B	C	D	E	F	G	H	I	J	K	L	M	N

SECTION B - Net Storage Space Available

(NS = Net Square Feet; TCF = Total Cubic Feet (Facility Capacity); ACF = Attainable Cubic Feet (w/o rewarehousing/new equip.))

9. Total NS Available in SA (9a+9b+9c)													
a. NS in Bins													
b. NS in Racks													
c. NS in Bulk													
*d. Ratio of gsf Used for Supply Ops to Total NS Available (7÷9)													
10. Total TCF Available in SA (10a+10b+10c)													
a. TCF in Bins													
b. TCF in Racks													
c. TCF in Bulk													
*d. Average Clear Stacking Height (SH) (10÷9)													
11. Total ACF Available in SA (within 10) (11a+11b+11c)													
a. ACF in Bins													
b. ACF in Racks													
c. ACF in Bulk													
*d. Average Net Stacking Height (nsh)(11÷9)													
*e. Ratios of TCF to ACF and of SH to nsh (10÷11)													

Continued

Item (Unit of Measure is in Thousands except for Data on Lines preceded by an asterisk (*)): See General Note A	Total Covered	Covered Supply Facilities (Groups 420, 430 & 440)										Open Supply Facilities (425 & 451)	
		Covered General Supply Facilities (430 & 440)								Covered Ammunition Supply Facilities (Group 420)			
		Gen Purpose (C & D)				Refrigerated (G & H)							
	(Cols C thru L)	Heated 441-10	Unheated 441-10	Control Humidity 441-20	Flam Hazardous 441-30	Chill 431-10	Freeze 431-10	Shed 441-35	Special Supply OPs 441-70s	Magazine 421 and 423	Inert 421	Improved	Unimproved
A	B	C	D	E	F	G	H	I	J	K	L	M	N

SECTION C - Net Storage Space Utilized

(M/T = Measurement Ton; CF = Cubic Feet; one M/T = 40 CF)

12. Total NS Utilized (9a+9b+12a)													
a. NS Utilized in Bulk Areas (Within 9c)													
13. Total ACF Utilized (13a+13b+13c)													
a. ACF Utilized in Bins													
b. ACF Utilized in Racks													
c. ACF Utilized in Bulk													
*d. Occupied Cube Loss Decimal Multiplier (.30 X (Line 13c÷Line 13) + .51). (See Table 13d for Formula Derivation)													
*e. Honeycombed/Non Occupied Cube Loss Decimal Multiplier (Normally .95 to .85 to indicate a "loss" of 5% to 15% of Line 13.)													
f. Approximate M/Ts of Material in Store (13 X 13d X 13e÷40 CF per M/T)													
*g. "Actual" NS Utilized per M/T of Material in Store (12÷13f)													
*h. "Standard" Allowable NS Utilized per M/T of Material in Store (78.4 TCF per M/T ÷ 11d for J, M&N; 78.4 ÷ 10d for all other cols.)													
i. Portion of 13 for Common/Cross Servicing of Other DOD Component Material (Detail in Format A)													
j. Portion of 13 for Common/Cross Servicing of Non-DOD Material (Detail in Format A)													
14. Total NS Vacant (in bulk areas) (9 minus 12)													
*a. Percent of Total NS Vacant to Total NS Available (14 ÷ 9 X 100)													
15. Total ACF Vacant (11 minus 13)													
a. ACF Vacant in Bins (11a minus 13a)													
b. ACF Vacant in Racks (11b minus 13b)													
c. ACF Vacant in Bulk (11c minus 13c)													
*d. Percent of Total ACF Vacant to Total ACF Available (15 ÷ 11 X 100)													
16. Total NS Vacant Obligated (Within 14) 2/													
a. Total NS Vacant Unobligated (14 minus 16)													
*b. Percent of Total NS Vacant Obligated to Total NS Vacant (16 ÷ 14 X 100)													
*c. Percent of Total NS Vacant Unobligated to Total NS Available (16a ÷ 9 X 100)													
17. Total ACF Vacant Obligated (Within 15) (17a+17b+17c) 2/													
a. ACF Vacant Obligated in Bins (Within 15a)													
b. ACF Vacant Obligated in Racks (Within 15b)													
c. ACF Vacant Obligated in Bulk (Within 15c)													
d. Total ACF Vacant Unobligated (15 minus 17)													
*e. Percent of Total ACF Vacant Obligated to Total ACF Vacant (17 ÷ 15 X 100)													
*f. Percent of Total ACF Vacant Unobligated to total ACF Available (17d ÷ 11 X 100)													
g. ACF Vacant and Unobligated in Bins (15a minus 17a)													
h. ACF Vacant and Unobligated in Racks (15b minus 17b)													
i. ACF Vacant and Unobligated in Bulk (15c minus 17c)													

2/ NOTE: Explain in Remarks any Obligated - Vacant space if it is 25% or more of total vacant space; percentages on Line 16b apply to 16 and percentages on Line 17e apply to 17 in each column.

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End of Page 1

Item (Unit of Measure is in Thousands except for Data on Lines preceded by an asterisk (*)): See General Note A	General Purpose	Controlled Humidity	Flammable Hazardous	Refrigerated	Shed	Special Supply OPs	Open Improved	Column J "Break-out"		
								Outfitting and ILO	SERVMART	MTIS
A	441-10 C & D	441-20 E	441-30 F	431-10 G & H	441-35 I	141-70s J 3/	451-10 M	441-71 J - O	441-72 J - S	441-73 J - M

SECTION D - Computations in Support of Basic Facility Requirements (BFR) Documentation - See NAVFAC P-80

18. Projected FYDP M/Ts of Mat'l to be Stored and TCF Allowed: *a. Projected Requirements Decimal Multiplier (e.g.: 1.0=no change, and will be assumed by ADP if data not entered, 1.25=25% increase, .90=10% decrease) 4/										
b. Empirical Value of M/Ts of Material to be Stored (18a X 13f)										
c. Projected Value of M/Ts of Material to be Stored 4/										
d. Empirical Value of TCF Allowed in Bin, Rack & Bulk Areas (78.4 TCF per M/T X 18c or 18b if 18c is blank)										
e. Proposed/Approved BFR Value of TCF Allowed (Based on above or Personnel/Aircraft Tables) 4/										
19. Allowable SH and nsh Values *a. Values for Existing Facilities (nsh from 11d for J and M, SH from 10d for other Columns)										
*b. Values for Req'd non-existing facilities not on 19a (Enter Values of 4 to 10 for nsh and 10 for SH, see NAVFAC P 80)										
20. Projected NS Allowed a. Empirical Value (18e : 19a/b or 18d : 19a/b if 18e is blank)										
b. Proposed/Approved BFR Value 4/										
21. Projected SF per NS Multiplier *a. Empirical Value Based on Reporting Activity Data (9d X 2b)										
*b. Empirical Value Based on Activity Group Average (NAVSUP Input)										
*c. Proposed/Approved BFR Value (Normally 21a unless otherwise specified) 4/										
22. Projected SF Allowed: a. Empirical Value (20b X 21c or 20a X 21c if 20b is blank)										
b. Proposed/Approved BFR Value 4/										
*23. Date(s) of Approved BFR (Leave Blank if above BFR data are proposed) 5/										

3/ NOTE: Column J reflects totals for all 441 70 series codes. Develop "break-outs" by Category Code in columns on right that reconcile with totals in Column J.
4/ NOTE: Maintain approved BFR Values within 10% of empirical values. Include Column N with Column M BFR data by "transposing" M/T requirements via Line 18a or 18c; similar transpositions apply to other columns to reflect actual requirements vice current availability by type of space.
5/ NOTE: Insert month/year of BFR approval in each column; (e.g., "0484" = April 1984.) Leave blank in any column reflecting proposed/not approved BFR data.

Continued

Item (Unit of Measure is in Thousands except for Data on Lines preceded by an asterisk (*)): See General Note A	General Purpose	Controlled Humidity	Flammable Hazardous	Refrigerated	Shed	Special Supply OPs	Open Improved	Column J "Break-out"		
								Outfitting and ILO	SERVMART	MTIS
A	441-10 C & D	441-20 E	441-30 F	431-10 G & H	441-35 I	141-70s J 3/	451-10 M	441-71 J : O	441-72 J : S	441-73 J : M

SECTION E - TCF Analysis (For Facilities Management/Acquisition Justification)

24. Current apparent TCF Excess (+) or Deficit (–) (11 minus 18e (or 18d if 18e is blank) in Cols. J and M; 10 minus 18e (or 18d if 18e is blank) in all other columns)										
a. Additional ACF Reasonably Obtainable (for Line 11) With Rewarehousing/New Equipment (Within Line 10) 6/										
25. TCF Requiring Replacement or Major Modification (25a+25b)										
a. TCF Functionally Substandard										
b. TCF Structurally Substandard										
26. Additional TCF Obtainable (26a+b+c+d+e)										
a. Recoupable from Standby (Line 4)										
b. Recoupable from Outgrants (Lines 5a & 5b)										
c. Recoupable by Reducing SA Aisle Widths and/or Support (S) Facilities (Lines 7a & 7d)										
d. Obtainable from Reassigned Facilities										
e. Programmed for Construction/Major Modification (Explain in Remarks)										
27. Projected FYDP TCF Excess (+) or Deficit (–) (24 minus 25 + 26)										
28. Additional Non-Programmed/Anticipated TCF Requirements (Explain in Remarks)										

6/ NOTE: If TCF values on Line 24 appear to overstate excesses or understate deficits on the basis of actual NS utilized, it is probable that the cube loss "differential" between TCF on Line 10 and ACF on Line 11 exceeds standard allowances; analysis of Lines 13g and 13h applies. This can be corrected by increasing nsh values reflected on Line 11d by rewarehousing and/or acquisition of new equipment to increase material stacking heights and ACF values on Line 11.

REMARKS

Provide detail for Lines 5, 6, 16, 17, 26e and 28, as applicable, (See Note 2/); explain differences between Lines 1 and 2 of 5,000 or more gsf, in Column B and 20,000 or more gsf in Column M; cite NAVSUP/OASD approvals of diversions of covered space exceeding 10,000/40,000 gsf, respectively, during one FY; also, provide remarks on Ammunition Supply Facilities required by NAVSUPINST 4450.22A.

GENERAL NOTES:

A. Insert all "Raw" input data into unshaded blocks as appropriate. Then, enter computed values in shaded blocks using formulas printed on each shaded line to verify accuracy and intent of input data. All input data will be in thousands (000s), except those lines preceded by an asterisk (*) will be in units. See transmittal sheet formats for location of decimal points.

B. Use verified input data in unshaded blocks for preparation of transmittal sheets for keypunching.

C. Shaded blocks on this Worksheet will contain computer generated data on ADP printouts. Therefore, Transmittal Sheets must not include any Worksheet data in shaded blocks.

D. Cross-hatched blocks are to be left blank.

CERTIFICATION

I certify this report, annotated as necessary, is correct for time period ending

_____

Signature: _____

Title/Code: _____

POC: Name: _____

Code: _____

Phone: Autovon _____

Commercial _____

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End of Page 2

PART D. DERIVATION OF “UNIVERSAL FACTOR” FOR CUBE LOSSES IN BIN, RACK AND BULK STORAGE AREAS

The information furnished below provides the methodology used in the derivation of basic cube formulas for bulk, bin and pallet rack storage areas. This is followed by a table of data that is used in developing the formula on Line 13d of the SFMR that results in ADP computation/ printout of Measurement Tons (M/Ts) of material in store on Line 13f of the SFMR. This information indicates how different types of space losses and actual available storage space are determined and accounted for.

The primary result is the derivation of a “Universal Factor” for determining TCF requirements that is equally applicable to bin, rack and bulk storage areas. It is thus possible to determine TCF facility requirements to accommodate amounts of material to be stored without regard to storage and handling equipment considerations.

This Universal Factor is stated as:

"1.96 TCF are allowed per cubic foot of material to be stored", or multiplying both numbers in this ratio by 40 cubic feet (per M/T) gives:

"78.4 TCF are allowed per M/T of material to be stored".

DERIVATION OF BASIC CUBE PLANNING FORMULA FOR BULK STORAGE AREAS

GIVEN:

NS = Net Square Feet for Storage of bulk materials (excludes aisles and structural loss)

SH = Average Clear Stacking Height of facility in feet - measured to a point 18 or 36 inches below sprinklers, OH cranes and other obstructions

TCF = Total Cubic Feet = NS X SH

nsh = Net Average Stacking Height - Measured to potential height of material stacks - is height attainable with existing MHE and floor load limitations

ACF = Attainable Cubic Feet = NS X nsh

ALLOWANCES:

1. A 19% cube loss allowance around material stacks in "utilized" NS areas. (.81 is the average ratio of occupied NS to "utilized" NS)

2. A 15% NS vacancy allowance for "Operational Flexibility" (.85 is the allowable ratio of "utilized" NS to total NS)

3. A 25% SH vacancy allowance above bulk stacks of material for surges, expansion, material crushability/stackability, and floor load/MHE limitations* (.75 is the ratio of planned material stack heights to total SH)

COMPUTATIONS:

1. Planned ratio of occupied NS to total NS = .81 X .85 = .688 NS

2. Planned ratio of occupied SH to total SH = .75 SH

3. Since TCP = NS X SH, the planned ratio of occupied TCP to total TCF = NS x .75 SH = .688 NS X .75 SH = .516 TCP (use .51 TCP)

Therefore for planning purposes: TCF Allowed = cu. ft. of material to be stored : .51, or,

TCP ALLOWED = 1.96 X CU. FT. OF MATERIAL TO BE STORED
= 78.4 X M/Ts OF MATERIAL TO BE STORED**

Notes:
*MY "cube loss" or difference between TCF and ACF in bin and rack storage areas must be charged against this 25% SH vacancy allowance,
**One M/T = 40 Cu. Ft.

DERIVATION OF BASIC CUBE PLANNING FORMULA
FOR
BIN AND PALLET RACK STORAGE AREAS

GIVEN:

NS = Net Square Feet on which bins and racks are erected (excludes aisles and structural loss)

SH = Average Clear Stacking Height of facility in feet - measured to a point 18 or 36 inches below sprinklers, OH cranes and other obstructions

TCF = Total Cubic Feet = NS X SH

nsh = Net Average Stacking Height - is height to tops of bins or material in racks

ACF = Attainable Cubic Feet = NS X nsh

ALLOWANCES:

1. TCF = ACF (no cube loss above bins or racks)*

2. Structural loss within bins and racks = 25% of TCF

3. Cube available for stock occupancy = 75% of TCF

4. Maximum stock level = 100% of cube available

5. Low average stock level = 35% of cube available

COMPUTATIONS:

Expected Avg. cube occupancy = $\frac{100\% + 35\%}{2}$ x .75 TCF = -51 TCF

Therefore, for planning purposes: TCF Allowed = Cu. Ft. of Material to be Stored - .51, or,

TCF ALLOWED = 1.96 X CU. FT. OF MATERIAL TO BE STORED
= 78.4 X M/Ts OF MATERIAL TO BE STORED**

Notes:

*Any "cube loss" or difference between TCF and ACF in bin and rack storage areas must be charged against the 25% SH vacancy allowance in bulk storage areas.

**One M/T = 40 Cu. Ft.

TABLE 13d

TABLE OF MULTIPLIERS FOR LINE 13d OF
NAVY SUPPLY FACILITY MANAGEMENT REPORT

PERCENTAGES OF ACF UTILIZED		
Bin Plus Rack Areas (Lines 13a + 13b)	Bulk Areas (Line 13c)	Decimal Multiplier (Line 13d)
0%	100%	.81*
10	90	.78
20	80	.75
30	70	.72
40	60	.69
50	50	.66
60	40	.63
70	30	.60
80	20	l 57
90	10	.54
100	0	.51**

*In bulk storage areas, .81 is the average ratio of occupied NS to utilized NS (Page 440A-13, Allowances). The same value is assumed applicable as the ratio of occupied ACF to utilized ACF on the basis that any potentially vacant/ honeycombed cube loss is accounted for by the decimal multiplier on Line 13e.

**In bin and rack storage areas, .51 is the average ratio of occupied ACF to utilized ACF (Page 440A-15, Computations).

FORMULA FOR DECIMAL MULTIPLIER

Data in the above table can be stated mathematically as follows:

Decimal Multiplier = .30 x ACF Utilized in Bulk Areas - Total ACF Utilized in Bin, Rack and Bulk Areas + .51; or,

Decimal Multiplier = .30 x (Line 13c - Line 13) + .51

PART E. DISCUSSION OF CUBE RELATIONSHIPS

1. Material Cube and the Measurement Ton. The cube of material may be expressed in terms of several units of measure. However, cubic feet and Measurement Tons are the most commonly used in the Navy. A Measurement Ton (M/T)is a volumetric unit of measure defined as 40 cubic feet. A M/T of material can be configured in any shape. It can be visualized, for example, as 40 cubes of material measuring one cubic foot each. The cube of material in bin, rack and bulk storage areas is normally quantified in terms of cubic feet of material or M/Ts of material. The M/T is the preferred unit of measure in the Navy since it is the standard unit of measure used for shipboard cargo.

The following information may prove useful in estimating M/Ts of material in storage when no other data are available. A M/T of material is the appropriate average cube of pallet load of Navy shipment cargo on a standard Navy/DoD 40" x 48" pallet with a load height averaging 36", including pallet. The cube of an average Navy pallet load in storage is typically 0.8 M/Ts or 40" x 48" with a load height averaging 30", including pallet. The maximum pallet load height specified by Military Standard 147 is 54", including pallet. A pallet load measuring 40" x 48" x 54" high, including pallet equals 60 cubic feet or 1.5 M/Ts of material. The maximum cargo load size specified by Military Standard 147 on a 40" x 48" pallet (with material overhanging on pallet) is 43" x 52" x 54" high, including pallet. A load measuring 43" x 52" x 30.9" high, including pallet, equals 40 cubic feet or one M/T.

2. Total Cubic Feet and The Universal Factor. Part D of section 440A furnishes the derivation of the "Universal Factor" which provides for the determination of Total Cubic Feet required based on the cubic feet or M/Ts of the material to be stored. The Universal Factor allows 1.96 cubic feet of space for every cubic foot of material that is to be stored, i.e., a ratio factor of 1.96 to 1 applies. This can also be stated as a ratio factor of 78.4 to 40 if both the "1.96" and the "1" are multiplied by 40. The "Universal Factor" can thus be stated in either one of two ways, i.e., "1.96 TCF are allowed per M/T of material to be stored" or "78.4 TCF are allowed per M/T of material to be stored." The term "Universal Factor" is used because it

applies equally to bin, rack and bulk storage areas. That is, it applies to all TCF in SA Facilities. This is an extremely convenient factor for determining storage space requirements since it means that TCF can be determined, on the basis of M/Ts or cubic feet of material to be stored, without regard to whether bin, rack or bulk facilities are or will be used to satisfy the requirement. Thus, the function of determining the BFR for TCF can be completely separated from the function of facility layout, equipment select ion, comparative cost analysis and integrated systems development. This latter function is covered in Section 440C, "Guidelines for Planning and Sizing Warehouse Construction and Modernization Projects".

3. Pallet Load Cube and Rack Cube Requirements. Standard Navy/DoD pallet racks are illustrated in detail in Section 6 of NAVSUP Pub 529, "Warehouse Modernization and Layout Planning Guide." They are also P-80 illustrated in modular elevation and layout drawings for pallet handling/storage systems in Section 21 of the Pub 529. It will be noted that one "standard" Navy/DoD double-opening pallet rack shelf is 40" deep by 108" wide. A "stack" of multiple level shelves is supported at each end by a 40" deep x 3" wide rack upright. The floor area or Net Square Feet (NS) occupied by one "stack" of such double-opening shelves in a "line" of multiple level shelves is 30.84 NS (40" x 111" divided by 144 square inches per square foot). Thus, the NS occupied by one "stack" of single pallet loads in racks is 15.42 NS. DoD Regulation 4145.19-R-1 stipulates that the average vertical shelf spacing of Navy/DOD pallet racks is about 4 feet. Adding an allowance of about 1 1/2 percent for sprinklers in racks gives an average SH value per shelf level of 4′ x 1.015 or 4.06 SH. Thus, the average TCF utilized per pallet opening or “slot” equals 4.06 SH x 15.42 NS equals about 62.6 TCF per pallet slot. Paragraph 1 above states that the average pallet load in storage equals 0.8 M/Ts. Thus, the TCF required for the average pallet load in storage equals 78.4 TCF (Universal Factor) x 0.8 or about 62.6 TCF required.

Summarizing the foregoing paragraph gives the following: 62.6 TCF are AVAILABLE per average Navy/DoD pallet rack slot with 4′ vertical shelf spacing or, 62.6 TCF are required per average Navy storage pallet load with 0.8 M/Ts.

On d direct proportion basis, these data can be expanded as follows for estimating M/Ts of material in pallet rack storage when no other data are available:

Pallet Rack Vertical Shelf Spacing	Average M/Ts per Pallet Load of Material In Store
3 feet	0.6 M/Ts
4 feet	0.8 M/Ts
5 feet	1.0 M/Ts
6 feet	1.2 M/Ts

NOTE: For activities reporting on the SFMR, M/Ts of material in store in bin, rack and bulk storage areas are developed empirically by ADP and printed on Line 13f by type of space/Facility Category Code.

PART F. DENSITY CONVERSION FACTORS:*

The following information provides the conversion factors pertaining to the different types of materials to be stored as well as to their related Navy cognizant symbols. These factors were summarized from NAVMAT P-4000-2. This NAVMAT publication provides additional information on density factors, DOD classes of supply and consumption rates.

Material Types	Navy Cog. symbols	M/T Per S/T	S/T Per M/T
Tactical Vehicles (Automotive)	9A,9E	4.73	.210
Clothing	9D,9U	3.00	.333
Construction (Minor)	9C	2.75	.364
(Major)	2C	2.14	.476
Electronics (Retail)	9N,9Y	3.25	.308
(Repair Parts)	2G,4G,1N-2N,4N,8N	3.02	.333
General	9G,90,9Q	2.50	.400
Industrial	OS,92	2.00	.500
Medical	9L	3.25	.308
Subsistance (Dry)	9MF	2.10	.476
(Chill)	9MP	1.40	.714
(Freeze)	9MP	1.70	.588
Shipboard (Assemblies)	2F,40,60 22,2P,4P,6P 8P,8T,2X,8X	2.32	.430
(Repair Parts)	1H,2H	1.92	.520
Aeronautical (General)	1R,2R,2V	4.24	.240
(Major)	4V,8R	2.86	.370
(Repairables)	8F,8J,8K,8V,8W	2.00	.500
(Repair Parts)	4A,bE,9F,9H 9I,9J 9K,4R,5R,9V	2.32	.430
Ammunition	2E,8E	1.07	.935
	2T,4T,8T	1.46	.685
	All Cog (General, (Mix, AE LOAD)	1.35	.740
(Air General)	2E	1.07	.935
(Air Missiles)	8E	1.07	.935
(Surface General)	2T	1.07	.935
(Torpedoes)	4T	1.07	.935
(Surface Missiles)	8T	2.32	.430
Weapons (Assemblies)	25	1.07	.935
(Repair Parts)	1A,2A	3.02	.330
Spec. Weapons (Ordnance)	6A,8A	3.02	.330
(Navigation)	6H	1.92	.520
Petroleum (Packaged)	1W	1.50	.667
(Bulk)	1W	1.04	.967
Ground Support MHE	1B,2B,20	2.32	.430
IPE	4L,8L,2S,2M	4.73	.210
MSTS	0X	4.73	.210
Forms and Pubs	0I,1I,0K 0P,6V	1.33	.750

*Summarized from NAVMAT P-4000-2; additional information on density factors, DOD classes of supply and consumption rates is available in this publication

PART G. MSC COMMODITY CATEGORY CONVERSION FACTORS:

The following conversion factors indicate the number of measurement tons (40 cubic feet) found in a short ton (2,000 lbs) by type of material to be stored.

MSC COMMODITY CATEGORY	M/T Per S/T
Ammunition	1.01
Household Goods	6.06
Privately-owned Vehicles (POVs)	7.54
General Material	2.32
Refrigerated Material	1.86
Special Material	4.73
Weighted Average (without aircraft)	2.48
Aircraft	53.69
Weighted Average (with aircraft)	2.63

WEIGHTS AND MEASURES

A list of weights and measures is provided as a matter of convenience and to ensure uniformity among all activities when calculating storage requirements.

1 M/T (Measurement Ton)	40 Cu Ft
1 S/T (Short Ton)	2,000 Lbs
1 L/T (Long Ton)	2,240 Lbs
1 Cu Ft	7.4805 U.S. Gallons
1 U.S. Gallon	0.133681 Cu Ft
1 U.S. Barrel	42 U.S. Gallons

SECTION 440B

GUIDELINES FOR DETERMINING STORAGE SPACE REQUIREMENTS

The technical planning information provided in this section is as follows:

PART A: Introduction

PART B: Analytical Method: Five Steps for Determining Storage Space Requirements

PART C: Procedure for Determining Cube Requirements for Material to be Stored

PART D: Procedure for Determining Requirements for Storage Facilities Using the SFMR

PART A: INTRODUCTION

1. Applicability. Guidelines for determining storage space requirements contained in this section apply specifically to General Supply Storage Facilities in Category Groups 430 (Cold Storage), 440 (Other Covered Storage) and 450 (Open Storage). Descriptions of individual facilities within these groups are furnished by category code number.

There are two methods for computing storage space requirements.

a. The SFMR Method
b. The Analytical Method

Both of these methods provide the documentation required to support the Basic Facilities Requirements (BFR) in the Shore Facilities Planning System. Part B of this section provides the procedure for determining the cube requirements for both of these methods.

SFMR Method: Procedural guidance for requirements planning is furnished in this section for storage activities reporting on the Supply Facility Management Report, (SFMR) in accordance with NAVSUPINST 4450.2219, "Supply Facility Management Reporting, Requirements Planning and Acquisition Justification System." The SFMR includes a reporting format for "Computation in Support of Basic Facility Requirements (BFR) Documentation." This format is used as the primary basis for requirements planning guidance in this section. The SFMR must be submitted to NAVSUP on a cyclic/situation basis by all Navy/Marine Corps storage activities having 20,000 or more gross square feet of covered Ammunition and/or General Supply Storage Facilities (Category Groups 420, 430, and 440).

Analytical Method: This method is used for BFR purposes only and is not a substitute for completing the SFMR. This method takes an analytical approach which requires five steps in order to derive the storage requirements. This method may also be applied to storage facilities at activities not required to report on the SFMR and to facilities not reportable on the SFMR if the cube of material to be stored is known or can be determined. This includes Supply Storage Facilities in Category Groups 430, 440 and 450 (for activities. under

the 20,000 gross square foot threshold) as well as to non-supply storage facilities in other category groups.

PART B. Analytical Method: Five Steps for Determining Storage Space Requirements. There are five steps required for determining storage space requirements by this method. Detailed procedures for determining the cube requirements is furnished in PART D below.

Step 1: Determine the TCF required for the cube/Measurement Tons of material to be stored. This is done by multiplying the Measurement Tons of material to be stored by 78.4 TCP (factor required per Measurement Ton of material to be stored) or 1.96 TCF required per cubic foot of material to be stored. The TCF required per man per month and per aircraft are also available directly from Tables 440B-1 and 440B-2 respectively. For cold storage requirements, see Table 431-10A and 431-10B.

Step 2: Determine a SH value. For an existing facility use the current SH value. For a planned facility use:

a. 4 to 10 feet for open storage.

b. 4 feet for MTIS, ILO and Outfitting facilities (up to 12 feet if racks are planned).

c. 4 feet for display gondolas and 7 feet for bin shelving in SERVMARTS.

d. Use 10 feet normally for all other covered storage facilities.

e. For a high rise facility, see Section 440C, Part C for conversion.

NOTE: These SH values are for BFR planning purposes only. For SH values applicable to follow-on modernization/construction planning, guidance in Section 440C applies.

Step 3: Determine the projected NS requirement by dividing the projected TCF required by the SH value determined in Steps 1 and 2 above,

Step 4: Select an appropriate "SF per NS Multiplier." For planned facilities, use the applicable Activity Group average value in Table 440B-3. For existing facilities, use the actual SF value divided by the NS value at the activity (Line 21a on SFMR). Compare this actual value with the average value for the activity's "Group" (Table 431-10B of Section 431 and Table 440B-3 of Section 440B). If the actual activity value is questionable, the applicable Activity Group average value or some intermediate value may be used, if documented/justified. If the activity is reporting on the SFMR, compare this actual value with the 1, average value for the activity's group, Line 21b of the SFMR. See Section 440C, PART C, for conversion.

NOTE: As with SH values above, these SF per NS values are for BFR planning purposes only. For SF per NS values applicable to follow-on modernization/construction planning, guidance in Section 440C applies.

Step 5: Determine the SF required by multiplying the NS by the SF per NS multiplier determined in Steps 3 and 4.

PART C: PROCEDURES FOR DETERMINING CUBE REQUIREMENTS FOR MATERIAL TO BE STORED

This part applies to both the Analytical and SFMR methods for determining storage requirements for an activity's Five Year Defense Program (FYDP). These procedures provide guidance for determining planned TCF requirements based on the cube of material to be stored and furnish guidance in determining cube requirements for amounts of material to be stored for input to Part D.

1. Procedures for Existing Activities.

a. Use Current M/Ts of Material in Store as Baseline Data. Use historical M/Ts of material in store by Facility Category Code as baseline data. Line 13f of the SFMR applies for reporting activities. Other activities may estimate M/Ts of material in store on pallets in bulk and rack storage using estimating guidance in Part E of Section 440A. The cube of material in bins/shelving/drawers can similarly be estimated. Alternatively, activities not reporting on the SFMR can use the SFMR format and related procedures in NAVSUPINST 4450.22A to develop estimated M/Ts of material in store in the same manner that is used for reporting activities. Another alternative is to develop line item listings of material in store with cube data in a manner similar to procedures described in subparagraph b (2) below.

b. Determine Projected Requirements for M/Ts of material to be stored during FYDP by calculating any additions to or reductions from current baseline M/Ts in store by type of space/Facility Category Code. If no changes are anticipated, proceed to guidance in subparagraph 2c below. If changes are anticipated procedures and suggested sources for data are as follows:

(1.) Obtain Change Data from Tables. Determine net additions or reductions in personnel and/or- air-craft to be supported. Next, obtain TCF requirements per man per month and/or per aircraft from Table 431-10A in Section 431 and from Tables 440B-1 and 440B-2 in Section 440B, as applicable. Note that Tables 440B-1 and 440B-2 furnish TCF requirements specifically for. Category Codes 441-35 and 441-50 but that only one total TCF is furnished for Category Codes 441-10, 441-20, 441-30 and 441-40. This total TCF requirement must be distributed among the four Facility Category Codes as appropriate. See guidance regarding use of each of these four types of space given under category code descriptions in Section 441. Divide TCF required for each Category Code by the Universal Factor of 78.4 to convert to M/Ts. This procedure applies to installation-type activities that primarily support personnel or personnel and aircraft. It does not apply to supply center, depots or industrial activities.

SAMPLE DATA (Applicable to SFMR and non-SFMR reporting activities) EXAMPLE for Category Code 441-10:

1. Baseline of 8,920 M/Ts (Line 13f of SFMR).

2. Net additions in aircraft and personnel provide a net additional allowance of 69,932.8 TCF using Tables 431-10A, 440B-1 and 440B-2.

3. No other changes in cube of material to be stored.

CALCULATIONS:

1. 69,932.8 divided by 78.4 TCF per M/T = additional 892 M/T requirement.,

2. This represents a 10 percent increase over baseline 8,920 M/Ts. It can be expressed as a "Projected Requirements Decimal Multiplier" of 1.1. (Enter 1.10 on Line 18a of SFMR).

3. Projected M/Ts of material to be stored = 1.10 x 8,920 = 9,812 M/Ts (Line 18b of SFMR).

(2) Obtain Chance Data Using Material Listings with Line Item Cube Data. Determine additions or reductions in quantities of material to be stored. Develop listings of line item changes with individual cubic foot values and determine net cubic foot additions or reductions. Line item cube data in load lists and data banks is currently rather limited but with the introduction of the Naval Integrated Storage Tracking and Retrieval System (NISTARS) at Naval Supply Centers during 1984, such data may be available at/from Naval Supply Centers for most system stock items during the 1985/1986 timeframe. Actual measurements may have to be taken or estimated for items for which cube data may not otherwise be available. Divide net cubic foot additions or reductions by 40 cubic feet per M/T to obtain net additions or reductions in M/Ts of material to be stored. This procedure is applicable to all storage activities.

SAMPLE DATA (Applicable to SFMR and non-SFMR reporting activities) EXAMPLE for Category Code 441-10:

1. Baseline of 8,920 M/T's currently in store (Line 13f of SFMR).

2. Net additions in cube of stock items and other material that represent a net addition of 35,680 cubic feet of material to be stored.

3. No other net changes in cube of material to be stored.

CALCULATIONS:

1. 35,680 cubic feet of material divided by 40 cubic feet per M/T = additional 892 M/T requirement.

2 . This represents a 10 percent increase over baseline of 8,920 M/Ts which can be expressed as a "Projected Requirements Decimal Multiplier" of 1.1 (enter 1.10 on Line 18a of SFMR).

3. Projected M/Ts of material to be stored = 1.10 X 8,920 = 9,812 M/Ts (Line 18b of SFMR).

(3) Estimate Percentage of Change by Task/Mission Change. If all or portions of projected additions or reductions cannot be determined as in subparagraph b(1) and b(2) above, it may be necessary to estimate changes as percentages of baseline data. That is, changes in projects, tasks and mission may have to be expressed as percent changes In baseline M/Ts. This will require creative use of line item, cube and workload data currently available at the storage activity. Conversion tables in Section 440A and in NAVMAT

P-7000-2, “Logistic Reference Data” may be useful in this regard. Include reasonable projections for Accommodation Storage of non-supply system materials in support of local as well as regional and Navy-wide requirements, as applicable. If this procedure is used, rationale and supporting data must be documented. Additional guidance in estimating requirements may be requested from NAVSUP, Warehousing, Equipment and Systems Branch on AV 227-2358 or 1100.

SAMPLE DATA (Applicable to SFMR and non-SFMR reporting activities) EXAMPLE for Category Code 441-10:

1. Baseline of 8,920 M/Ts currently in store (Line 13f of SFMR

2. Net estimated additions in a listing of documented requirements resulting in estimated increase of 10% in M/Ts to be stored.

3. No other net changes in cube of material to be stored.

CALCULATIONS:

1. A 10 percent increase in M/Ts can be expressed as a “Projected Requirements Decimal Multiplier” of 1.1 (enter 1.10 on Line 18a of SFMR).

2. Projected M/Ts of material to be stored = 1.10 X 8,920 = 9,812 M/Ts (Line 18b of SFMR).

(4) Combine Change Data Elements That Are Not Duplicative. It is possible that any 2 or all 3 of the methods for computing net changes in M/T requirements described in subparagraphs b(1), b(2) and b(3) above could be applicable at the same time, provided there is no duplication in material represented by the individual net change data elements. If, for example, 2 of the 3 sample computations above were not duplicative, the net Projected Requirements Decimal Multiplier would be:

10% increase + 10% increase = 20% increase = 1.20 "Decimal Multiplier."

c. Validate Projected Cube Requirements by Type of Space.

(1) Evaluate Type of Space Available Versus Type Required. In many cases, the type of space actually required for storage of material on hand may not be available and other space may have to be substituted. For example, if there is no controlled humidity space available for storage of items for which such space is justifiable, such material may have to be stored in general purpose space until controlled humidity space becomes available. Similarly, there may be material in open storage that requires general purpose warehouse space or shed storage space. In such cases, historical (baseline) data showing cube of material in store by type of space should be adjusted so that forecasted requirements are specified in terms of types of space actually required. For activities reporting on the SFMR, such adjustments can be made using instructions for Lines 18a and 18c.

(2) Storage of Gas Bottle Cylinders and Drummed POL. When planning facility requirements for flammables/hazardous materials, be certain that bottle gas cylinders and drummed petroleum, oils and lubricants (POL) are not planned for storage in flammables/hazardous warehouses. These items should be planned for storage in shed space. If POL drums have been hot dip galvanized for protection, they may be planned for storage in open storage facilities. DoD Regulation 4145.19-R-1, "Storage and Materials Handling" should be used for guidance in providing the appropriate types of storage facilities for materials to be stored.

c. BFR Allowances. Develop BFR for existing activities in accordance with PART D below. SFMR line entries start with Line 18a for existing activities.

2. Procedures for New Activities.

a. Determine Projected TCF Allowances. Determine TCF requirements during the new activity's FYDP by type of space/Facility Category Code. Procedures and suggested data sources are as follows:

(1) Obtain TCF Allowances from Tables. Obtain TCF Allowances per man per month and/or per aircraft from Table 431-10A in Section 431 and from Tables 440B-1 and 440B-2 in Section 440B, as applicable. Note that Tables 440B-1 and 440B-2 furnish TCF Allowances specifically for Category Codes 441-35 and 451-10, but that only one total TCF Allowance is given for category codes 441-10, 441-20, 441-30 and 441-40. This total TCF Allowance must be distributed among the four category codes, as required. See guidance regarding use of each of these four types of space given under category code descriptions in Section 441. This procedure will normally apply to installation-type activities that primarily support personnel or personnel and aircraft. It will not apply to supply centers, depots or industrial activities.

(2) Develop TCF Allowances Using Material Listings with Line Item Cube Data. Develop listings of line items to be carried with individual cubic foot values. Line item cube data in load lists and data banks is currently rather limited but, with introduction of the Naval Integrated Storage Tracking and Retrieval System (NISTARS) at some Naval Supply Centers during 1984, such data may be available from these supply centers for most supply system stock items during the 1985/1986 timeframe. Actual measurements may have to be taken or estimated for items for which cube data may not otherwise be available. Tables in Section 440A and NAVMAT P-7000-2, "Logistic Reference Data," may prove useful in developing data in some cases. In other cases, cube data on material to be stored may best be obtained from an existing activity with a mission and task functions similar to those assigned to the new activity. After determining the cube of material to be stored by type of space, multiply such cubic foot values by the Universal Factor, "1.96 TCF Allowed per cubic foot of material to be stored," to obtain projected TCF Allowances. These procedures are applicable to all types of storage activities.

b. BFR. Develop BFR for new activities in accordance with procedures in Part D below. SFMR line entries start with Line 18e for new activities.

PART D: PROCEDURES FOR DETERMINING REQUIREMENTS FOR STORAGE FACILITIES USING THE SFMR.

1. Introduction. Part B above furnishes Summary Highlights of five steps required for determining BFR for storage facilities. Detailed procedures for these five steps are given in Item 4 below in the format used by activities reporting existing storage facilities on the SFMR. These procedures are also applicable to non-reporting activities.

2. Types of Space Reported on the SFMR. NAVSUPINST 4450.22A furnishes complete procedural guidance for the reporting and submission of data on the SFMR with the exception of Section D for which procedural guidance is furnished below for "Computations in Support of BFR Documentation." A copy of the SFMR ("Worksheet" version) is furnished in Section 440A for convenience. The types of space for which data are entered in Section D of the SFMR are divided into two columnar categories. These are identified in the procedures as "Main Columns" and "Break-out Columns" which consist of the types of space/Facility Category Codes listed below.

Main Columns. There are 7 Main Columns in Section D that reflect a continuation of availability, utilization and occupancy data in Sections A, B and C of the SFMR. The General Purpose Warehouse Column (Column C + D) in Section D reflects the total of heated and unheated general purpose data in columns C and D of Sections A, B and C. Similarly, the Refrigerated Warehouse Column (Column G + H) in Section D reflects the total of chill and freeze data in Columns G and H of Sections A, B and C. The 7 "Main Columns" are as follows:

SFMR Column(s)	Category Code	Facility Description
C+D	441-10	General Purpose Warehouse (includes MARCORPS CCN's 441-11, 441-13 and 441-14)
E	441-20	Controlled Humidity Warehouse
P	441-30	Flammables/Hazardous Materials Warehouse
G+H	431-10	Refrigerated Warehouse
I	441-35	Shed Storage Facility
J	441-70's	Special Supply Operations Facilities (See "Break-out Columns" below)
M	451-10	Open Storage Facilities (Improved)

Break-out Columns. There are 3 columns in Section D used for "Break-out" of data in the "Main Column" containing data totals for "Special Supply Operations" (Column J) in the 441-70 series. Data in Column J of Sections A, B, and C of the SFMR reflect the totals for the 3 categories of "Special Supply Operations" identified in the "Break-out" columns of Section D as follows:

SFMR Column	Category Code	Facility Description
J-O	441-71	Integrated Logistics Overhaul (ILO) and Outfitting Building
J-S	441-72	SERVMART Facility
J-M	441-73	Material Turned Into Store (MTIS) Facility

Descriptions of these Supply Storage Facilities are furnished in Category code sequence in Sections 431, 441 and 451.

3. General Comments on use of the SFMR for Support of BFR Documentation.

a. Worksheet and Printout Versions. The SFMR format printed in NAVSUPINST 4450.22A and reprinted for convenience in Section 440A of this publication is the “Worksheet” version that is used for the initial SFMR submission by activities reporting to NAVSUP for the first time. It may also be used by non-reporting activities as a tool for developing computations in support of BFR documentation.

It will be noted that the “Worksheet” version of the SFMR contains clear blocks, shaded blocks and cross-hatched blocks. Clear blocks are for "raw" input data; shaded blocks are for data entries that are mathematically derived by formulas on shaded lines that use data on other lines; crosshatched blocks are not to be used. The ADP printout version of the SMFR uses pointed brackets to identify lines or portions of lines that contain clear blocks on the “Worksheet” version and on which "raw" input data are entered.

Activities reporting on the SFMR use the ADP printout version (after initial submissions on the “Worksheet” version) to annotate new or change data on the most recent NAVSUP ADP printouts. Annotated entries include entry of all "raw" new or change input data on bracketed lines. Annotations also include follow-on entry of new/change computed values on unbracketed lines (shaded on Worksheet); computations are based on formulas printed in the line description for each unbracketed/shaded line and are performed to verify the accuracy and intent of annotated “raw” input data. Verified data on bracketed/unshaded lines (or portions of such lines) are entered on transmittal sheets for keypunching. Data on unbracketed/shaded lines are not entered on transmittal sheets for keypunching since data for these lines will be computer-generated on follow-on ADP printouts.

One copy of a fully annotated ADP printout or fully completed “Worksheet” version of the SFMR, with transmittal sheets containing all raw input data for keypunching, is submitted by the reporting activity to NAVSUP for ADP processing as an updated or initial report printout. Two copies of the ADP printout are furnished by NAVSUP to the reporting activity, one copy is furnished to the cognizant NAVFAC Engineering Field Division and one copy is furnished to the cognizant subclaimant command. One of the two copies furnished to the reporting activity by NAVSUP is subsequently annotated with new/change data by the activity and returned to NAVSUP as the new report submiss ion.

b. General Comments on Data Entries in Section D of the SFMR. With the exception of 6 lines, all data entries on Lines 18a through 22b of Section D will be expressed in terms of thousands of units, carried to 2 decimal positions: e.g., 54,324 will be entered as 54.32; 54,325 will be entered as 54.33. The exceptions are Lines 18a, 19a, 21a, 21b and 21c. Data on these lines will be expressed in units carried to 2 decimal positions; e.g., a "Projected Requirements Decimal Multiplier" of 1.25 on Line 18a, 10.00 feet of stacking height on Line 19a or 19b, and SF per NS Multiplier of 2.32 on Line 21a, 21b or 21c. For reference and convenience purposes, these 6 lines as well as Line 23 (for entry of BFR approval date) are preceded by an asterisk (*) on the ADP and Worksheet versions of the SFMR as well as in the instructions for entering data on these lines in Item 4 below.

4. Procedures for Data Entries on Format of Section D of the SFMR. Procedures given below are to be used in determining BFR Allowance values for the 4 standard units of measures applicable to storage and warehousing facilities. These are TCF, SH (or nsh), NS and SF (or SY). See Section 440A, Part B for details. Instructions are for all columns with specific guidance pertaining to the "Column J Break-out" columns when necessary for clarity.

Step 1: Determine Projected TCF Requirements for the Activity's FYDP.

*Line 18a. "Projected Requirements Decimal Multiplier". This line is applicable to any column/type of space having an entry for current M/Ts of Material in Store on Line 13f of the SFMR. If there is an entry of M/Ts in Store on Line 13f in Column J, such M/Ts will have to be distributed to the "Break-out Columns" (on backup documentation) in order for Line 18a to be applicable to the "Break-out Columns". Using procedures in Item 1 of Part C above, determine if there is to be a change in "baseline" data on Line 13f during the activity's FYDP. Enter 1.00 on Line 18a in any column in which there is to be no change in M/Ts of Material to be Stored: enter 1.25 if there is to be an increase of 25 percent; enter .90 if there is to be a decrease of 10% etc. If M/Ts of material are projected for storage in a type of facility that does not currently exist, the projected amount should be entered directly on Line 18c in the applicable column(s). Prepare back-up documentation to justify any entries on Line 18a other than 1.00 and all entries on Line 18c for facilities that do not currently exist. Retain/submit justification documentation as required by Item 5 below.

Line 18b. "Empirical Value of M/Ts of Material to be Stored (18a X 13f)". Enter in any column the value obtained by multiplying Line 13f by Line 18a in each column, as applicable. The result(s) is/are the apparent M/Ts of material that are to be stored. ADP applies on printouts for (bracketed) "Main Columns" only. Raw input data (equal to Column J data) distributed to "Break-out Columns" must be entered on Transmittal Sheet 2 for keypunching and ADP processing.

Line 18c. "Projected Value of M/Ts of Material to be Stored".

For Existing Facilities. If, in any column, there is currently an M/T value that is within 10% of the empirical value on Line 18b, it is not necessary to change the value on Line 18c unless desired. Enter the empirical value (Line 18b) as the projected value if there is no current projected value on Line 18c that is within 10% of the empirical value.

For Non-Existing Facilities. If, for any type of non-existing facility, a requirement to store a quantity of M/Ts of material has been determined in Item 1 of Part C above, enter the required quantity on Line 18c in the applicable column.

Transposition of data. If, for example, there is an entry on Line 18b indicating a projection of 10,000 M/Ts of material to be stored in general purpose warehouse space, and if 600 of these M/Ts are justified as requiring controlled humidity warehouse space that does not currently exist, such data should be "transposed" on Line 18c as follows:

Line Number	G. P. Warehouse (441-10)	C. H. Warehouse (441-20)
18b	10,000	
18c	9,400	600

Similar procedures may apply to transpositions of projected M/Ts of material to be stored from unimproved open storage to improved open storage, or from open storage to shed storage, etc. Transpositions can be to types of facilities that currently exist or do not exist. Provide backup data with BFR submiss ions : see Item 5 below.

Line 18d. "Empirical Value of TCF Allowed in Bin, Rack and Bulk Storage Areas (78.4 TCF per M/T X 18c or 18b if 18c is blank)". Compute and enter values using the given formula in any column, as applicable. ADP applies on printouts.

Line 18e. "Proposed/Approved BFR Value of TCF Allowed".

For Existing Activities. If, in any column, there is currently an approved BFR value within 10% of the empirical value on Line 18d, it is not necessary to change the value on Line 18e unless desired. Conversely, enter the empirical value (Line 18e) as the proposed BFR value if there is no current approved BFR value within 10% of the empirical value.

For New Activities. If TCF Requirements for new activities have been determined by type of space using procedures in Item 2 of Part C above, enter the required quantity of TCF on Line 18e in the applicable columns(s). Lines 18a through 18d will not apply to new activities. Furnish backup data with BFR submissions; see Item 5 below.

STEP 2: Determine Allowable SH and nsh Values.

*Line 19a. "Values for Existing Facilities (nsh from line 11d for Columns J and M; SH from Line 10d for other columns)". For existing facilities only, enter values as indicated in Line Description. If there is an entry in Column J, enter the applicable value(s) in the "Break-out Columns", as appropriate. If more than one type of Special Supply Operations facility currently exists, compute the nsh value for each type of facility by dividing the total Attainable Cubic Feet (ACF) by the total Net Square Feet (NS) applicable to each type of facility. For guidance, see Part B above and Definitions of Terms in Section 440A. Also, see NAVSUPINST 4450.22A and use Storage Unit

Reports (NAVSUP Form 605) in accordance with NAVSUP Manual, paragraph 27028. ADR applies on printouts for “Main Columns” only. Raw input data in "Break-out Columns" must be entered on Transmittal Sheet 2 for keypunching and ADP processing. See Item 5 below regarding backup worksheet data for "Break-out Columns".

*Line 19b. "Values for Required Non-Existing Facilities Not on Line 18a". For non-existing facilities only, enter proposed SH and nsh values, Do not enter values on this line in any column if there is a value for existing facilities on Line 19a in the same column. For open storage facilities, enter a value of between 4 and 10 feet nsh. If possible, select a value comparable to the average nsh value for an open storage facility at a similar type storage activity. For SERVMARTS, suggest use of 4 feet nsh for display gondola port ions, 7 feet nsh for bin shelving portions and up to 12 feet nsh for rack portions. For Outfitting, IL0 and MTIS facilities, suggest use of up to 12 feet nsh for rack portions and 4 feet nsh for other portions. Preliminary planning and layout sketches should be developed for SERVMARTS, MTIS ILO and Outfitting facilities before selecting nsh values. For all other non-existing covered storage facilities normally use 10 feet SH for BFR purposes. For BFR documentation purposes, “nsh” allowances for open storage facilities and for Special Supply Operations facilities will be identified as “SH” allowances.

NOTE: SH Allowances developed in accordance with the above procedures are for BFR purposes only. For SH values applicable to modernization or new construction planning, guidance in Section 440C applies.

STEP 3: Determine Projected NS Allowed.

Line 20a. "Empirical Value (18e divided by 19a or 19b; or, 18d divided by 19a or 19b if 18e is blank)". In each column, compute the applicable NS Allowed using the given formula, as appropriate. ADP entries apply on printouts.

Line 20b. “Proposed/Approved BFR Value”. In any column, if there is currently an approved BFR value that is within 10 percent of the empirical value on Line 20a, it will not be necessary to change the value on Line 20b unless desired. Conversely, enter the empirical value (Line 21a) as the proposed BFR value if there is no current approved BFR value within 10 Percent of the empirical value in any column(s),

STEP 4: Select An Appropriate SF per NS Multiplier.

*Line 21a. Compute and enter value using the given formulae as applicable, in each “Main” column. Compute values for Lines 9d and 2c and then apply the given formula (9d x 2b) for “Break-out columns”. This will require supplemental worksheet data for “Break-out columns”. See Item 5 below. ADP entries apply on printouts of Main Columns only. Raw input data in “Break-out Columns” are entered on Transmittal Sheet 2 for keypunching and ADP processing.

LINE 21b. “Empirical Value Based on the Activity’s Croup Average.” Data on this line will be entered by NAVSUP on ADP Printout versions of SFMR and will represent average values by type of space for the activity’s group

For example, if the activity is a shipyard, the latest average values for all shipyards will be entered by NAVSUP by type of space. Average values as of June 1983 are furnished for refrigerated facilities in Table 431-10B of Section 431, and for other types of facilities (except "Break-out" facilities) in Table 440B-3. Historical data for "Break-out" facilities is not currently available but will be added to Line 21b on ADP printouts when available.

*Line 21c. "Proposed/Approved BFR Value". For existing facilities, normally use the activity's actual SF value divided by the actual NS value for each type of space at the activity; i.e., normally use data on Line 21a. If actual value is questionable, the applicable activity group average value or some intermediate value may be used, if determined applicable and justified (see item 5 below) in support of BFR documentation. For non-existing facilities, use the applicable activity group average value on Line 21b.

NOTE: As with SH values above, these SF per NS Multiplier values are for BFR purposes only. For SF per NS multiplier values applicable to modernization or construction planning, guidance in Section 440C applies.

STEP 5: Determine Projected SF Allowed.

Line 22a. "Empirical Value (20b X 21c or 20a X 21c if 20b is blank)". Compute and enter value using the given formulas, as applicable in each column. ADP applies on printouts.

Line 22b. "Proposed/Approved BFR Value". In each column, if there is currently an approved BFR value that is within 10 percent of the empirical value on Line 22a, it is not necessary to change the value on 22b unless desired. Conversely, enter the empirical value (Line 22a) as the proposed BFR value if there is no current approved BFR value within 10 percent of the empirical value. Alternatively, the approved BFR value may be correct for existing facilities on the basis of experience, even though it deviates from the empirical value by more than 10 percent. In this event, the applicable SF per NS Multiplier on Line 21c may be incorrect and in need of analysis and change.

*Line 23. "Date(s) of Approved BFR". If, in any column, the TCF, NS and SF values entered on Lines 18e, 20b and 22b, respectively, are all within 10 percent of NAVSUP and NAVFAC approved BFR documentation, enter the month and year of such approval. For example, if the applicable date is April 1984, enter "0484". Conversely, leave the line blank or delete a prior approval date (with "0"/zero entry) in any column which does not have BFR approved values or values within 10 percent of empirical values on all 3 of the applicable lines. Alternatively, date entries and deletions may be made by NAVSUP.

NOTE: See Sample Problem Number 1 in Section 440C of this publication for sample computations using the format of Section D of the SFMR.

5. Submission of BFR Documentation for Storage Space Requirements

a. Navy Activities Reporting on the SFMR. Activities reporting on the SFMR will prepare BFR data in Section D of the SFMR in accordance with procedures given in Item 4 above. Additionally, when back-up justification

documentation is required by procedures in Item 4 above for Lines 18a, 18c, 18e, 19a, 21a and/or 21c, detailed back-up justification must be developed and retained by the activity for “call up” submission to NAVSUP or other commands, if required. Such detailed justification will be included with submissions of MILCON project documentation to support data used in the “Equivalency Statement” and in reconciliation of BFR/deficiency data with MILCON data. See procedural requirements in Parts C and D of Section 440C.

Summary justification comments of the detailed back--up justification documentation retained at reporting activities will be developed for Lines 18a, 18c, 18e and/or 21c, as applicable (not required for Lines 19a and 21a). These summary comments will be developed for entry in the “Remarks” Section of the SFMR and will be keyed to the applicable line number and column alpha character code. See guidance for preparation of ADP Transmittal Sheet 3 in NAVSUPINST 4450.22a. The following guidance applies to preparation of summary justification comments for the “Remarks” Section of the SFMR:

Line No.	Guidance
18a	Furnish summary justification for any value on Line 18a other than 1.00. Explain why there is an anticipated increase or decrease in the current M/Ts in Store reported on Line 13f. List summary data for each major element of anticipated change.
18c&18e	Furnish summary justification for any value on Line 18c or Line 18e that is in a data column for a type of facility that does not currently exist at the activity, and/or in which there is value for M/Ts of Material in Store on Line 13f. Explain with summary data each aspect of “transposition” and/or basis for new M/T or TCF requirements.
21c	Furnish summary justification for any value on Line 21c that differs from the empirical value on Line 21a in the same column. Procedural guidance for Lines 21c and 22b are both applicable.

When it is riot feasible to adequately summarize justification documentation in the “Remarks” Section of the SFMR, submitted supplemental document&ion to NAVSUP and prepare a short comment for the “Remarks” Section that references the dated supplemental documentation.

All summary justification “Remarks” will be retained on SFMR printouts until deleted. See instructions for Transmittal Sheet 3 in NAVSUPINST 4450.22a.

Section D data and related “Remarks” developed in accordance with the foregoing will be submitted to NAVSUP (along with new/change data for Sections A, B, C and E and related “Remarks”) with Transmittal Sheets 2 and 3, respectively. Such submissions will provide for NAVSUP key-punching/ADP processing of new/change data and “Remarks” in consonance with the provisions of NAVSUPINST 4450.22a.

Upon review and technical approval of empirical or proposed BFR values for TCF, SH, NS and SF, NAVSUP will forward such values along with a copy of the SFMR printout to NAVFAC for review, administrative approval and entry of approved TCF, SH and SF values into the Shore Facility Planning System.

b. Navy Activities not Reporting on the SFMR. For activities not reporting on the SFMR, the same data preparation procedures given above can be followed for manual entry of data in the format of Section D of the SFMR. Such data with related back-up justification documentation should be forwarded to NAVFAC Engineering Field Divisions in accordance with NAVFACINST 11010.44.

c. Marine Corps Activities. All Marine Corps activities are required to report BFR information on the SFMR. BFR's submitted to Headquarters Marine Corps for approval should, therefore, be consistent with the SFMR and should be based on the data contained in sections A, B, and C. Preparation and submission of the BFR and any other backup documentation should be in accordance with Marine Corps Order P11000.12.

d. Additional Guidance. If additional guidance is desired, contact the Warehousing, Equipment and Systems Branch at NAVSUP on AVN 227-2358 or 227-1100. MARCORPS activities should contact MARCORPS Headquarters, Supply Management Section on AVN 224-1474 or the Facilities Branch on AVN 224-1369.

TABLE 4408-1

Storage Space Allowances in Gross Square Feet (SF) and Total Cubic Feet (TCF) for Navy and Marine Corps Aircraft with a Stacking Height OF 10 Feet

Type Aircraft Supported (For aircraft not listed use allowances for a similar type aircraft)	Type Space and Cat. Codes					
	Warehouse		Shed		Open Storage	
	441-10 20/30/40		441-35		451-10	
	SF	TCF*	SF	TCF*	SF	TCF*
VF F-4, F-8	382	1,736	8	64	110	312
VF F-14	407	1,850	8	64	115	326
VA A-4, A-7, AV-8	407	1,850	8	64	115	326
VA A-3, A-5, A-6	407	1,850	8	64	120	340
VP P-2, P-3	713	3,241	51	408	225	638
VR C-1, C-47, C-117, C-119, C-131	356	1,618	15	120	125	355
VA C-54, C-118, C-121, C-130	534	2,427	30	240	200	507
VS S-2, S-3	407	1,850	8	64	115	326
VU C-45, U-l, U-11	254	1,155	5	40	50	142
VU U-16	356	1,618	15	120	125	355
VT T-28, T-34	178	809	5	40	50	142
VT T-l, T-2, T-29. T-33, T-39	382	1,736	8	64	110	312
VO O-1, OV-10, U-6, U-11	178	809	5	40	50	142
H H-1, H-13	178	809	5	40	50	142
H H-2, H-3, H-19, H-34, H-46	254	1,155	8	64	75	213
H H-53	356	1,618	15	120	125	355
VW E-1, E-2	916	4,164	51	408	275	780

* TCF allowances in this table dre constant for all combinations of NS X SH. The SF allowances in this table are based on an SH of 10 feet for warehouse and shed facilities and a SH of 4 feet for open storage facilities. NS values for each pair of TCF and SF in the table can thus be determined by dividing TCF values for covered storage facilities by 10 feet SH and for open storage facilities by 4 feet SH. The applicable SF/NS Multipliers used in developing the table are 2.20 for warehouses, 1.25 for sheds and 1.41 for open storage facilities.

Normally, only the TCF allowances in the table will be used in developing requirements for existing facilities; both the TCF and SF allowances may be used (with related SH and NS allowances) for developing requirements when the type facility for which all such allowances are used does not currently exist at the activity for which requirements are being developed; requirements planning guidance in Section 440B applies.

TABLE 440B-2

Storage Space Allowances in Gross Square Feet (SF) and Total Cubic Feet (TCF)
Per Man Per Month with a Stacking Height of 10 Feet

Installation Military Strength**	Type Space and Cat. Codes					
	Warehouse 441-10 20/30/40		Shed 441-35		Open Storage 451-10	
	SF	TCF*	SF	TCF*	SF	TCF*
First 4,000	15.27	64.98	2.03	15.98	5	16.26
Next 2,000	10.18	43.32	1.52	11.97	3	9.76
Next 2,000	5.09	21.66	0.51	4.02	2	6.50
All above 8,000	3.05	12.98	0.00	0.00	0	0.00

* The TCF allowances in this table are constant for all combinations of NS X SH. The SF allowances in this table are based on an SH of 10 feet for warehouse and shed storage facilities and an SH of 4 feet for open storage facilities. NS values for each pair of TCF and SF values in the table can thus be determined by dividing TCF for covered storage facilities by 10 feet SH and for open storage facilities by 4 feet SH. The applicable SF/NS Multipliers used in developing the table are 2.35 for warehouses, 1.27 for sheds and 1.23 for open storage facilities.

Normally, only the TCF allowances in the table will be used in developing requirements for existing facilities; both the TCF and SF allowances may be used (with related SH and NS allowances) for developing requirements when the type facility for which all such allowances are used does not currently exist at the activity for which requirements are being developed; requirements planning guidance in Section 440B applies.

** In the case of Naval Air Reserve Stations, authorized military strength will include active duty personnel on a 100 percent basis, plus inactive reserve (weekend) personnel on a 25 percent basis, except in the provision for clothing storage and issue wherein the inactive reserve personnel will also be included on a 100 percent basis.

TABLE 440B-3

Gross Square Feet (SF) Multipliers Applicable to Net Square Feet (NS) Allowances for Traditional Low-Rise Storage Facilities in Category Groups 440 and 450*

Type of Activity Group	441-10's	441-20	441-30	441-35	441-70's	451-10
Air Installation Facilities (Navy)	2.51	1.68	1.67	1.25	1.90	1.44
Air Installation Facilities (Marine Corps)	2.02	1.47	1.81	1.04	2.54	1.29
Marine Corps Ground Activities	1.81	1.84	1.49	1.38	1.43	1.19
Communications Stations	2.13	1.03	1.03	1.03	1.03	2.78
Security Group Activities	1.43	1.03	-	1.03	-	-
RDT&E Activities (Under CNM)	1.83	3.50	1.34	1.55	1.94	1.23
RDT&E Activities (Miscellaneous)	1.55	-	2.06	-	-	1.46
Naval Stations	2.34	1.33	1.35	1.25	1.80	1.23
Naval Weapon Stations	1.63	3.42	1.46	1.06	2.86	1.24
Supply Activities	2.49	1.67	2.60	1.78	2.94	1.88
Training Activities	2.38	2.88	1.88	1.37	1.85	1.26
Shipyard and Ship Repair Facilities	2.08	2.06	1.55	1.14	1.67	1.34
Medical Activities (Hospitals, Dispensaries)	2.52	1.42	1.03	1.03	1.03	1.10
Construction Battalion Centers	1.50	1.44	1.49	1.43	1.89	1.94
Miscellaneous Navy Activities (Activities above not included in)	1.65	1.57	1.37	-	1.46	1.52
Total Navy Average	2.14	1.46	1.71	1.33	2.35	1.61

* SF per NS Multipliers for warehouse facilities are average historical values that are based on traditional low-rise warehouses with wide aisles for counterbalanced forklift truck operations. For existing activities, these values are furnished to assist the planner in evaluating actual SF/NS Multipliers; such actual values for activities reporting on the SFMR are determined and printed by ADP on Line 21a of the SFMR; Line 21b of the SFMR exhibits average SF/NS Multipliers for the "Type of Activity Group" of which the reporting/planning activity is a part. The SF/NS Multipliers in this table and those appearing on Lines 21a and 21b of the SFMR are to be used in developing BFR documentation for traditional low-rise facilities. If new construction of high-rise, state-of-the-art facilities is planned, guidance in Section 440C applies.

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SECTION 440C

GUIDELINES FOR PLANNING AND SIZING WAREHOUSE CONSTRUCTION AND MODERNIZATION PROJECTS

The technical planning information provided in this section is as follows:

PART A: General Planning Guidance

PART B: Warehouse Bay Sizes, Elevations and Configurations

PART C: Project Planning Criteria

PART D: Warehouse Sizing Procedures and Sample Problems

PART E: Additional Planning Guidance

PART A: GENERAL PLANNING GUIDANCE. In view of recent state-of-the art advances in integrated warehousing facilities and equipment systems and congressional removal of dollar restrictions per square foot of new construction, Clear Stacking Height (SH) design constraints are discontinued. Guidance in selecting appropriate values of SH for use in preparing documentation for submission of warehouse construction projects is available in NAVSUP Publication 529, "Warehouse Modernization and Layout Planning Guide" (1984 Revision). Empirical data in this publication and recent construction experience indicate that on a life-cycle total system cost basis, traditional low rise warehouses with low SH values and large building "footprints" are significantly more costly to construct and operate than modern high rise warehouses with high SH values and reduced footprints having the same Total Cubic Feet (TCF) capacity in net storage areas. Experience indicates that savings realized in facility construction costs (i.e., brick, mortar, etc.) by building modern high rise rather than traditional low rise warehouses are typically more than adequate to cover the cost of high rise storage aids and companion narrow aisle high reach material handling vehicles. If the material handling vehicles are used for unit load handling or order picking of materials in storage rack/bin areas and are guided by floor or overhead truss mounted rails or by electronic guidewire buried in the floor, the storage aids and companion handling vehicles can sometimes be procured with construction funds as built in equipment. For- additional information or assistance, contact the NAVSUP, Navy Warehouse Utilization Program Manager, on AV 227-2358 or 227-1100.

The NAVSUP Pub 529 includes warehouse modular layout drawings and system selection/design criteria for use in developing functional warehouse configurations, bay sizes and elevations. The system selection and design criteria are based on current state-of-the-art storage and handling total system concepts. The Pub 529 criteria provide preliminary comparative costs for alternative combinations of facilities, equipment and manpower. The criteria are based on projected daily issues and replacement transactions and on quantities of material to be stored evaluated by material groupings. These criteria are also applicable to modernization within existing high bay structures such as heavy duty warehouses with craneways no longer in use and aircraft hangars no longer required for aircraft operations. Subsequent to

development of functionaldesign based on use of NAVSUP Pub 529, follow-on Architect-Engineer designs should be developed using complementary guidance in NAVFAC DM 32.2, "Covered Storage" and NAVFAC P-272, "Definitive Designs for Naval Shore Facilities" (Drawings 1404208 through 1404214). See additional planning guidance in Part E below.

PART B: WAREHOUSE BAY SIZES, ELEVATIONS AND CONFIGURATIONS. Modular drawings in Sections 21 and 22 of NAVSUP Pub 529 include bay sizes and elevations for different storage/handling systems. Exact bay sizes in each case should be determined on the basis of total system analysis and selection in accordance with Section 17 of the NAVSUP Pub 529. If warehouses must be built urgently and functional storage/handling system layouts are to be planned at a later date, the universal bay size (33′ by 64′) furnished in Table 1 of the NAVFAC DM 32.2 and used in NAVFAC Definitive Drawings 1404208 through 1404214 should normally be used, Layout of bays should be planned to configure a building that is approximately square since the perimeter walls to floor space ratio is most efficient in terms of construction and operating costs in that arrangement. See details in NAVFAC DM 32.2 and Section 17 NAVSUP Pub 529.

Recent availability of electronically guided forklift/pallet handling/ order picking trucks that are capable of reaching storage heights of 45 feet and of storage/retrieval (S/R) machines capable of reaching heights of over 80 feet provides an opportunity to significantly increase the density of storage per square foot of floor and land area. This is particularly advantageous in congested tidewater areas where land is scarce and any reduction in facility "footprint" requirements can be significantly beneficial. Thus, the basic envelope of a modern warehouse should be a square building with a high ceiling.

The development of expandable construction techniques that utilize concrete, metal and other panel type walls permits the design of warehouse buildings that are capable of expanding with a minimum of building modifications. If a self supporting steel frame and roof structure is used with curtain type walls, size can be flexible. When coupled with the concept of cyclic "loop flow" to minimize back hauling and overall travel of material, this feature gives added credibility to the design of square buildings with a corner oriented site configuration. Section 17 of NAVSUP Pub 529 illustrates a site pattern with the rail and truck dock access at right angles and with the high capital investment facilities (restrooms, other employees facilities, mechanical equipment systems, etc.) in the corner of the junction of the rail and truck docks. By locating mezzanines over low bay functional areas such as bulk storage areas, docks, personnel facilities, supervisory offices, material identification and screening, etc., the roof above such areas can be designed to be at the same level as the roof over high bay storage areas. Mezzanines may be used for support functions such as personnel support facilities, assembly, preservation, packaging and packing. Bin, mini-S/R and carousel storage can also be considered for mezzanine levels. See Sample Problem Number 3 in Part D below. Dock designs should be developed in accordance with guidance in NAVFAC DM 32.2 and Section 23 of NAVSUP Pub 529.

PART C: PROJECT PLANNING CRITERIA. Criteria fur planning and programming new construction or modernization/expansion within existing facilities are as follows:

1. Determine BFR allowances by facility category code using procedures in Section 44OB of NAVFAC P-80.

2. For each facility category code, determine portions of BFR allowances that are deficient in terms of the following units of measure as defined in Section 44OA of NAVFAC P-80.

a. Total Cubic Feet (TCF)

b. Stacking Heiyht (SH or nsh)

c. Net Square Feet (NS)

d. Gross Square Feet (SF)

3. Plan facility sizing for the proposed construction or modernization project on the basis of the following two criteria:

d. Maintain the planned TCF value approximately equal to the allowable BFR deficiency value.

b. Maintain the allowable BFR deficiency value of the SF minus NS "delta" (difference) as a maximum value in layout planning.

4. Upon completion of project planning and facility layout, summarize applicable BFR and project data in the following "Equivalency Statement":

"This facility of_____Total cubic Feet (TCF) with _____Net Square Feet (NS) and _____Gross Square Feet (SF) at an Average Clear Stacking Height (SH) of_____feet is EQUIVALENT TO a BFR deficiency allowance of_____ TCF with_____NS and_____SF for an SH of _____feet." AN EQUIVALENCY STATEMENT IS TO BE INCLUDED ON ALL PROJECT DOCUMENTATION TO SHOW RECONCILIATION OF THE PROPOSED PROJECT SCOPE WITH THE ALLOWABLE BFR DEFICIENCY VALUES.

PART D: WAREHOUSE SIZING PROCEDURES AND SAMPLE PROBLEMS. The following sample problems are developed on succeeding pages to facilitate explanation of sizing procedures that are based on project planning criteria in Part C above:

Sample Problem Number 1 is a MILCON sizing problem based on satisfying the total BFR allowance for controlled humidity space. The problem involves replacing an entire existing warehouse comprised of both Storage Area (SA) facilities and Support (S) facilities. See Definitions and Lines 7 through 7g of the Supply Facility Management Report (SFMR) exhibited in Section 440A of NAVFAC P-80.

Sample Problem Number 2 is a MILCON sizing problem based on satisfying a portion of the total BFR allowance for general purpose warehouse space. The problem involves replacement of some existing substandard SA and S facilities plus an addition of SA and S facilities to satisfy new mission requirements.

Sample Problem Number 3 furnishes sample guidance in combining several types of warehouse space and functions into a single structure. The problem involves utilizing multiple floor level construction as well as high rise single floor level construction resulting in a single level roof and a relatively square footprint.

SAMPLE PROBLEM NUMBER 1

This is a MILCON sizing problem based on satisfying the total BFR allowance for a controlled humidity warehouse. The problem involves replacing an entire existing warehouse containing both SA and S facilities.

1. Sample BFR Computations

ASSUME :

a. Replacement of the one existing functionally and structurally substandard controlled humidity warehouse, Category Code 441-20, at a Naval activity currently reporting on the SFMR. The warehouse comprises both SA and S facilities.

b. BFR values computed/entered on Lines 18a through 22b of the activity's SFMR as given below are approved as BFR allowances.

GIVEN:

SFMR Line No.	Quantity	Description
13f	8116.9	Apparent M/Ts of material currently in store
18a	1.10	Projected increase of 10% in quantity of M/Ts to be stored, stated as decimal multiplier.
18b	8928.6	Projected M/Ts of material to be stored (13f X 18a)
18d	700,000	Projected TCF allowed (18b X 78.4 TCF per M/T)
10d & 19a	10 feet	Average SH value of existing facilities
20a	70,000	Projected NS allowed (18d divided by 19a)
21a & 21c	2.142	Existing/Projected SF/NS Multiplier for SH value of 10 feet (9d X 2b)
22b	150,000	Projected SF allowed (20a X 21c)

SUMMARY OF ALLOWABLE BFR DEFICIENCIES:

700,000 TCF
10 Feet SH
70,000 NS
150,000 SF
80,000 SF minus NS “Delta”

COMMENTS:

a. The allowable TCF can be satisfied by any combination of NS X SH that equals 700,000 TCF. For example: 10’ SH X 70,000 NS or 35’ SH X 20,000 NS or 70' SH X 10,000 NS = 700,000 TCF.

b. The 80,000 SF “Delta” is the maximum area allowed for Support (S) facilities and for aisles and structural loss in Storage Area (SA) facilities. See Definitions and Lines 7a through 7d of the SFMR in Section 440A of NAVFAC P-80.

2. MILCON Sizing Computations.

PROCEDURES:

Use NAVSUP Pub 529 system selection criteria and standard modular layout/elevation drawings.

b. Hold allowable TCF constant in determining NS allowable values for any SH values selected using NAVSUP Pub 529 guidance.

c. Develop functional layout. Total SF of layout should not exceed NS of layout plus Allowable SF minus NS “Delta.” If good layout practice is applied, the “Allowable Delta” will typically be considerably in excess of layout requirements.

d. Develop an “Equivalency Statement.”

ASSUME:

a. MILCON Scope is defined by allowable BFR deficiencies summarized in Item 1 above.

b. A 35 foot SH turret truck/rack system is selected as the least cost total system alternative, based on NAVSUP Pub 529 system selection criteria that include comparative costs for facilities, equipment and handling labor.

c. Planning and layout efforts evolve the following:

(1) NS = 20,000 (700,000 TCF divided by 35’ SH)

(2) SF = 62,000 based on layout. This is less than the 100,000 SF allowed (20,000 NS plus 80,000 SF “Delta”)

COMMENT:

The SPINS Multiplier for the above equals 62,000 SF/20,000 NS or 3.1. This compares favorably with SF/NS Multipliers for comparable 32 foot SH turret truck/rack systems planned or constructed recently. For example, a 3.3 ratio applies to a 32,000 SF facility with a turret/rack system and a 4.0 ratio applies to a 13,000 SF facility with a turret truck/rack system. Note that the SF/NS ratio decreases as the building size increases. The SF/NS ratio will also vary from one type storage/ handling system to another. The Total SF of a warehouse facility is equal to the total of its S and SA (if any) segments. Note on modular layout drawings for storage/handling systems in Sections 21 and 22 of NAVSUP Pub 529 that the SA/NS ratio will vary from one system to another. The SA/NS ratio is basically a function of storage aisle and cross aisle widths; the narrower the aisles, the lower the SA/NS ratio and, therefore, the lower the SF/NS ratio.

EQUIVALENCY STATEMENT:

The following Equivalency Statement reflects the above and is to be entered on submissions of applicable construction project or modernization/expansion project documentation: "This facility of 700,000 TCF with 20,000 NS and 62,000 SF at an SH of 35 feet IS EQUIVALENT TO a BFR allowance/deficiency of 700,000 TCF with 70,000 NS and 150,000 SF at an SH of 10 feet."

NOTE: For additional planning information and latest data on SF/NS Multipliers for recent high rise construction projects, contact NAVSUP, Navy Warehouse Utilization Program Manager, Autovon 227-2358 or 227-1100.

SAMPLE PROBLEM NUMBER 2

This is a MILCON sizing problem based on satisfying a portion of the total BFR allowance for general purpose warehouse space. The problem involves replacement of some existing substandard SA and S facilities plus an addition of SA and S facilities to satisfy new mission requirements.

1. Sample Computations of Allowable BFR Deficiencies.

ASSUME:

d. Replacement of two general purpose warehouses, Category Code 441-10, that are structurally substandard. These are Warehouse 100, used exclusively as an S facility to perform shipping, receiving and miscellaneous support functions, and Warehouse 102 used as an SA and S facility to perform storage functions as well as miscellaneous support functions. These warehouses are at a Naval activity currently reporting on the SFMR. Backup detailed information on TCF, SH, NS and/or SF values for these storage units are contained in Storage Unit Reports (NAVSUP Forms 605) in accordance with NAVSUP Manual, Paragraph 27028. Comparable data should be maintained in Facility Planning Documents in accordance with NAVFACINST 11010.44 Series.

b. Current Category Code 441-10 assets (including Warehouses 100 and 102) are equal to current approved BFR allowances.

c. The storage activity is an air station that has been designated by higher authority to support a new type aircraft that is planned to be operational at the air station in about two years or within the current Five Year Defense Plan (FYDP). TCF allowances for the additional aircraft and personnel translate to an increase of 10 percent in the quantities of M/T's of material to be stored based on the Universal Factor of 78.4 TCF allowed per M/T of material to be stored. See sample Data/Calculations in Part C, Item l.b.(1) of Section 440B, aircraft/ personnel tables with TCF and SF allowances in Section 440B and derivation of the Universal Factor in Section 440A of NAVFAC P-80.

d. Approved BFR allowances are determined as in Sample Problem Number 1 above.

e. The applicable Table of Derived Allowable BFR Deficiencies is as follows:

Description	TCF	SH	NS	SF	SF Minus NS Delta
Approved FYDP BFR Allowances (Includes + 10%)	7,700,000	10	770,000	1,650,000	880,000
Current Asset	7,000,000	10	700,000	1,500,000	800,000
Current deficiency (w/o replacements)	700,000	10	70,000	150,000	80,000
Replace Building 100 (S Facility)	0	N/A	0	120,000	120,000
Replace Building 102 (SA and S Facility)	1,300,000	13	100,000	240,000	140,000
Allowable BFR Deficiencies (with replacement of Bldgs 100 and 102)	2,000,000	11.76	170,000	510,000	340,000

COMMENTS:

a. The Allowable TCF Deficiency can be satisfied with any single combination or multiple combinations of NS X SH that equal a total of 2,000,000 TCF.

b. The 340,000 SF “Delta” is the SF maximum allowed for Support (S) facilities and for aisles and structural loss in Storage Area (SA) facilities.

c. Note that Building 100 has no Storage Area (SA) facilities and, therefore, it has no TCF, SH or NS values.

2 . MILCON Sizing Computations.

PROCEDURES:

Use procedures outlined in Sample Problem Number 1 above.

ASSUME:

a. MILCON scope is defined by Allowable BFR Deficiencies as listed in the table in Item 1 above.

b. A 50 foot SH storage/retrieval (S/R) system is selected as the least cost total system alternative for the pallet rack storage requirements listed in the table below and that a 25 foot SH order picking truck system is selected as the least cost total system alternative for the bin storage requirements listed in the table below. These selections were made on the basis of system selection criteria in NAVSUP Pub 529 that include comparative costs for facilities, equipment and handling labor.

c. The data listed in the following Table of MILCON Facility Requirements are derived from use of system selection criteria in the NAVSUP Pub 529 and reflect MILCON sizing derived from follow-on functional analysis and layout drawings.

Type Facility	Functional Area	TCF	SH	NS	SF	"Delta"
S	Shipping/Receiving Miscellaneous supplies	0	N/A	0	120,000	120,000
SA	S/R Pallet Storage	1,000,000	50	20,000	40,000	20,000
SA	Order Picking Truck -Bin Storage	1,000,000	25	40,000	120,000	80,000
SA & S	Total MILCON Facility Requirements	2,000,000	33.3	60,000	280,000	220,000

COMMENTS:

a. Note that the Planned Total MILCON Requirement of 2,000,000 TCF is equivalent to the Allowable BFR Deficiency value of 2,000,000 TCF in the Table of Derived Allowable BFR Deficiencies in Item 1 above. Similarly, note that the Planned Total MILCON Facility Requirement of 220,000 SF for the "Delta" is less than the Allowable BFR Deficiency value of 340,000 SF. Thus, the proposed MILCON sizing meets the criteria of Part C above.

b. Note that for the S/R Pallet Storage System requirement, the gross to net or SA/NS ratio is 40,000 SF/20,000 NS or 2.00. This is comparable to the SA/NS ratio entered on the modular layout drawing for this system in the NAVSUP Pub 529. Similarly, the SA/NS ratio of 120,000 SF/40,000 or 3.00 for the Order Picking Truck/Bin System is comparable to the SA/NS ratio entered on the modular layout drawing for this system in the NAVSUP Pub 529.

EQUIVALENCY STATEMENT:

The following Equivalency Statement applies to the foregoing and is to be entered on submissions of applicable project documentation:

"This facility of 2,000,000 TCF with 60,000 NS and 280,000 SF at an average SH value of 33.3 feet IS EQUIVALENT TO a BFR allowance/deficiency of 2,000,000 TCF with 170,000 NS and 510,000 SF at an average SH of 11.76 feet,"

SAMPLE PROBLEM NUMBER 3

This sample problem furnishes guidance in combining several types of warehouse functional areas into a single structure. The problem involves utilizing multiple floor level construction as well as high bay single floor level construction resulting in a flat roof with a relatively square footprint at ground level.

Assume that a decision is made to combine Total MILCON Facility Requirements of Example Problem Number 2 above into a single MILCON project.

Data developed during layout planning for the three functional segments listed in Sample Problem Number 2 are summarized below for integrated layout planning purposes:

Project Segment	Space Requirements	Location of Project Segment
Pallet Rack S tot-age Area	40,000 SF at 50' SH	Ground level adjacent Shipping/Receiving/ Misc. Support area
Shipping/Receiving/ Misc. Support Facility Area	120,000 SF*	Ground level adjacent to Pallet Rack Storage Area
Bin Storage	120,000 SF at 25' SH*	Above 120,000 SF Shipping /Receiving/ Misc. Support Area

*The height of the Shipping/Receiving/Misc. Support area should be planned SO that such height plus the 25 foot SH of the bin storage area plus the flooring/ sprinklers/other fixtures between such two floors equate to the 50 foot SH of the adjacent Pallet Rack Storage area.

The foregoing reveals that a single facility occupying a ground area of 160,000 SF (40,000 SF + 120,000 SF) and having a flat roof over such entire area at a height that is adequate to accommodate the 50 foot SH requirement in the Pallet Rack Storage area will accommodate all three project segments. One example of a configuration for such building is 400 feet long by 400 feet wide and approximately 56 feet high (outside dimensions). This scenario satisfies guidance in Part B above, in NAVFAC DM 32.2 and in Sect ion 17 of NAVSUP Pub 529 regarding the desirability of constructing high rise buildings that are relatively square and have a single roof level for economic purposes whenever possible.

PART E: ADDITIONAL PLANNING GUIDANCE. It will not always be possible or feasible to construct square buildings with a single roof level. Guidelines pertaining to factors bearing on this issue and other issues that relate to sample problems in Part D and to related discussion in the last paragraph of Part B are listed below:

1. Whenever functionally and economically feasible, consider constructing high rise SA facilities as a contiguous addition to existing low rise facilities. Use existing low rise buildings as S facilities for accommodation of support functions and as SA facilities for storage of bulk materials that cannot be stored in high rise pallet, cantilever or other type racks.

2. When a high rise warehousing facility is being planned to resolve Allowable BFR Deficiencies that include a TCF requirement for bulk storage, consider the following options:

a. Locate the bulk material SA facility on the first floor level under mezzanine levels whenever possible, using an SH value of 12 to 16 feet.

b. If it is not realistic to locate the bulk material SA facility and/or all support functions under mezzanines as proposed in Item 2.a and Sample Problem Number 3 above, respectively, or in existing/contiguous low rise struc-
tures as proposed in Item 1 above, consider the following two alternatives:

(1) Plan the construction of the new facility with two roof levels. Provide a high roof level above high rise SA facilities and a low roof level above support functions and bulk storage SA requirements.

(2) Plan the construction of the new facility with a single high roof level if future expansion of high rise SA requirements is anticipated. Locate bulk storage SA requirements and “relocate” support functions in the area of the planned structure identified for future expansion of high rise SA requirements. This scenario should be adopted only if it can be operationally and economically justified. If adopted on this basis, assume for practical purposes that the SH value chargeable to bulk storage ureas is 12 to 16 feet when computing the TCP capacity of such areas for the “Equivalency Statement” required on applicable MILCON documentat ion; use the actual SH value (3 feet below roof truss, sprinklers and other overhead obstructions) when computing the value of “TCF in Bulk Storage Areas” required for entry on Line 10c of the SFMR.

3. For a correlation between Allowable BFR Deficiency values for pallet rack areas and the number of pallets to be stored, see Section 14.3.4 of the NAVSUP Pub 529. Note that an average of about 0.8 M/T’s of material are to be Planned for storage in each pallet load location when standard Navy/DOD 108 inch wide double opening shelving is spaced on 48 inch vertical centers. Modular elevation drawings in Section 21 of the NAVSUP Pub 529 apply. Similarly, note that an average of about 1.1 M/T’s of material are to be planned for storage in each pallet load location when such shelving is spaced on 66 inch vertical centers. The modular elevation drawing in Appendix C of NAVSUP Pub 529 applies. Similar correlations are applicable to other storage

and handling systems illustrated in Sections 21 and 22 of NAVSUP Pub 529. The Universal Factor of "78.4 TCF Allowed per M/T of Material to be Stored" is applicable in such correlations.

NOTE: For additional information or assistance, contact the NAVSUP, Navy Warehouse Utilization Program Manager on AV 227-2358 or 227-1100.

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SECTION 440D

STORAGE SPACE ALLOWANCES (NS)
FOR VEHICLES IN PRE-POSITIONED WAR RESERVE
MATERIAL STOCK (PWRMS)

Activities having a mission to store and issue vehicles in pre-positioned war reserve material stock are authorized covered storage for their vehicles if they are subject to prolonged severe weather conditions.

There are two methods for determining storage space requirements for vehicles in PWRMS. The method selected should be based upon the information available and the data required.

METHOD 1.

In those instances when the dimensions of vehicles are not available, or are subject to drastic change, Table 440D-1 may be used as broad planning guidance for use in determining the gross square footage requirement for this facility, which is based upon the number and types of vehicles to be stored.

TABLE 440-DI
Storage Space Allowances (SF) Per PWRS Vehicle

Type of Equipment in PWRS	Total SF Allowance Per Vehicle
General Purpose Vehicles	220
Construction Equipment	330
Special Purpose Vehicles	330

METHOD 2.

The total net and gross square foot storage requirement can be determined when the number and type of each vehicle is known. The criteria and supporting tables are provided in the “CATEGORY CODE 440-SUPPLEMENT STORAGE SPACE ALLOWANCES(NS) FOR VEHICLES IN PREPOSITIONED WAR RESERVE MATERIAL STOCK (PWRMS)” and is located at the back of this section, starting on page 440S-1.

Covered vehicle holding space for a maintenance function will be assigned under the appropriate “shop” code. For example, covered storage for pavements and grounds equipment is assigned to Category Code 219-20; ground support equipment is assigned to Category Code 218-61; and vehicle parking areas (open) is carried under 852-10.

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CATEGORY CODE 440 - SUPPLEMENT STORAGE SPACE ALLOWANCES (NS)

FOR VEHICLES IN

PRE-POSITIONED WAR RESERVE MATERIAL STOCK (PWRMS)

VEHICLE SPACE FACTORS

Table 440-D2 provides a means of determining the amount of space (gross square feet) needed to store various types of vehicles. A vehicle space factor of 1 equals 101 square feet of floor space. To determine the space factor of a vehicle not listed multiply the vehicle length by the vehicle width and divide by 101.

VEHICLE SPACE REQUIREMENTS

The total amount of space required to store the assigned vehicles may be computed as follows:

(a) Determine the number of vehicles, by type, for which storage space is required.

(b) Assign to each vehicle the appropriate space factor obtained from Table 440D-2 and compute the total of the space factors so obtained.

(c) To determine the total net square feet required, multiply the total space factor obtained by 101.

(d) To determine the total gross feet required, use Table 44OD-3.

TCF REQUIREMENTS

To determine TCF for each vehicle group or class of vehicles, multiply the NS allowance for the vehicle group by the height of the tallest vehicle in the group. The height of the tallest vehicle in the group is the SH for the group.

See the definitions for TCF, NS and SH in Section 440A.

Therefore, for planning purposes:

$$TCF = NS \times SH$$

TABLE 440D-2
VEHICLE SPACE FACTORS

COMMERCIAL DESIGN
GENERAL PURPOSE VEHICLES

	Vehicle Space Factors
Ambulances	1.5
Bus, 12 passenger, 4 X 2	1.6
Bus, BOC, 37 passengers or less	1.6
Bus, BOC, 38 passengers & over	2.5
Bus, Integral & Convertible	3.5
Bus, Multi-Train (4 unit)	12.0
Carriers, all	2.5
Dolly Trailer Converter	0.1
Motorcycles	0.6
Scooters	0.6
*Sedans	1.0
Semitrailer, Van	0.6
Semitrailer, All others	0.4
*Station Wagons	1.0
Trailers, All	0.4
Truck, Panel	1.5
Truck, Multistop	1.0
Truck, Jeep	1.5
Truck, Pickup	1.0
Truck, 15,999 GVU & less	1.0
Truck, 16,000 - 18,999 GVW	2.0
Truck, 19,000 - 23,999 GVW	2.5
Truck, 24,000 GVW & over	3.0
Truck Tractor, 23,999 GVW & less	2.0
Truck Tractor, 24,000 - 39,499 GVW	2.5
Truck Tractor, 39,500 & Over	3.0

*When equipped with air conditioning add .1 equivalent.

NOTE: For commercial design trucks (all series) add 0.2 for four-wheel drive.

COMMERCIAL DESIGN
SPECIAL PURPOSE VEHICLES

	Vehicles Space Factors
Carrier, Amphibious, Cargo, or Snomobile	2.5
Crane, Models L-3010, MC-1, A-16	6.0
Crane, Model H-11	4.5
Dolly Trailer	0.1
Semitrailer, Van Refrigerator	2.5
Semitrailer, All Others	0.6
Trailers, All	0.4
Truck, Airfield Line Servicing	2.0
Truck, Armored Payroll	3.0
Truck, Coal	2.5
Truck, Dump, 23,999 GVW & less	2.5
Truck, Dump, 24,000 GVW & over	3.0
Truck, Dump, Off-the-Road	4.0
Truck, High Lift	3.0
Truck, High Reach	4.0
Truck, Insulator Washing	2.0
Truck, Maintenance	1.0
Truck, Material Handling	3.5
Truck, Refrigerator Van	3.5
Truck, Refuse	3.5
Truck, Tank Fuel, 1200 gal. & less	2.5
Truck, Tank Fuel, over 1200 gal.	3.0
Truck, Tank Lavatory, Waste, or Water Servicing	2.5
Truck, Tank Water/Waste	3.5
Truck, Telephone Main & Cntrn	2.5
Truck, Wrecker, 21,000 GVW & less	2.5
Truck, Wrecker, over 21,000 GVW	3.5

CONSTRUCTION AND BASE MAINTENANCE EQUIPMENT

Batching Plant	1.5
Compactor, Engine Driven	4.0
Concrete Block Crane, Crawler & Truck Mounted, 20 ton &, less	5.5
Crane, Crawler & Truck Mounted, over 20 ton	6.0
Crane, Towed	4.0

TABLE 440D-2
(Continued)

Vehicle	Space Factors
Crushing & Screening Plant	4.0
Digger Strainer	3.0
Distributor, Bituminous, Truck mounted	3.0
Distributor, Bituminous, Trailer mounted	1.5
Distributor, Water Truck	3.5
Ditching Machine	3.5
Drill, Rock	2.0
Dryer, Aggregate	3.0
Dryer, Mixer Bituminous/Concrete	3.0
Earth Auger	1.0
Excavator	3.0
Grader, Road Motorized	3.5
Grader, Road Towed	1.5
Grouting Machine	3.0
Heater, Bituminous	3.0
Joint Cleaning-Refacing Unit	1.0
Joint Sealing Unit	1.0
Kettle, Heating Bituminous	0.5
Loader, Aggregate	2.5
Loader, Belt	2.5
Loader, Full Tracked	4.0
Loader, Scoop	4.0
Marker, Traffic Line, Runway	6.0
Marker, Traffic Line, other than Runway	2.0
Mixer, Bituminous	2.5
Mixer, Concrete, Truck Mounted	4.0
Mixer, Concrete, Trailer Mounted	1.0
Mixer, Rotary Tiller	2.0
Paving Machine	3.0
Plow, Cable	2.5
Reeling Machine	1.5
Roller, Road Towed	0.5
Rooter, Road	1.0
Sawmill, Trailer Mounted	1.5
Scraper, Road Motorized	3.5
Scraper, Road Towed	1.5
Scrubbing Machine	1.0
Semitrailer, Tank Water Distributor	3.0
Snow Removal Unit, Bank Rotary	5.0
Snowplows, All others	3.5
Spreader, Aggregate	1.0
Sweeper, Magnetic	1.5
Sweeper, Rotary Self-Propelled	1.8

Vehicle	Space Factors
Sweeper, Rotary Towed	1.0
Sweeper, Snow Air Blast	2.5
Sweeper, Vacuum, Runway	4.0
Sweeper, Warehouse	1.0
Tractor, Tracked, Size 1 thru 4	4.0
Tractor, Tracked, Size 5 &, over	6.0
Tractor, Wheeled, Ind & Agric	2.5
Tractor, Wheeled w/Bulldozer	6.0
Trailer, Dump	1.0
Trencher	3.0
Truck, Dump, Off-the-Road	4.0
Well Drilling Machine	2.0
MATERIALS HANDLING EQUIPMENT	
Conveyor, Aggregate	1.0
Conveyor, Belt	2.0
Conveyor, Drag	1.5
Crane, Warehouse Electric	1.0
Crane, Warehouse Gas	2.0
Tractor, Warehouse Electric	1.0
Tractor, Warehouse Gas	1.0
Trailer, Cargo Loading/Unloading	0.5
Trailer, Palletized Cargo	0.8
Truck, Platform	1.5
Truck, Forklift Electric/Gas	1.5
Truck, Pallet Electric	1.5
Truck, Sideloader	1.5
Truck, Straddle Carry	3.0
Truck, Stake Airfield, Elevating or Fixed Platform	3.0
4K Forklift, 463L	1.5
6K Forklift, 4631, A/S32H-7	3.0
6K Forklift, Rough Terrain, A/S32H-13	3.0
10K Forklift, 463L, A/S32H-10	3.0
10K Forklift, Heady Duty, P100-48-AF	3.0
10K Forklift, Adverse Terrain, A/S32H-15	4.0
25K Loader, A/S32H-5	12.0
40K Loader, A/S32H-6	14.0
55K Loader, A/S32H-16	14.0
10K Rough Terrain Loader, a/S32H-12	12.0
Sled, Flatbed	0.4
Sled, Staked	0.3

TABLE 440D-2
(Continued)

MILITARY DESIGN, GENERAL PURPOSE

Vehicle	Space Factors
Ambulances	1.6
Dolly Trailer Converter	0.1
Semitrailer, Van	0.6
Semitrailer, All others	0.4
Trailers, All	0.4
Truck, 5,999 GVW & less	1.5
Truck, 6,000 - 16,999 GVW	2.0
Truck, 17,000 GVW & over	2.5
Truck Tractor, 20,999 GVW & less	2.0
Truck Tractor, 21,000 - 44,500 GVW	2.5
Truck Tractor, 44,501 GVW & over	3.0

MILITARY DESIGN, SPECIAL PURPOSE

Vehicle	Space Factors
Armored Car or Truck	2.5
Carrier, Amphibious, Cargo, or Personnel	3.0
Semitrailer, Acid	3.0
Semitrailer, Cargo Cylindrical Type	2.0
Semitrailer, Compressed Gas	3.0
Semitrailer, Fuel, 2500 gals. & less	2.0
Semitrailer, Fuel over 2500 gals	3.5
Semitrailer, Recharging LOX/N Cylindrical	3.5
Semitrailer, Runway Foaming	2.5
Semitrailer, Tank LOX/N, NTET, UDMH or N204	3.5
Semitrailer, Tank Water	0.4
Semitrailer, Tank Water/Alcohol	3.5
Semitrailer, Van Refrigerator	2.5
Semitrailer, All others	0.6
Trailer, Fire Crash	0.2
Trailer, All others	0.4
Tractor, Aircraft Towing, MB-2	5.0
Tractor, Aircraft Towing, MB-4	2.4
Tractor, Aircraft Towing U-30	8.0
Tractor, Aircraft Towing, Intermediate U-18	4.0
Truck, Airfield Line Servicing	2.0
Truck, Coal	2.5
Truck, Dump, 32,000 GVW & less	3.0
Truck, Dump, 33,000 GVW & over	3.5
Truck, Ffgf Crash (O-11 or P-2)	15.0
Truck, Ffgt Crash (O-6 or P-4)	10.0
Truck, Ffgt Crash (P-6, R-2, R-2A, P-10)	3.0
Truck, Fire Pumper	3.5
Truck, Flatbed	1.0
Truck, High Lift	3.0
Truck, High Reach	4.0
Truck, Insulator Washing	2.0
Truck, Refrigerator Van	3.5
Truck, Refuse	3.5
Truck, Tank Demineralized Water	5.0
Truck, Tank Fuel 2500 gals. & less	3.0
Truck, Tank Fuel, over 2500 gals.	6.5
Truck, Tank Liquid Nitrogen	3.0
Truck, Tank Potabale Water, 250 gals.	2.0
Truck, Tank Water	3.0
Truck, Tank Water/Waste	4.0
Truck, Telephone Maint & Cntrn, 12,500 GVW & less	1.0
Truck, Telephone Maint & Cntrn, 12,501 GVW & over	2.5
Truck, Van, 12,500 GVW & less	1.0
Truck, Van, 12,501 - 23,999 GVW	2.5
Truck, Van, 24,000 GVW & over	3.0
Truck, Wrecker	3.5

NON-REGISTERED VEHICLES AND OTHER EQUIPMENT

Vehicle	Space Factors
Aerator, Turf	0.3
Auger Attachment	0.5
Cleaner, Steam	0.5
Compressor, Air, to 600 CFM	2.0
Compressor, Air, Gasoline Engine Driven	0.5
Compressor, Air, Power Driven	0.2
De-icer H-33	5.0
De-icer, Spray Truck Mounted	5.0
Digger, Post Hole	0.5
Ditcher Attachment	0.5
Edger, Push Type and Tractor Mounted	0.5
Hoe, Back Attachment	0.5
Hose, Car, Fuel Service 0.5 Line Marker, Street & Pavement	0.4
Missile Checkout Test Station	0.8
Mixer, Application Unit	1.0

TABLE 4400-2
(Continued)

Vehicle	Space Factors
Mower, Gasoline Engine Drive, to 25"	0.3
Mower, Gasoline Engine Driven, to 76"	0.8
Mower, Towed, to 15'	0.6
Mower, Towed, Gang Type	0.5
Platform, Acft Service, A/S32H-13 (except Mtd Equip)	3.0
Pneumatic Test Set Van	0.8
Power Unit, Under 3KW	0.2
Power Unit, 3KW to 4.OKW Inclusive	0.5
Power Unit, 5KW to 14 KW Inclusive	1.0
Power Unit, 15 KW to 59 KW Inclusive	2.0
Power Unit, 60KW to 99KW Inclusive	2.5
Power Unit, 100KW to 150KW inclusive	3.0
Pump, Diaphram, Gasoline Engine Driven	0.4
Pump, Engine	0.5
Pump, Water, Gasoline Engine Driven	0.4
Saw, Chain, Gasoline Engine Driven	0.5
Screed, Gasoline Engine Driven	0.3
Sickle Bar Attachment	0.5
Snowblower, Sidewalk, Gasoline Engine Driven	0.8
Sod Cutter, Gasoline Engine Driven	0.5
Sprayer, Towed	0.5
Stump Remover, Towed	0.5
Tamper, Gasoline Engine Driven	0.5
Trailer, Airdome Utility 5000 Lb.	0.4
Trailer, Compressed Gas	1.0
Trailer, Hose Cart	0.5
Trailer, Missile Support	0.4
Trailer, Missile Transporter	2.0
Trailer, Stake	0.4
Trailer, Utility	0.2
Trailer, Van	0.4
Trailer, Warehouse	0.4
Truck, Aircraft, Prop Handling, A/32M-6	5.0
Truck Decontaminator	2.5
Trub-Fogger	0.5
Unit, Fuel Purification	0.4
Unit, Purging, Trailer Mounted	0.2
Welder, Gasoline Engine Driven	0.4
Lubrication Unit, Skid, Mtd, GED	0.5

TABLE 440D-3

VEHICLE STORAGE SPACE REQUIREMENTS

Vehicle Space Factor	Area, Gross Square Feet
25 - 50	3,600
51 - 100	7,200
101 - 150	10,800
151 - 250	18,000
251 - 350	26,280
351 - 450	32,400
451 - 650	46,800
651 - 850	59,500
851 - 1,000	74,700

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441 10 GENERAL PURPOSE WAREHOUSE (SF)

This code includes general warehouses, heated or unheated, and with/without heavy duty (overhead crane) capability, sprinkler systems and/or alarm systems. the general warehouse provides covered space for bulk and bin storage, aisle space, space for receiving, packing and crating, office space for direct warehouse supervision (non-administration) and toilet space. Facilities excluded from this category are all warehouses, storehouses, etc., assigned other category codes (see pages 440-l and 440-2 for excluded facilities). Marine Corps activities will use this category code only for Marine Corps air installations requirements in support of Navy wholesale stock point operations. These requirements will be determined by the criteria in the “Storage and Warehouse Planning Guidelines”, described on page 440-2. Marine Corps Air Installations will determine requirements for storage in support of aviation operations (without a stockpoint mission), in the same manner prescribed for Naval Air Installation. For those Marine Corps Air Installations with a stockpoint mission consult NAVSUPSYSCOM for procedural methods of determining total allowable values of SF. For guidance in determining space allowances see “Storage and Warehouse Planning Guidelines", outlined on page 440-3.

441 11 GENERAL PURPOSE WAREHOUSE, MARINE CORPS DSSC (SF)

This category code includes requirements for Marine Corps ground activities which have been designated by Marine Corps Orders as Direct Support Stock Control (DSSC) activities or which have specialized DSSC functions. The criteria in the “Storage and Warehouse Planning Guidelines” described on pages 440-3 is preferred in determining storage space. However, the storage space may be calculated by using Table 441-11 below.

TABLE 441-11
Storage Space for DSSC Functions

Installation Military Strength	SF Allowed with SH of 10 Feet
up to 500	7,500
501 to 1,000	14,000
1,001 to 3,000	36,000
3,001 to 5,000	64,000
5,001 to 7,000	96,000
7,001 to 10,000	125,000
10,001 to 15,000	182,000
15,001 to 20,000	216,000
20,001 to 25,000	286,000
25,001 to 30,000	304,000
30,001 to 35,000	330,000

For DSSC mission include military strength of base at which located plus military strength of other locally supported units. Non-DSSC activities use only military strength of base at which located.

If stacking height values other than 10 feet are used, follow procedures given for Naval Air Installations to determine allowable values of NS and SF. Special assistance may be obtained from the Headquarters of the Commandant of the Marine Corps.

441 12 STORAGE OF AIR OR GROUND ORGANIC UNITS FOR MARINE CORPS (SF)

This category code includes general purpose storage facilities assigned to Marine Corps base, air installations and Fleet Marine Force (FMF) units for organic requirements to include Division/Wing, Battalion/Group and Company/Squadron storage areas, base property storage/issue points maintenance facility storage areas, Special Services storerooms, base shipping and receiving functions and any other organic storage requirements.

Nonsupply oriented (out-of-stores) storage requirements for other than FMF units w-ill be calculated by the use of Table 441-11. For guidance in determining space allowances, see "'Storage and Warehouse Planning Guidelines" described on page 440-2. This facility is excluded from the Supply Facility Management Report, required by NAVSUPINST 4450.22.

441 13 SPECIFIC PURPOSE WAREHOUSE, MARINE CORPS LOGISTICS SUPPORT BASE (SF)

This facility includes general purpose warehouses designated as storage areas for Marine Corps owned material in support of logistic support base mission as Integrated Material Managers. Also included is the space utilized in support of pre-positioned war reserve stocks. These requirements will be determined by using the criteria in the "Storage and Warehouse Planning Guidelines" described on page 440-3.

441 14 SPECIFIC PURPOSE WAREHOUSE, MARINE CORPS SASSY MANAGEMENT UNIT (SF)

This facility includes general purpose warehouses designated for support of the Supported Activity Supply System (SASSY) management units to include general and mount out accounts and consolidated issue Point assets. These requirements will be determined by using the criteria in the "Storage and Warehouse Planning Guidelines" described on page 440-3.

441 20 CONTROLLED HUMIDITY WAREHOUSE (SF)

A Controlled Humidity Warehouse is similar to a General Warehouse (441 10) in every respect except that it is constructed with appropriate vapor barriers and contains humidity control equipment to maintain humidity at desired levels. This warehouse may be a separate building or contiguous with a General Warehouse. Planning for storage of material in controlled humidity space for varying periods of time is authorized when the use of such space:

1. Permits technical material and material highly sensitive to moisture to be stored in a state of readiness for immediate use.

2. Permits a reduction in the cost in initial preservation or represervation of material.

3. Affords significant reduction in either the reactivation time and reactivation cost of material or both.

4. Maintains the condition of any material being held in temporary storage while awaiting repair, disposition, preservation or represervation or assembly of components.

5. Affords the desired supplemental protection to material already subjected to preservation treatment.

Any requirement for controlled humidity space must be thoroughly justified and such requirement must be considered a portion of the total space allowed for Category Code 441 10 through 441 40. For guidance in determining space allowances, see the criteria in the "Storage and Warehouse Planning Guidelines" described on page 440 2. For Marine Corps Fleet Stock Account requirements under this category code see NAVFAC P-272, Part 4, Definitive Designs.

441 30 HAZARDOUS AND FLAMMABLES STOREHOUSE (SF)

A hazardous and flammables storehouse is similar to a general warehouse (441 10) in most respects except provision is made to prevent and remove through proper ventilation evaporated and gaseous fumes in accordance with NFPA (National Fire Prevention Association) Standard No. 30. Materials normally considered for storage in this category include paints, certain packaged POL, chemicals, acids, corrosive liquids, oxidizing material and other similar hazardous and/or flammable materials. Any amount of space that is justified for a hazardous and flammables storehouse must be considered a portion of the total amount of space allowed for Category Codes 441 10 through 441 40 and will not normally exceed 5% of such total amount unless thoroughly justified. Whenever practical, general storage shed (441 35) should be specified and used. If necessary, the Naval Safety Center NAS Norfolk, Virginia should be consulted for guidance. For guidance in determining space allowances, see the criteria in the "Storage and Warehouse Planning Guidelines" described on page 440-3.

Storage of Gas Bottle Cylinders and Drummed POL. When planning facility requirements for flammables/hazardous materials, be certain that bottle gas cylinders and drummed petroleum, oils and lubricants (POL) are not planned for storage in flammables/hazardous warehouses. These items should be planned for storage in shed space. If POL drums have been hot dip galvanized for protection, they may be planned for storage in open storage facilities. DOD Regulation 4145.19-R-1, "Storage and Materials Handling" should be used for guidance in providing the appropriate types of storage facilities for materials to be stored.

441 35 GENERAL STORAGE SHED (SF)

The general shed is a roofed structure without complete side and/or end walls and with or without sprinkler and/or alarm systems. Examples of material stored in sheds include gas cylinders, vehicles, unfinished lumber and other construction material.

In those areas where it is impracticable to use shed space for the storage of materials because of weather conditions, storage requirements will be included as warehouse space and complete justification will be submitted. For guidance in determining space allowances, see the criteria in the "Storage and Warehouse Planning Guidelines" described on page 440-3.

441 40 UNDERGROUND STORAGE (SF)

Where it is necessary, because of potential sabotage or enemy action, to protect supplies either by dispersal or protective construction instead of programming new protective construction, existing mines may be used. Suitable mines for this purpose are: limestone, marble, quartzite, granite, gold, silver, uranium, lead, zinc and copper. Only draft-type entries should be considered. Rooms should not be less than 30 feet wide or less than 12 feet high. Optimum dimensions are 500 feet wide by 18 feet high.

Any amount of space that is justified must be considered a portion of the total space allowed for Category Codes 441 10 through 441 35, unless such justification is based entirely upon computation and rationale not in any way related to requirements under Category Codes 441 10 through 441 35. For guidance in determining space allowances, see "Storage and Warehouse Planning Guidelines" described on page 440-3.

SPECIAL SUPPLY OPERATIONS (411 71, 72, and 73)

Since performance of Special Supply Operations is primarily a function of facility floor space and not stacking height (SH) the actual height to which material is/will be stacked is pertinent. For guidance in determining space allowances, see "Storage and Warehouse Planning Guidelines" described on page 440-3.

441 71 INTEGRATED LOGISTICS OVERHAUL (ILO) AND OUTFITTING BUILDING (SF)

This facility provides covered supply space used for processing materials offloaded from or assembled for loading aboard ships. It includes space required for receiving, sorting, identifying and processing materials off-loaded and processing and assembly of outfitting materials to be loaded aboard fleet units. This facility was formerly called Outfitting and Supply Operations Assistance Program (SOAP) Building.

441 72 SERVMART (SF)

A SERVMART Provides covered supply facilities used for display and sale of supply systems materials for self-service requisitioning by end users. It includes areas used to display items on shelves or gondolas, check-out counters and administrative functions. It excludes back-up storage areas; requirements for such areas must be based on SH values and are carried under other basic category 441 codes.

441 73 MTIS BUILDING (SF)

This facility provides covered supply space used for processing materials turned into store for redistribution or disposal. It includes space used for receipt, screening, identification, assembly and staging fur return to storage areas. MTIS is acronym for “Materials Turned Into Store”.

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450 STORAGE - OPEN

This category group consists of noncovered storage areas, paved or other wise stablished, for storage of General Supply Materials. Several of the excluded types of functions include miscellaneous materials coded under other basic category codes, i.e., ammunition on open pad, coded under 425 10; and open storage areas for nonsupply oriented functions, coded under 852 35 and 40 and any other areas not assigned to the Supply/Material Department.

451 10 OPEN STORAGE AREA (SY)

Determination of space allowances for aircraft and personnel can be computed by using the guidance given in “Storage and Warehouse Planning Guidelines” on page 440-2, and Tables 440B-1 and 440B-2. Space allowances based on historical/planned M/Ts of material in store/to--be-stored can be developed from these tables.

In those areas where it is impractical to use open storage because of weather (e.g., arctic region), storage requirements may be included under Category Group 440.

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451 10 OPEN STORAGE AREA (SY)

Determination of space allowances for aircraft and personnel can be computed by using the guidance given under the Base Loading Method on page 440-6 and Table 451-1 and 451-2 below. Space allowances based on historical/planned M/T's of material in store/to-be-stored can be developed from Table 440-4 using the guidance provided by the Modified Measurement Ton Method on page 440-14.

In those areas where it is impractical to use open storage because of weather (e.g., arctic region), storage requirements may be included under Category Group 440.

TABLE 451-l
Open Storage Space Allowances (SF) for Navy and Marine Corps Aircraft

Type Aircraft Supported (For aircraft not listed use allowances for a similar type aircraft)	SF allowances per aircraft with nsh of 4 feet
VF F-4, F-8	110
VF F-14	115
VA A-4, A-7, AV-8	115
VA A-3, A-5, A-6	120
VP P-2, P-3	225
VR C-1, C-47, C-117, C-119, C-131	125
VA C-54, c-118, C-121, C-130	200
VS S-2, S-3	115
VU C-45, U-1, U-11	50
VU U-16	125
VT T-28, T-34	50
VT T-1, T-2, T-29, T-33, T-39	110
VO O-1, OV-10, U-6, U-11	50
H H-1, H-13	50
H H-2, H-3, H-19, H-34, H-46	75
H H-53	125
VW E-1, E-2	275

TABLE 451-2
Storage Space Allowances (SF) Per Man Per Month

Installation Military Strength	Space Allowance Per Man Per Month With nsh of 4 feet
First 4,000	5
Next 2,000	3
Next 2,000	2
All above 8,000	0

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Section 5

FACILITIES CLASS 500 - HOSPITAL AND OTHER MEDICAL TREATMENT FACILITIES

Planning for hospital and medical treatment facilities shall be done with full consideration for the Department of Defense policy of joint utilization of military medical facilities. This policy provides that all Services in an urea have their medical needs met with adequate facilities, but without inter-Service duplication. Examples of policy are: joint utilization of military medical facilities and services and recognition of medical resources available within the civilian community.

Space requirements generated using the criteria in this section will produce an adequate gross estimate of future requirements for planning purposes. However the criteria are not intended to replace sound judgment. As stated in Chapter I of this publication, an installation is entitled to the minimum facilities that it actually needs to accomplish its mission and perform efficiently all of the various tasks with which it is charged. Therefore, if an installation presently has the facilities it needs to perform its mission, it should not request approval of a larger requirement simply because the quantitative factors can be used to produce a larger requirement. Inflated requirements result in wasted man hours and dollars in master planning and other long range efforts to provide space for expansion that will never be approved.

The criteria in this section will be used for planning purposes. However, due to the dynamic nature of medical facility requirements and constraints imposed on medical facility planning, the ultimate size and scope of a facility shall be determined at the time a project programming decision is made; by coordinated efforts of the activity concerned, organizations in its chain of command, the Bureau of Medicine and Surgery, and the Assistant Secretary of Defense (Health Affairs).

Category Code groups described in this section include the following:

Code 510 Hospital Buildings
Code 530 Laboratories
Code 540 Dental Clinics
Code 550 Medical Clinics

The space allowances prescribed in this section includes provisions for all functions that are in direct support of the facility. In this context, direct support encompasses all those functions that would normally be incorporated in a single structure if new construction were planned. Some examples are as follows: library, administration, conference/classrooms, morgue, laboratory, exchange convenience outlets, exchange cafeteria, post office, and storage of operating supplies. Support facilities frequently associated with medical

facilities that are identified and planned separately -includes but are not limited to:

Code 111-20 Helicopter Land Pad
Code 143-10 Operational Vehicle Building
Code 219-XX Maintenance-Public Works
Code 400-XX Supply Facilities
Code 721-XX Unaccompanied Personnel Housing-Enlisted
Code 724-XX Unaccompanied

Interpolation. The gross area of certain category code statements may have to be determined by interpolation. The following example is provided as a guide.

Example : A medical clinic with a projected clinic workload of 133,842 outpatient visits (OPV) has a requirement for outpatient treatment space computed by interpolation as follows (See Table 550-10):

FORMULA

Outpatient Visits	Gross Square Feet
120,000 = A	53,900 = C
140,000 = B	57,200 = D

$$\frac{OPV-A}{B-A} \times D - C + C = \text{Square foot allowance}$$

$$\frac{133,842-120,000}{140,000-120,000} \times 57,200 - 53,900 + 53,900 =$$

$$\frac{13,842}{20,000} \times 3,300 + 53,900 = 56,184 \text{ GSP of Medical Clinic Required,}$$

510 HOSPITAL BUILDINGS

Hospital buildings provide comprehensive inpatient and outpatient medical services.

510 10 HOSPITAL - MEDICAL CENTER (BD)

A hospital is a health treatment facility capable of providing definitive inpatient care. It is staffed and equipped to provide diagnostic and therapeutic services in the field of general medicine and surgery, preventive medicine services, and has the supporting facilities to perform its assigned missions and functions. A hospital may, in addition, discharge the functions of a clinic. A medical center is a large hospital which has been so designated and appropriately staffed and equipped to provide health care, including a wide range of specialized and consultative support for all other medical Facilities within the geographic area of responsibility. Additionally, a medical center, when designated, conducts post graduate education in health professions. The Bureau of Medicine and Surgery (BUMED), subject to approval of the Assistant Secretary of Defense (Health Affairs) (OASD (HA)), is responsible for making the ultimate determination of scope and size of a naval hospital or medical center to be planned, programmed, and constructed. The following steps are provided as a guideline to the hospital planning procedure:

Step 1: The local planner, in coordination with Healthcare Support Office (HSO) 03/04 and BUMED 03, should identify the projected DOD Active Duty population and other eligible beneficiaries within the area.

Step 2: The Medical Treatment Facility Commanding officer (MTF CO), in coordination with the lead agent, HSO, BUMED, and the Responsible Line Commander (RLC), should initiate a Business Plan/Concept of Operations including functions and staffing.

Step 3: The MTF CO, in coordination with required HSO/Engineering Field Division (EFD) assistance, should initiate the application of DOD Medical Space Planning criteria to develop the Basic Facility Requirement (BFR) to support the business plan. The BFR must be approved. by BUMED.

Step 4: The MTF CO should interface with the EFD to update the Facility Requirement Plan (FRP) and Master Plan.

Step 5: The MTF CO, in coordination with BUMED and HSO, should conduct a facility study/economic analysis to develop the 1391. The level of study is typically complex and use of a medical facility consultant is recommended. Funding should be budgeted.

Step 6: The MTF CO should forward the requirement to BUMED, via the appropriate EFD.

Step 7: BUMED then forwards the requirement to OASD (HA).

Step 8: OASD (HA) then funds a Health Care Delivery economic analysis.

Step 9: DMFO then develops the Program For Design (PFD).

NOTE: Close coordination with HSO Medical Facility Planners is required through each step of this process.

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530 LABORATORIES

530 20 LABORATORY (SF)

No criteria. Individual detailed justification required. This category code should be used only for a medical laboratory that is not a component of a hospital, clinic, or R&D command. Hospital laboratories should be planned under CCN 510-10; clinic laboratories should be planned under CCN 550-10; laboratories associated with R&D commands should be planned under the appropriate category code in facility group 300.

530 40 ANIMAL HOUSE, MEDICAL RESEARCH (SF)

No criteria. Individual detailed justification required. This category should be used only for a facility that is a component of a medical treatment facility. Animal houses associated with R&D commands should be planned under the appropriate category code in facility group 300.

530 45 ZOONOSIS CONTROL CLINIC (SF)

This facility is used to prevent the spread of animal diseases to other animals and man. The Zoonosis Control Clinic treats certain diseases of animals and provides for immunizations to animals against those diseases of significant import and transmissibility to man. The facility may also be equipped to provide foot inspection services if required. Table 530-45 provides space allowance for individual components of a Zoonosis Control Clinic. It should be noted that not all components may be required for each clinic.

TABLE 530-45
Space Criteria for a Zoonosis Control Clinic

TYPE OF SPACE	NET SQUARE FEET
I. Clinical Spaces	
A. Exam. Rms. (one per veterinarian + 1)	80 (ea)
B. Surgical Suite	160
C. Clean Utility Room	80
D. Dirty Utility Room	80
E. X-Ray (incl. processing space)	110
F. Kennel (quarantine)	80
II. Sanitation Spaces	
A. Food Inspection Room	80
B. Egg Candling Room	80
C. Laboratory	160

TABLE 530-45 (Continued)
Space Criteria for a Zoonosis Control Clinic

TYPE OF SPACE	NET SQUARE FEET
III. Support Spaces	
A. Senior Veterinarian Office	140
B. Junior Veterinarian Offices	110 per person
C. Reception Area (average number in area)	14 per person
D. Storage Area	80
E. Technician Spaces	90 per person
F. Clerical Support	60 per person

Multiply total net square feet by a conversion factor of 1.25 to find total allowance in gross square feet.

530 50 ENVIRONMENTAL AND PREVENTIVE MEDICINE UNIT LABORATORY (SF)

This facility is used to provide expert and specialized consultation, advice and recommendations on matters of preventive medicine and environmental health to commands afloat and ashore. Further, the facility is used to provide epidemiological laboratory and technical services to assist in the detection and elimination of direct or potential health hazards to personnel in the naval service and their families, and in the training and indoctrination of personnel in the methods and techniques of preventive medicine. This category code is restricted for use only by numbered Environmental and Preventive Medicine Unit Laboratories (EPMU) and Navy Disease Vector Ecology and Control Centers. Space allowances are given in Table 530-50.

TABLE 530-50
Space Criteria for an Environmental and
Preventive Medicine Unit Laboratory

TYPE OF SPACE	GROSS SQ FT
1. Academic Instruction Section:	1,700
Classrooms (2 @ 500 SF each)	1,000
Projection Booth	100
Training Aids Room	200
Library/Conference Room	400
2. General Storage:	1,100
Flammable/Insecticides/Equipment Workshop	
3. Administrative Section:	2,300
Office space (O.I.C., Environmental Health Branch Br., Admin. Section, Admin. Ofc., Fiscal & Supply, Student and Crew Lounge	

TABLE 530-50 (Continued)
Space Criteria for an Environmental and
Preventive Medicine Unit Laboratory

TYPE OF SPACE	GROSS SQ FT
4. Epidemiology Department:	600
Epidemiologist Ofc., Exam. Rm., Interviewer's Ofc.	
5. Entomology Department:	1,000
Entomology Lab, Insectary, Office	
6. Microbiology Department:	3,500
Bacteriology Lab, Infectious (virology, parisitology, mycology) Lab, Central Autoclave Section, Media Preparation Section, Glassware Section, Office, Storage	
7. Industrial Hygiene Department	1,200
Laboratory, Storage, Office (Hygienist)	
8. Miscellaneous	360
Small Animal Lab	200
Bathrooms, Showers, Wash and Dryer	160
9. Total Gross SQ FT	11,810

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540 DENTAL CLINICS

A dental clinic is an oral health care service facility equipped and staffed to perform dental procedures for general practices, a specialty, or a grouping of specialties. A dental facility will normally include treatment areas, administrative, support and storage areas.

540 10 DENTAL CLINIC (sq.m./SF)

The Bureau of Medicine and Surgery (BUMED), subject to the approval of the Assistant Secretary of Defense (Health Affairs), is responsible for the determination of scope of dental clinics planned, programmed, and constructed. The following information is provided as a guide to be utilized for planning and preliminary programming purposes.

Step 1: Beneficiary Population. Determine the active duty beneficiary population. On average there will be 1 dental officer per 700 active duty beneficiaries. The authorized number of dentists and the specialty mix at an activity should be confirmed through the Regional Naval Dental Center.

Step 2: Staffing. Obtain staffing figures for the planning year from the Authorized Manpower documentation for the military personnel and the authorized positions for the civilian personnel. The planning documents must be submitted via the major Claimant for confirmation of support for any increased staffing, both military and civilian.

Step 3: Dental Treatment Rooms (DTR's). Determine the number of required DTR's from the following criteria.

1	DTR for each dentist in training.
1 1/2	DTR's for each general duty dentist assigned to clinical dentistry.
2	DTR's for each Prothsodontist, Periodontist, Endodontist, Oral Surgeon, Pedodontist, Orthodontist, and Comprehensive General Dentist assigned to clinical dentistry.

NOTE: When the total number of dentists is five (5) or less, use a DTR factor of 2 DTR's per dentist Clinics with six (6) dentists will have a minimum of 10 DTR's.

1	Oral Hygiene Treatment Room (OHTR) for each oral hygienist or technician functioning as oral hygienist.

Step 4: Clinic Space Required. After calculating the number of DTR's required, consult table 540-10A to determine the gross area required. Interpolation is required. These figures include space allowance for all functions that are in direct support of the dental clinic, such as administration, locker rooms, conference rooms, limited prosthetic laboratory, storage of operating supplies, a central sterile, and dental X-ray. This also includes waiting rooms, mechanical spaces, restrooms, circulation, walls and partitions, and consultation rooms. Interpolation, as explained at the front of the 500 series, is necessary.

TABLE 540-10A
Space Allowances for Dental Clinics

Number of DTR's and OHTR's	Gross Area per DTR and OHTR sq.m.	SF
2	88 sq.m.	950 GSF
3	88 sq.m.	950 GSF
4	79 sq.m.	850 GSF
6	70 sq.m.	750 GSF
8	68 sq.m.	730 GSF
10	68 sq.m.	730 GSF
12	68 sq.m.	730 GSF
18	68 sq.m.	750 GSF
25	65 sq.m.	700 GSF
30	65 sq.m.	700 GSF
40	65 sq.m.	700 GSF
50	65 sq.m.	700 GSF
100	56 sq.m.	600 GSF

step 5: Optional Functions: (must be specifically justified and documented)

A. Naval Dental Centers. Naval Dental Centers have administrative personnel not normally associated with a branch dental clinic. Determine by Authorized Manpower Document the number of such personnel and calculate requirements at 15 sq.m. (162.5 GSF) for each full-time administrative person.

B. Dental Equipment Repair. For clinics with equipment repair technicians assigned, determine the number of repair technicians from Manpower Authorization and consult table 540 10B to determine the gross area required.

TABLE 540-10B
Space Allowance for Dental Equipment Repair Technicians

Number of Repair Technicians	Gross Area sq.m.	SF
1	25 sq.m.	270 GSF
2	46 sq.m.	500 GSF
3	60 sq.m.	650 GSF

Add 9 sq.m. (100 GSF) more for each additional repair technician.

C. Special Education Functions. Where specifically justified, an education training room can be planned based upon documentation of course title, frequency and duration of courses, and average on board students. A space factor of 2.6 sq.m. (28 GSF) per student will be used to size the facility based upon the average monthly student population that can be justified. Routine classroom/conference room functions are already included in TABLE 540-10A

D. Full Prosthetic Lab. If authorized and staffed with a full time prosthetic lab technician, additional space may added for a fill prosthetic lab. Consult Table 540 10C for the gross square area required.

TABLE 540-10C
Space Allowance for a Full Prosthetic Laboratory

	Gross Area	
	sq.m.	SF
Dental Prosthetic Lab	63 sq.m.	675 GSF
Each technician over 3	8 sq.m. each	85 GSF
If Required:	sq.m.	SF
Ceramic Room	19 sq.m.	200 GSF
Casting & Grinding	19 sq.m.	200 GSF
Model Storage	11 sq.m.	120 GSF

E. Naval Dental Center. If the facility is serving as a Naval Dental Center additional space may be provided for regional storage for Branch Dental Clinics. Consult Table 540 10D for additional gross square area.

TABLE 540-10D
Space Allowance for Regional Storage

Number of Branch Clinics Served	Gross Area	
	sq.m.	SF
up to 5	19 sq.m.	200 GSF
6 to 10	65 sq.m.	700 GSF
11 to 20	93 sq.m. max	1000 GSF

Step 6: Total Gross Square Footage Required. Add the gross square footage for the clinic obtained in step 4 to the gross square footage of the supported options obtained in step 5. The sum is the total space requirement for category code 540-10 and includes all functions that are normally associated with a Dental Clinic or Regional Dental Center.

Step 7: Parking. Based on the 15 Oct 1991 MIL-HDBK-1191 (DOD Medical and Dental Treatment Facilities Design and Construction Criteria), for clinics with less than 30 DTR's, provide 3 parking spaces per DTR For larger clinics, 2.5 spaces per DTR should be planned. One space per organizational vehicle is also authorized.

Step 8: Site Selection.

A. Site facility convenient to active duty beneficiaries.
B. Collocation of Dental Clinics with Medical clinics is operationally efficient and desired.
C. In site selection provide a minimum of 25% expansion capability of the facility square meters, as calculated in step 6, & parking requirements, calculated in step 7.
D. Facility should be sited convenient to existing utility support.

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550 MEDICAL CLINICS

A clinic is a free standing health care treatment facility primarily intended and appropriately staffed and equipped to provide urgent care and routine outpatient services. A clinic is also intended to perform certain non therapeutic activities related to the health of the personnel served such as examinations, immunizations, staff education and training, medical administration, and preventive medicine services necessary to support a primary military mission. A clinic will not normally be equipped with beds. The key planning factor for medical clinics is sizing the facility based upon data obtained in the approved clinic business plan/concept of operations. This document will be provided by the regional parent medical command.

550 10 MEDICAL CLINICS (sq.m./SF)

The Bureau of Medicine and Surgery (BUMED), subject to approval of the Assistant Secretary of Defense (Health Affairs), is responsible for the determination of scope and size of a naval medical clinic to be planned, programmed, and constructed. The following information is provided as a guide to be utilized for preliminary planning and programming purposes. The space allowance in Table 550-10 assumes the clinic will be staffed with physicians and nurses and provide X-Ray, pharmacy, laboratory, and other services normally associated with outpatient clinics.

Step l: Population Supported/Projected Clinic Workload. In accordance with current DOD criteria, the population supported is defined as those eligible persons, regardless of service affiliation, who reside within a 40 mile radius of the medical facility. This population information is available in the approved Clinic Business Plan/Concept of Operation prepared by the parent medical command and approved by the regional lead agent. This business plan should contain the projected clinic workload for each beneficiary category far the planning year and consider what portion of each category will be served in the military treatment facility (MTF). The calculated Gutpatient Clinic Visits (OPV's) is determined by the approved Business Plan's estimate of outpatient clinic visits per year in the MTF only.

Step 2: Space Requirement. Once the number of OPV's per year is determined, use Table 550-10A to determine the preliminary planning area required. Table 550-10A includes space allowance for all functions that are in direct support of the medical clinic such as administration, locker rooms, conference rooms, and management information. Space for waiting rooms, mechanical spaces, restmoms, circulation, wall and partitions, and supply storage is also included in the table. Interpolation, as explained at the front of the 500 series, is necessary.

TABLE 550-10A
Space Requirement - Medical Clinics

OPV's/yr.	Gross Area	
<=1000	46 sq.m.	500 GSF
2,500	167 sq.m.	1,800 GSF
3,500	353 sq.m.	3,800 GSF
5,000	511 sq.m.	5,500 GSF
10,000	883 sq.m.	9,500 GSF
15,000	1,301 sq.m.	14,000 GSF
20,000	1,719 sq.m.	18,500 GSF
30,000	2,044 sq.m.	22,000 GSF
40,000	2,601 sq.m.	28,000 GSF
60,000	3,716 sq.m.	40,000 GSF
80,000	4274 sq.m.	46,000 GSF
100,000	4,831 sq.m.	52,000 GSF

Step 3: Medical Clinic Options: (must be specifically justified and documented)

A. Administration. If a clinic command structure is present (the facility is not a branch clinic), determine by Authorized Manpower Document the number of such personnel and calculate the requirements at 15 sq.m. (162.5 GSF) for each administrative person.

B. Occupational Health/Industrial Hygiene. If the clinic provides occupational health/industrial hygiene support to a Navy Industrial Activity (i.e. Shipyard, NADEP, etc.), use Table 550-10B to determine the additional space allowance.

TABLE 550-10B
Space Allowance for Occupational Health

	Gross Area
Each staff person	19 sq.m. 200 GSF
Audio Booth	33 sq.m. 350 GSF
Eye screening	16 sq.m. 170 GSF
Testing Lab	16 sq.m. 170 GSF
Pulmonary Function	16 sq.m. 170 GSF
Counseling	15 sq.m. 162.5 GSF
Records	1.1 sq.m. (12GSF) per file cabinet

C. Social Work. If full-time social workers are present in the medical clinic an additional 22 sq.m. (240 GSF) per social work staff may be provided.

D. Physical Therapy/Wellness. If the medical clinic will be equipped with physical therapy equipment and staff an additional 56 sq.m. (600 GSF) per therapist may be provided.

E. Holding Unit. For remotely isolated clinics, a 2 bed holding unit may be provided at an additional 65 sq.m. (700 GSF), when authorized by Parent Command.

Step 4: Total Gross Square Footage Required. Add the gross square meters for the clinic obtained in step 2 to the space determined in the supported options. The sum is the total space requirement for category code 550-10 and includes all functions that are normally associated with a Medical Clinic or Regional Medical Center.

Step 5: Parking. The following formula, extracted from the 15 Oct 1991 MIL-HDBK-1191 (DOD Medical and Dental Treatment Facilities Design and Construction Criteria), may be used to estimate the required number of parking spaces

# of parking spaces = (.59)(X1) + (.21)(X2) + (X3) + (X4) + (X5)

Xl = All personnel working in the Medical Treatment Facility on a full time basis, minus the Dental staff, plus an allowance for visitors and part-time staff. (List each category separately)

X2 = Average daily outpatient workload for “peak month” using 21 workdays per month and 250 workdays per year as a basis for calculation.

X3 = One space for each patient bed.

X4 = See Category Code 540-10 for detailed Dental parking requirements.

X5 = One space for each medical and dental organizational vehicle.

Please consult MIL-HDBK-1191 for further clarification of variables and updates. Additional parking spaces beyond the above calculations shall be separately justified (i.e. pharmacy)

Step 6: Site Design. Provide an additional 25% of the total gross square meters required calculated in step 4 for expansion capability when siting the facility.

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Section 6. FACILITY CLASS 600--ADMINISTRATIVE FACILITIES

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610 ADMINISTRATIVE BUILDINGS

These are headquarters and office-type buildings accommodating administrative and professional activities, business and data-processing machines, records, files, and administrative supplies for normal operations. For bulk storage of administrative records and supplies, see the 400 series.

610 10 ADMINISTRATIVE OFFICE (SF)

This facility accommodates the executive and staff function of the station or of a particular department. The functions performed in an administrative office are primarily logistical and personnel management as distinguished from tactical and strategic activities. The latter would be performed in operational (e.g., OPCON centers) rather than administrative space. Administrative office space that is provided within an operational facility for direct support thereof such as workshops, warehouses, recreational facilities, hospitals, schools and the like, is planned under the category code of primary facility. For example, space in general warehouse that may be partitioned off and assigned to the shipping clerk for administrative duties associated with that particular warehouse is planned as warehouse space, Code 442 10. Space allowances for such administrative functions, however, shall conform to the criteria given for Code 610 10.

Gross Floor/Building Area--The total usable areas of all floors measured between the exterior faces of outside walls. It includes full areas of basements, on-grade and above grade floors, service and equipment rooms, boiler plant and heater rooms mezzanines, penthouses, enclosed passages and raised covered platforms. It also includes half areas of covered open porches, covered (but not enclosed) passages and uncovered raised platforms. Excluded is all enclosed space with an average ceiling height of less than seven feet

Net Floor Area--The total gross floor area, less space taken up by outside walls, stair towers, elevator shafts, interior partitions, toilets, basements unsuited for office use, permanent hallways, elevator machinery and machinery or equipment used for heating and/or ventilating the building.

Net Office Floor Area--The net floor area less central files, storage, special purpose rooms, conference rooms, mail rooms, snack stands and miscellaneous rooms not used directly as office space.

Special Purpose Rooms--Consists of auditoriums, training rooms, drafting rooms and rooms housing electronic data processing (ADP) equipment (Note: Category Code 610 20 is used when the requirement is for a Data Processing Center in lieu of an ADP support requirement integral to an administrative function). These rooms may be included in an administrative facility when justified by operational requirements. Justification for special purpose rooms should include, except ADP rooms, the number of people that would normally utilize the room and the amount and size of the equipment in each room. For ADP rooms, as a general rule, the area should be three times the plan area of the equipment.

Basic Planning Factors

The basic planning factors for an administrative office per building occupant engaged in the administrative function is as follows (to be utilized in the absence of definitive drawings or detailed planning):

1. The average net office floor area per building occupant will not be less than 80 square feet and will not exceed 90 square feet.

2. The average net floor area per building occupant will be not less than 115 square feet nor more than 130 square feet. The difference between net floor area and net office area is to provide space for special purpose rooms, conference rooms, local reproduction facilities, storage, snack stand and minor feeding service space, mail rooms, central files and rooms not used directly as office space.

3. The gross floor area (for BFR purposes) may be computed by either one of the two alternate methods:

a. In the absence of detailed data or when close approximation to precise requirements is not considered necessary, the gross floor area should be computed based on 150 square feet per building occupant.

b. If specific personnel data is available and more precise planning figures are desired, the detailed planning and programming factors, as given in the following section, should be used. Computations similar to the given example should accompany the BFR submittal. Due to the complexity of this task and the need for personnel data input, space requirement calculations utilizing this method should be performed by the activity in question.

Excluded from gross floor area are:

a. Computer Processing center, as opposed to an ADP room. (Use Cat. Code 610 20.)

b. Command and control center. (Use Cat. Code 141 83.)

c. Restaurants and other messing or dining facilities. (Use Cat. Codes 740 04, 740 26, 722 10 through 722 41, 724 30.)

d. Communications center, telephone exchange. (Use Cat. Code 131 40.

e. Clinic, outpatient. (Use Cat. Code 530 10.)

f. Auditorium, when not an integral part of the administration functions. (Use Cat. Code 740 33.)

g. Credit unions and banks. (Use Cat. Codes 740 19, 740 18.)

h. Post Office. (Use Cat. Code 740 33.)

i. Recreational library. (Use Cat. Code 740 76.)

j. Family services, Red Cross/Navy Relief. (Use Cat. Codes 740 25, 740 12.)

k. Printing plant, as opposed to local reproduction facilities. (Use Cat. Code 229 50.)

Detailed Planning, Programming (PCE), and Asset Evaluation Factors

The basic factors for detailed planning, programming, and for evaluating existing assets are set forth in the following section.

Allowances provide space for furniture and equipment normally associated with the position and, in case of open office space, includes a circulation or layout factor.

Private Office-- Net Office Floor Area Space Allowance

Due to the wide variation in organizational structure within the Navy/Marine Corps, the position titles shown below will not be directly applicable in all cases. Consideration must be given to the entire organization structure involved and the relative relationship of positions within the organization.

Planning of private offices in the assignment categories 3, 4, and 5 below will be based on demonstrated functional need, as well as a combination of rank/grade and position title.

In buildings with fixed modular partition layouts, minimum necessary adjustments in private office sizes may be made.

Private and semiprivate offices, which, due to operational needs, require space in excess of allowance to adequately perform assigned duties may exceed the criteria on an individual office basis by not more than 15 percent. Such increases will not be added to the total authorized allowances but will be made by adjustment within the total area authorized.

Assignment	Maximum Allowance Square Feet Per Person
1. Installation commanders; heads of: directorates, major separate activity commands, general and special staff agencies; hospital commanders; executive assistants in grade GS-18 or equivalent	400
2. Rear admiral; chief of staff; division heads in grade GS-16 or brigadier general and above; deputies to positions in assignment 1; executive assistants in grades GS-17 and 16	300

Assignment	Maximum Allowance Square Feet Per Person
3. Navy captain; regimental commanders; division heads in grades GS-15 or GS-14; colonel in comparable positions to assignment 2; technical or scientific specialists in grade GS-16 and above requiring private offices	200
4. Commanders and lieutenant colonels; battalion commander; division and branch heads requiring private offices; grade GS-13 technical or scientific specialists requiring private offices; grades GS-15 and GS-14	150
5. Branch heads requiring private offices; GS-12 or Lt. Commander/major and below; company commanders; technical or scientific specialists below grade GS-13 requiring private offices; administrative personnel requiring private offices	100

Open Office--Net Office Floor Area Space Allowance

Assignment	Maximum Allowance Square Feet Per Person
1. Unit supervisors in grades GS-9, E8, W0, 01 or above who supervise six or more employees	110
2. Professional and administrative personnel in grades GS-7, E8, W0, 01, or above; unit supervisors in grades GS-8, E7, or below, who supervise six or more employees	90
3. Stenographic and clerical position	60

Miscellaneous Space Allowance

1. File Area. An allowance of 6 square feet will be made per letter file cabinet, and 7 square feet per legal file cabinet. This will provide 4 foot work aisles where rows of filing cabinets face one another. A cross aisle of 3 feet should be planned every 25 feet, if the row of files is that long.

2. Conference Room. Conference requirements must be carefully tailored to an organization's mission and experience, and then adjusted to take into consideration the availability of building conference facilities which can be shared. Based on the number of conferences, the following allowances should be made:

No. of Persons	Net Floor Area in Sq Ft
8	150
Up to 14	375
Up to 24	500

For larger meeting rooms, with row-type seating, an allowance of 150 square feet, plus 10 square feet per person to be seated should be authorized.

3. Reception Area. Size will depend largely on the type and volume of visitor traffic. For planning purposes, desk space for a receptionist plus 10 square feet per person usually served may be used as a guide.

4. Drafting Room. For planning purposes, 90 square feet per person may be used as a guide.

The space allowances listed for Private and Open Offices are not in addition to the maximum allowance of 90 square feet of net office floor area per building occupant but merely establish maximum space limits for certain administrative functions within total allowance.

In all cases justification for an administrative project, except where a definitive drawing is available for a specific organization, will include the total number of personnel to be assigned office space and documentation of approved personnel allowances.

Example:

This is an example of a procedure that could be used for calculating administration space requirements by the Net Office Floor Area Method. The example is based on a hypothetical facility performing the functions of Director of Maintenance, Administration, Industrial Engineering, Operations, Production Planning and Control, and Quality Assurance. This facility requires private office space (P), general office space (G), and special purpose space (SP). Table 610-10 represents a suggested worksheet and should be prepared as follows:

Step 1: Under the Description column, list all offices and special purpose spaces required.

Step 2: For each entry in the Description column record the number of employees (based on applicable staffing guides) under the proper section of "Justified Personnel" column. In Table 610-10 section (P) shows employees requiring private offices. Section (G) shows employees assigned to special purpose spaces.

Step 3: Compute the "Net Office Floor Area"--A(net) which is the number of employees, E(tot) occupying the (P) and (G) type spaces multiplied by 90 (square feet per employees maximum net floor area).

$$A(net) = E(tot) \times 90 \text{ (Sq Ft/Pers)}$$

In this case: A(net) = (8 + 54) x 90 = 62 x 90 = 5,580 Sq Ft

Before proceeding further it is important to note that a maximum constraint has now been established for total "Net Office Floor Area" space availability. Steps 4 through 6 indicate one possible approach to the subdivision of this space. Further note that one person (Technical Library-2f(1)) has not been included in Step 3. That individual and the associated space requirement is part of special purpose space requirements and therefore included as part of the average "Net Floor Area" space, not "Net Office Floor Area."

Step 4: Plan each private office listed by considering its functions and furnishings needed. Size the offices based on maximum guidelines provided in Private Office of Detailed Planning Factors Section. Enter this figure in section (P) of "Net Office Space in Sq Ft" column. Use figures which reflect actual needs for each office. These usually will be less than the maximum allowance. Obtain total private office net space, A(priv) by adding individual requirements in column section (P).

Step 5: Calculate total general office space, A(gen) by subtracting total private office space, A(priv) from net office floor area, A(net).

A(gen) - A(net) - A(priv)

In this case: A(gen) = 5,580 - 990 = 4,590 Sq Ft

Step 6: Determine the total number of employees assigned to general office space E(gen). Calculate the portion of net general office space to be designated for each function by prorating the total areas available, A(gen) to the number of employees in that specific function.

$$\text{Net Office Space} = A(gen) \times \frac{\text{employees in specific functions}}{E(gen)}$$

As an example, calculating net general office space for the specific function Commodity Entry Area (Item 5b in Table 610-10):

E(spec) = 3; E(gen) = 54, therefore:

$$\text{CEA Office Space} = 4{,}500 \times \frac{3}{54} = 225 \text{ Sq Ft}$$

Tailor each space to the individual requirements for machines and equipment. Adjustments may be made up of 15 percent, however, they must be equalized by reductions in other functions since the net office areas, A(net) may not be exceeded.

Step 7: Calculate special purpose (SP) space requirements by using guidelines given in the text for administrative office criteria. Enter results in (SP) column.

Step 8: Obtain net floor area by adding net office area, A(net) and the sum of special purpose areas.

In this case: A(net) = 5,580 Sq Ft; Spec. purpose areas = 2,610 Sq Ft.

Therefore, net floor area = 5,580 + 2,610 = 8,190 Sq Ft

Check: Total employees = 63
Maximum allowable net floor area = 130 Sq Ft/Employee

In this case: Total allowable net floor area = 63 x 130 = 8,190 Sq Ft. This indicates that the sum of detailed space allocations has not exceeded maximum allowable net floor area.

Gross Floor Area. To compute gross floor area, the net floor should be multiplied by an adjustment factor to compensate for common circulation, mechanical equipment spaces, and wall thicknesses. This factor ranges from 1.12 for efficiently laid out buildings to 1.25 for buildings with less efficient layout or having some unusual constraints. The adjustment factor of 1.25 shall be the maximum allowable to determine gross floor area.

TABLE 610-10
Administration Space Requirements

Description	Justified Personnel				Net Office Space in Sq Ft		(SP)
	Offices		(SP)	Total	Offices		
	(P)	(G)			(P)	(G)	
1. DIRECTOR OF MAINTENANCE	1			1	160		
a. Deputy	1			1	130		
b. Secretary	1			1	100		
c. Technical Assistance		4		4		340	
d. Conference Room			none				240
2. ADMINISTRATION MANAGER	1			1	120		
a. Secretary		1		1		85	
b. Budget and Fiscal		2		2		170	
c. Commercial Services		2		2		170	
d. Mail and Records		2		2		170	
e. Personnel		1		1		85	
f. Reports and Statistics				1		170	
(1) Technical Library			1	1			250
3. INDUSTRIAL ENGINEERING MANAGER	1			1	120		
a. Secretary		1		1		85	
b. Methods and Standards		3		3		225	
c. Operations and Analysis		2		2		170	
d. Plant Processes and Layout		2		2		170	
e. Plant Services		2		2		170	

TABLE 610-10 (Continued)
Administration Space Requirements

Description	Justified Personnel				Net Office Space in Sq Ft		(SP)
	Offices		(SP)	Total	Offices		
	(P)	(G)			(P)	(G)	
4. OPERATIONS MANAGER	1	-		1	120	-	
a. Secretary	-	1		1	-	85	
b. Conference Room	-	-	none	-	-	-	240
5. PRODUCTION PLANNING & CONTROL	1	-		1	120	-	
a. Secretary	-	1		1	-	85	
b. Commodity Entry Area	-	3		3	-	225	
c. Control	-	4		4	-	340	
d. Materials Control	-	3		3	-	225	
e. Planning and Scheduling	-	11		11	-	935	
6. QUALITY ASSURANCE MANAGER	1	-		-	120	-	
a. Secretary	-	1		1	-	85	
b. Calibration	-	1		1	-	85	
c. Inspection	-	3		3	-	225	
d. Quality Control	-	2		2	-	170	
7. MISC. SPECIAL PURPOSE ROOMS (No personnel assigned)	-	-	none	-	-	-	1,880
SUBTOTAL	8	54			990 A (priv)	4,590 A (gen)	
TOTAL	62 E(tot)		1	63	5,580	A (net)	2,610

610 20 AUTOMATIC DATA PROCESSING INSTALLATION (SF)

This code is intended for facilities which accommodate non-tactical Automated Data Processing (ADP) equipment and direct support functions. As a general rule, these are centralized computer installations such as the Navy Regional Data Automation Centers (NARDAC's) or equivalent. In contrast, spaces for small machines or intelligent terminals which are dedicated to support as discrete administrative or technical function, are included under the specific category code for that function.

The ADP spaces may be divided into three basic categories:

Main computer(s)
Primary support
Secondary support

At smaller installations some or all of the space categories may be colocated in the same building, while at large installations, they are likely to be separated. In addition to the three basic categories, an ADP installation may require indirect support features which are planned and reported under their own category codes; these are identified later in the text.

REQUIREMENTS COMPUTATION

ADP centers can be equipped with one or several computer systems, which are usually well defined. The facilities planner should use the equipment list of the existing or proposed systems for calculating space requirements. If the system has not been determined, select a system similar in capability and use its equipment inventory for calculations and requirements back-up data.

The terminology used to describe and identify ADP functional elements varies widely with equipment suppliers. These criteria attempt to standardize the terminology in order to simplify the facility requirement computation and review. When submitting requirements, subtotals must be shown for each functional group of spaces as shown below.

A separate calculation for each is required, even though co-location in a single building may be planned.

In general, requirements for spaces which primarily house equipment will be calculated by multiplying the actual square feet occupied by the equipment (footprint or shadow) by a factor which will allow for operation, circulation and maintenance. The footprint of a piece of equipment is the actual amount of floor space occupied. The shadow is the projection of the equipment outline on the floor which would encompass protrusions or overhangs from the sides of certain equipment such as printers. The space requirements for other areas will be determined on an individual basis.

Following is a discussion of the basic categories of ADP spaces. Space allowances are given in Table 610-20.

Main Computer Area

This space accommodates the central processor, memory, controllers, on-line storage, on-line output devices, telecommunications interface equipment and other directly related equipment. Key sections of this area require raised floor and closely controlled HVAC system; these requirements are determined by individual analysis.

Primary Support Area

This area accommodates functions and equipment which directly control or provide input to the main computer. The main components of this category are:

Tape, disc and card library. Area is for storage, cataloging and maintenance of library material. It does not require raised flooring, but should have the same environmental controls as the computer area.

Vaults may be required for security of data masters and classified material. Space calculations must show the volume of material to be stored with its related floor area requirement, space devoted to circulation, and space requirements for desks and work tables.

Data entry. Area for input devices such as readers for cards or tapes, drums, disks, optical character recognition, and similar equipment.

Electronic Accounting Machine (EAM). This equipment may not be used by all activities.

Terminal control room. This space is for all equipment related to the operation of terminals, data sets, testing and communications switching.

Secondary Support Area.

The main components are:

Field engineering. Work area required for the equipment vendors' use. It must be securable.

Production control. This space accommodates internal management, scheduling operations and customer relations. Requires provisions for visitors' conferences and display boards.

Work reception. This is a buffer zone designated for customers to deliver and receive their work. It should be adjacent to the building entrance and production control. Security screening may be required in this area.

Output preparation. Computer output products are processed in this area. It houses PCAM equipment, bursters, paper shredders, decollators, reproduction machines and assembly tables.

Break room. This space is required for personnel who work in environmentally controlled areas where smoking, food or beverage consumption are not permitted.

Utilities support. This space accommodates equipment which directly serve the ADP areas such as fire alarms, smoke detection system, temperature and humidity controls, no-break power sources, and power quality regulators. Derive space requirements by using an industrial engineering layout.

DPI Administration. This component is dedicated to administrative type personnel who need to be immediately contiguous to the ADP spaces. Such functions include: direct supervision of the DPI, monitoring equipment performance, DPI security, environmental monitoring, software and hardware, teleprocessing troubleshooting and repair.

Table 610-20 provides space allowances or other planning guidance to calculate facility requirements for the above components.

TABLE 610-20
Space Allowances for Automatic Data Processing Centers

TYPE OF SPACE	ALLOWANCE IN NET SF	NOTES
1. MAIN COMPUTER AREA	5 x Footprint or Shadow of Equipment	1
2. PRIMARY SUPPORT AREA		
Tape/Disc/Card Library	Individual Computation (See Text)	
Data Entry	5 x Footprint or Shadow of Equipment	
Electric Accounting Machine	5 x Footprint or Shadow of Equipment	
Terminal Control Room	5 x Footprint or Shadow of Equipment	
3. SECONDARY SUPPORT AREA		
Field Engineering	225 NSF per Workbench	2
Production Control	100 NSF per Person	
Work Reception	90 NSF per Person	3
Output Preparation	3 x Footprint or Shadow of Equipment	4
Break Room		
Utilities Support	Industrial Engineering Analysis	
DPI Administration	Use Code 610-10 Detailed Criteria	

NOTES

1. Includes footprints of floor mounted A/C equipment.
2. Add space for parts storage (individual justification required).
3. Add space for counter and storage for customers' work.
4. Add space for work surfaces (individual justification required).

NET TO GROSS CONVERSION

The allowance for items 1 through 3 of table 610-20 are given in net square feet. To obtain gross square feet, multiply allowance total by the factor of 1.3.

An activity whose primary mission is to operate a data processing installation may have other considerations for facilities not in direct support of the DPI operations such as:

General activity administration spaces
Training administration
Programming support
System software development
Conference rooms
Technical library

These facilities are to be planned using code 610-10 criteria as well as reported under 610-10 category code. Bulk administration storage is to be planned and reported under category code 610-77.

Most ADP facilities have a mission requirement for training of their own personnel as well as customer representatives in system operation and application to their particular needs. For this task there may be a requirement for classrooms that are planned using category code 171-10 or 171-20 criteria.

610 30 CLASSIFIED MATTER INCINERATOR/SHREDDER AND BLDG. (SF)

No planning factors are available. Provide facilities as required.

610 40 LEGAL SERVICES FACILITY

NAVY FACILITIES

Naval Legal Service Offices provide comprehensive legal services to command and individual clients. These services include trials by court-martial, administrative discharge proceedings, adjudication of claims, legal assistance, and command advice. Properly designed and constructed, NLSO facilities emphasize the Navy's commitment to the administration of local, state, federal, and international law, improve the client’s perception of the services provided by Navy legal personnel and allow for the most efficient provision of legal services.

Generally, the space requirements for a NLSO relate to the following five functions:

1. Military Justice
2. Claims
3. Legal Assistance
4. Unit Administration
5. Law Library

Some of the space requirements can be derived from administrative space criteria, Category Code 610-10. Naval Legal Service Offices, however, present a unique set of spatial constraints which must be recognized during the facility planning and design stages. These constraints include:

1. The physical separation of the trial counsel (prosecution) and defense counsel spaces;

2. Separate waiting areas for individuals waiting to be interviewed by trial and defense counsel:

3. Sufficient library space to allow for the continuous expansion of bound legal precedents and other legal materials.

Table 610-40 delineates the functional elements of a NLSO, provides planning factors, and comments on special requirements applicable to the individual elements. For the convenience of facility planners, Table 610-40 has been designed to reflect the entire NSLO operation. It may be used to calculate space requirements for the entire operation or for any of the individual components. Naval Legal Service Office facilities are planned and reported under Category Code 610-40.

TABLE 610-40
Space Allowance for Legal Services Facilities

TYPE OF SPACE	ALLOWANCES IN NET SF (NSF)	NOTE
1. UNIT ADMINISTRATION		
CO, X0, Master Chief PO		1
Secretarial Staff	Use 610-10 Detailed Criteria	
Administrative Staff		2
Conference/Training Room	Small Activity - 1 ea 500 NSF Medium Activity - 2 ea 500 NSF Large Activity - 1 ea 500 NSF 1 ea 900 NSF	
Data Processing Space	Based on equipment sizes	
2. LEGAL ASSISTANCE		
Legal Officers	150 NSF per counsel	1
Paralegals	110 NSF per person	
Staff	Use 610-10 Detailed Criteria	2
Waiting Room	9 NSF per occupant	3
Will Execution Room	100 NSF	8
3. CLAIMS		
Legal Officers	150 NSF per counsel	1
Paralegals	110 NSF per person	
staff	Use 610-10 Detailed Criteria	
Files	7 NSF per legal cabinet	
Archives	Small Activity - 150 NSF Medium Activity - 200 NSF Large Activity - 400 NSF	
4. LAW LIBRARY		
Stack Area	6.6 NSF per 100 volumes	
Work Area	25 NSF per person	
Staff	10% of stack plus reading areas	
Expansion	120 NSF	
5. MILITARY JUSTICE		
Courtrooms		
Trial by Court Members	1,500 NSF	
Trial by Judge	900 NSF	

TABLE 610-40
Space Allowance for Legal Services Facilities

TYPE OF SPACE	ALLOWANCES IN NET SF (NSF)	NOTE
Support Spaces		
Judges Chamber	200 NSF (one per judge)	
Deliberation Room	300 NSF	5
Witness Room	180 NSF (one per courtroom)	
Trial Counsel Spaces	150 NSF per Counsel	1, 6
Trial Counsel Waiting Area	9 NSF per Occupant	6
Defense Counsel Spaces	150 NSF per Counsel	1, 6
Defense Counsel Waiting Area	9 NSF per Occupant	6
Detent ion Room	48 NSF (with W/C and Lavatory)	6
Court Reporter	150 NSF	1, 7
Paralegals	110 NSF	
Clerks	60 NSF	
ACDUTRA Counsel/IMC Spaces	110 NSF per Counsel	
Secure Storage	100 NSF	
Command Service Attorney	150 NSF	
Command Service Paralegal	110 NSF	

NOTES:

1. Private offices required.
2. Private offices for staff must be individually justified.
3. Locate waiting room to serve both legal assistance and claims sections.
4. Provide one courtroom for each judge, if only one courtroom is required, plan for trial by court members. If two or more are required, plan for a 1 to 1 mix of courtroom types. Provide space for 40 to 50 spectators for trial by court members type courtroom and 20 to 25 spectators for trial by judge type.
5. Provide one deliberation room with separate and integral toilet facilities for each trial by court members courtroom.
6. Plan for a minimum of two defense and trial counsel offices with separate waiting rooms and detention room as part of defense counsel spaces. It is mandatory that defense and trial counsel spaces are separated to insure confidentiality of internal proceedings.
7. If space for more than one recorder or transcriber is required, plan for general office space with acoustically treated partitioning.
8. Provide for medium and large facility.

To obtain gross floor area, add net areas and multiply by 1.50.

As a general rule, legal service facilities will be categorized in one of three types: small facility (with approximately 30 personnel), medium facility (approximately 45 personnel), or large facility (approximately 135 personnel).

MARINE CORPS FACILITIES

The Marine Corps has specific requirements for courtroom facilities at certain locations. This facility provides space for the courtroom and immediately adjacent space for trial proceedings. The basic allowance provides for the following: courtroom proper, prosecution counsel, prosecution witness, defense counsel, defense witness, court reporter, judge's office, holding room, lobby, janitor, men's toilet, women's toilet and a single occupancy toilet.

There are two facility types:

Type A (large facility) - 4,440 gross sq ft (60' x 74' The courtroom proper is 1,512 net sq ft (42' x 36') with provisions for trial by trial board members. In addition to the basic functional elements it includes a deliberation room.

Type B (small facility) - 3,213 gross sq ft (51' x 63'). The courtroom proper is 825 net sq ft (30' x 27.5') with the basic functional elements as described above.

Marine Corps Requirements

Type of Function	Number of Type A Facilities	Number of Type B Facilities	Remarks
M.C.B.	1	1	Camp Pendleton requires two Type B facilities.
M.C.R.D.	1	1	
M.C.L.B.	1	1	
M.C.A.S.	1	0	New River requires a Type A facility. None at Tustin. 1st MarBrig is serviced by M.C.A.S. Kaneohe.
COMCABS EAST/WEST	1	1	
FMF (Div.)	1	2	3rd Div. requires 3 type A and 3 type B facilities.
FMF (Wing)	1	1	
Force Troops,	1	1	Force Service Support Group (F55G) is serviced by the Marine Corps Air Ground Combat Center (MCAGCC).

610 70 DIVISION/WING HEADQUARTERS, MARINE CORPS (SF)

This category code is for a Fleet Marine Force (FMF) facility and provides the necessary administrative space to conduct the day-to-day operations of a Marine Division Headquarters or a Marine Aircraft Wing Headquarters. See NAVFAC P-272, Definitive Designs, Part 4, for appropriate space allocations.

610 71 REGIMENTAL/GROUP HEADQUARTERS, MARINE CORPS (SF)

This category code is for a Fleet Marine Force (FMF) facility and provides the necessary administrative space to conduct the day-to-day operations of a Marine Regimental Headquarters or a Marine Aircraft Group Headquarters. See NAVFAC P-272, Definitive Designs, Part 4, for appropriate space allocations.

610 72 BATTALION/SQUADRON HEADQUARTERS, MARINE CORPS (SF)

This category code is for a Fleet Marine Force (FMF) facility and provides the necessary administrative space to conduct the day-to-day operations of a Marine Battalion or a Squadron Headquarters. Squadron administrative facilities are often provided within the organizational maintenance hangar (Category Code 211 05) and in such cases are not authorized under this category code. See NAVFAC P-272, Definitive Designs, Part 4, for appropriate space allocations.

610 73 COMPANY/BATTERY HEADQUARTERS, MARINE CORPS (SF)

The category code is for a Fleet Marine Force (FMF) facility and is intended for those FMF units of company or battery size which require separate administrative facilities. See NAVFAC P-272, Definitive Designs, Part 4, for appropriate space allocations.

Requirements for company or battery administrative functions are often included as part of other facilities such as bachelor enlisted quarters. In this case, the requirements are determined as for Category Code 610 10.

610 77 ADMIN STORAGE (READY ISSUE/SHOP STORES/MISC.) (SF)

Storage facilities for miscellaneous equipment or goods related to administrative facility support will be provided only where it can be individually justified. There are no criteria for this type of facility. General information on normal stacking heights, SF per measurement ton requirements, and other parameters are provided in Category Code 440 series.

620 ADMINISTRATIVE FACILITIES - UNDERGROUND

620 10 UNDERGROUND ADMINISTRATIVE FACILITY (SF)
620 20 UNDERGROUND DATA PROCESSING CENTER (SF)
620 77 UNDERGROUND ADMIN STORAGE (READY ISSUE/SHOP STORES/MISC.) (SF)

Planning for the above facilities is identical as for Category Codes 610 10, 610 20 and 610 77, respectively. Plan only where authorized by higher headquarters.

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690 OTHER ADMINISTRATIVE FACILITIES

690 10 FLAGPOLE/MARKER (EA)
690 15 SALUTING BATTERY GUN MOUNT (EA)
690 25 REVIEWING STAND (EA)
690 30 CLASSIFIED MATERIAL INCINERATOR/SHREDDER (NO BUILDING) (EA)

No planning factors are available. Provide facilities as required.

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Section 7

FACILITY CLASS 700 - HOUSING AND COMMUNITY FACILITIES

Housing and Community Facilities are those necessary to support the personnel residing and working on the base. Personnel to be considered include the **military complement, civilian personnel and, in certain instances, trainees, students, and transients.** Facilities that may be provided include **housing for married personnel, barracks and quarters for single personnel, messing facilities, service and community support facilities such as, laundries, bakeries, schools, libraries, chapels, commissaries, exchanges, and essential recreational facilities.**

Category groups pertaining to these facilities are as follows:

Group 710	**FAMILY HOUSING**
Group 720	**UNACCOMPANIED PERSONNEL HOUSING**
Group 730	**COMMUNITY FACILITIES - PERSONNEL SUPPORT AND SERVICES**
Group 740	**COMMUNITY FACILITIES - MORALE WELFARE AND RECREATION - INTERIOR**
Group 750	**COMMUNITY FACILITIES - MORALE WELFARE AND RECREATION - EXTERIOR**
Group 760	**MUSEUMS AND MEMORIALS**

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710 FAMILY HOUSING

Design Criteria: MIL-HDBK-1035

A family housing requirement exists for all Navy and Marine Corps military and key civilian personnel with dependents. Housing will not he programmed where the local housing market has the capacity to provide suitable rental housing for military facilities. The gross housing requirement for a naval installation is based on the number of eligible personnel with dependents. Eligible personnel are commissioned officers, warrant officers, or enlisted members and key civilian employees. Students in these categories are included if they are on permanent change of station orders for courses of 20 or more weeks. The gross housing figure for a base may be developed from its planned personnel strength projected as far as reliable estimates are available, or from a study of the base table of organization, utilizing the marriage factors developed from an actual survey of personnel assigned to a similar installation. In the absence of actual personnel survey data, the Navy and Marine Corps service averages, as shown in Table 710-A on the following page may be used to estimate family housing, unaccompanied personnel housing as well as other personnel support facility requirements.

The following basic categories of facilities are included in the 710 Family Housing group:

Code 711	**FAMILY HOUSING - DWELLINGS AND ATTACHED GARAGES**
Code 712	**FAMILY HOUSING - MOBILE HOMES (SUBSTANDARD)**
Code 713	**FAMILY HOUSING - MOBILE HOME PARKS**
Code 714	**FAMILY HOUSING - DETACHED FACILITIES**

TABLE 710-A
Navy and Marine Corps Personnel Averages
(1992 Data)

NAVY					MARINE CORPS				
GRADE	RANK	% DISTRIB	% MARRIED	AVG NO. DPN	GRADE	RANK	% DISTRIB	% MARRIED	AVG NO.DPN
OFFICERS					**OFFICERS**				
07-10	ADMIRAL	**0.3**	**96.9**	**2.3**	**07-09**	GENERAL	**0.3**	**94.1**	**1.8**
06	CAPTAIN	5.1	91.6	**2.8**	**06**	COLONEL	**3.3**	**95.4**	**2.6**
05	COMMANDER	11.3	**90.0**	**2.9**	05	COLONEL	**8.3**	**93.1**	**3.0**
04	LT.COMMANDER	19.8	**84.2**	**2.7**	**04**	MAJOR	16.3	**89.4**	**2.9**
03	LIEUTENANT	**34.1**	**69.1**	**2.2**	**03**	CAPTAIN	**32.0**	**77.8**	**2.4**
02	LIEUT. J.G.	**13.4**	**45.9**	**1.7**	**02**	1st LT	17.7	**53.6**	**1.7**
01	ENSIGN	11.9	**30.1**	1.8	01	2nd LT	12.2	**32.6**	**1.5**
W	WARRANTS	**4.1**	**90.5**	**2.8**	W	WARRANTS	**9.9**	**89.0**	**3.1**
	Totals		**68.8**	2.4		**Totals**		**72.6**	**2.5**

TABLE 710-A

NAVY					MARINE CORPS				
GRADE	RANK	% DISTRIB	% MARRIED	AVG NO. DPN	GRADE	RANK	% DISTRIB	% MARRIED	AVG NO.DPN
ENLISTED PERSONNEL					**ENLISTED PERSONNEL**				
E9	MASTER CPO	1.0	91.1	**2.9**	E9	M GUN SGT/ SGT MAJOR	**0.8**	**89.9**	**2.8**
E8	SENIOR CPO	**2.2**	**88.8**	**3.0**	E8	M SGT/ 1st SGT	**2.1**	**88.6**	**3.1**
E7	CPO	**6.9**	**86.2**	**2.9**	E7	GUN SGT	**5.4**	**85.4**	**3.1**
E6	PO 1ST CL	17.4	**80.3**	**2.6**	E6	STAFF SGT	**8.9**	**81.7**	**2.8**
E5	PO 2ND CL	21.6	**64.3**	**2.1**	E5	SERGEANT	14.3	**72.6**	**2.3**
E4	PO 3RD CL	**20.1**	**39.6**	**1.6**	E4	CORPORAL	18.7	**49.0**	**1.7**
E3	SEAMAN	15.2	**25.0**	**1.5**	E3	LANCE CORP	**33.8**	**25.7**	**1.4**
E2	SAPPRENTICE	9.0	15.2	1.5	E2	PVT 1st CL	**10.5**	**11.8**	**1.4**
El	RECRUIT	**6.6**	**8.6**	**1.4**	E1	PVT	5.5	7.8	1.4
	Totals		**50.4**	**2.3**		**Totals**		**44.4**	**2.2**

Note: Percent married is not the same as percent with dependents. Numbers have been rounded.

711 FAMILY HOUSING - DWELLINGS AND ATTACHED GARAGES

711 20 through 711 76 Series, HOUSING (FA)

Design Criteria: See MIL-HDBK-1035 (June 89) Detailed Guidance, Sample Calculations & Tables of acceptable Land Use Intensity Ratios.

For a complete list of five digit codes in this category group, see NAVFAC P-72.

Public quarters for eligible military personnel will be planned as indicated on page 710. Housing for key civilian personnel with dependents will be planned on an individual basis. Government-owned or controlled housing will be provided for all eligible personnel required to reside on-station by reason of military necessity, and for other eligible personnel for whom it is impracticable to obtain adequate private housing at reasonable rentals and locations. In computing net housing requirements, existing housing in the following category codes will be considered as assets against gross requirements:

1. Wherry housing unacquired.
2. All adequate public quarters.
3. All private housing leased for use as public quarters.
4. All rental guaranty housing (in foreign countries).
5. All public quarters under construction or authorized and approved for construction.
6. Private units approved for leasing but not yet under contract.
7. Rental guaranty units under the contract or approved for development.

In addition existing private and local government rental housing (including mobile homes) in which military personnel are accepted as tenants, will be considered as suitable community support and will be charged as assets against requirements in all cases where it is classed as satisfactory by the occupant. If not classed as satisfactory by the occupant, or if vacant, it will be considered suitable provided it meets the following criteria:

1. **Location** --The distance from the administrative area of the installation can be traversed by privately-owned vehicle in one hour or less during rush hours.

2. **Cost** -- Rent plus utilities (except telephone) does not exceed 115% of the member's Basic Allowance for Quarters (BAQ) plus Variable Housing Allowance (VI-IA).

3. **Condition** -- Must be complete dwelling unit with private entrance with bath and kitchen for sole use of occupants and so arranged that both kitchen and bathrooms can be entered without passing through bedrooms. The units must be well constructed and in good condition of repair with heating (if required) and kitchen equipment provided. It must be in a residential area not subject to offensive fumes, industrial noises. and other objectionable features.

Land Use Intensity. The optimum land use for family housing has been established by the Department of Defense. The following parameters are to be considered in determining land use intensity ratio for a particular site:

1. Floor area
2. Living space
3. Recreation space
4. Open space

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712 FAMILY HOUSING - MOBILE HOMES (SUBSTANDARD)

712 10 MOBILE HOMES, SUBSTANDARD (PA)

Mobile homes with government ownership are an emergency expedient. They are not considered in basic planning.

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713 FAMILY HOUSING-MOBILE HOME PARKS

This group includes single and/or double wide manufactured housing parking sites with appurtenant utility connections, roads, walks, storage sheds, laundry /community buildings and recreational facilities.

713 10 TRAILER SITES - FOR GOVERNMENT-OWNED TRAILERS (FA)

The use of government-owned trailers is not generally contemplated.

713 11 MOBILE HOME PARK (FA)

This group includes single and/or double wide manufactured housing parking sites with appurtenant utility connections, roads, walks, storage sheds, laundry /community buildings and recreational facilities.

The number of trailer sites are computed from a specific study and are provided only when private facilities are not available. The sites are self-supporting - tenants supply their own trailers, pay site rent, and receive BAQ.

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714 FAMILY HOUSING - DETACHED FACILITIES

Detached facilities are structures separated from family quarters, but available to the occupants.

714 10 DETACHED GARAGES (SF)

Design Criteria: See MIL-HDBK-1035 (June 89)

Detached garages are planned on the basis of one per living unit and a space allowance of one vehicle per garage at those locations subject to temperatures of -10° Fahrenheit and below, or where extreme winds, salt air, or sandstorms require garages. See MLL-HDBK-1035 for detailed guidance.

714 20 DETACHED CARPORTS (SF)

Design Criteria: See MILHDBK-1035 (June 89)

Detached carports are also provided on the basis of one per living unit and a space allowance of one vehicle per carport. See MIL-HDBK-1035 for detailed guidance.

714 30 FAMILY HOUSING - OTHER DETACHED BUILDINGS (SF)

714 31 FAMILY HOUSING - OTHER DETACHED FACILITIES (EA)

These codes are for inventory purposes only and are to be used for minor detached buildings and facilities directly relating to a particular family dwelling.

714 32 COMMUNITY CENTER (SF)

Design Criteria: See MIL-HDBK-1035 (June 89) for specific criteria and procedures for planning FHCC's

A Family Housing Community Center (FHCC) provides space for social and recreational programs at family housing projects where comparable Navy or non-navy facilities are not reasonably accessible. The establishment of an FHCC must be authorized by NAVFAC Assistant Commander for Family Housing (FAC 08) or Commandant of the Marine corps (LFL).

Normally the establishment of an FHCC should be considered only for housing projects with 250 or more family units. FHCC in support of smaller projects at isolated locations will be considered on a case by case basis.

A typical FHCC may provide spaces for assemblies, games, hobbies and crafts, conferences, and other functions in direct support of the FHCC operation. The design emphasis will be placed on flexible space arrangements and multipurpose space utilization. Indoor-outdoor function interrelationships should also be considered. Size of the facility is determined by user requirements.

714 33 HOUSING WELCOME CENTER (SF)

A Family **Housing Welcome Center (HWC)** provides space for administrative and service functions associated with the provisions of Government and private sector housing. The establishment of a HWC must be authorized by **NAVFAC Assistant Commander for Family Housing (FAC 08) or Commandant of the Marine Corps (LFF-3).** When authorized, the size of a HWC is based upon user requirements using 610-10 criteria.

714 77 DETACHED HOUSING STORAGE (ASF)

Detached storage facilities in support of family housing will be provided only where it can be individually justified. There are no criteria for this type of facility. General information on normal stacking height, SF per measurement ton requirements, and other parameters are provided in category code 440 series.

This category code is **not intended for Marine Corps use.**

720 UNACCOMPANIED PERSONNEL HOUSING

This general category group includes public quarters for unaccompanied military and, under certain conditions, civilian personnel. It also includes direct supporting facilities such as mess halls, The basic group is divided into the following categories.

Group 721	**UNACCOMPANIED PERSONNEL HOUSING - BACHELOR ENLISTED QUARTERS**
Group 722	**UNACCOMPANIED PERSONNEL HOUSING - MESS FACILITIES**
Group 723	**UNACCOMPANIED PERSONNEL HOUSING - DETACHED FACILITIES**
Group 724	**UNACCOMPANIED PERSONNEL HOUSING - OFFICERS' QUARTERS**
Group 725	**UNACCOMPANIED PERSONNEL HOUSING - EMERGENCY HOUSING**

Quarters and messing will be provided for military and, where authorized, civilian personnel in the following categories:

1. **Single**
2. **Unaccompanied Married**
3. **Students and Trainees**
4. **Transients**
5. **Rotational**

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721 UNACCOMPANIED ENLISTED PERSONNEL HOUSING - BACHELOR ENLISTED QUARTERS (PN)

See Military Handbook 1036 for design criteria.

Bachelor Enlisted Quarters (BEQ) refers to apartment style, hotel style, dormitory style living quarters and the open bay barracks for recruits. If messing facilities are attached, use category code numbers (CCNS) 721-11 through 721-40 for the quarters portion as appropriate and category code number 721-45 for the mess hall portion. For detached mess halls, use category group 722. The basic codes for the quarters portion of category group 721 are:

	U/M
721-11 BEQ (Permanent party E1 through E4 Navy)	(PN)
721-12 BEQ (Permanent party E5 through E6 Navy)	(PN)
721-13 BEQ (Permanent party E7 through E9 Navy)	(PN)
721-14 Class 'A' Student Dormitories (Navy only)	(PN)
721-15 Recruit Barracks/ USMC School of Infantry	(PN)
721-21 BEQ (Transient E1 through E4 Navy)	(PN)
721-22 BEQ (Transient E5 through E6 Navy)	(PN)
721-23 BEQ (Transient E7 through E9 Navy)	(PN)
721-24 BEQ (E1-E4 Marine Corps)	(PN)
721-25 BEQ (E5 Marine Corps)	(PN)
721-26 BEQ (E6-E9 Marine Corps)	(PN)
721-30 Civilian Bachelor Housing	(PN)
721-31 Civilian Bachelor Housing (Contractors)	(PN)
721-40 Disciplinary/Restricted Barracks	(PN)

PLANNING CRITERIA

The BEQ programming requirements are derived from the unaccompanied personnel Housing Survey (R-19). At Marine Corps installations, use the Facilities Support Requirement (FSR) document, issued annually by HQMC. Refer to BUPERSINST 1396.77 for programming TPU facilities. For broad planning and programming purposes where survey figures are not available, the quarters requirements may be determined by contacting the EFD or EFA bachelor quarters program management office.

721-11/12/13 PERMANENT PARTY - BACHELOR ENLISTED QUARTERS (PN)

GROSS PLANNING CRITERIA FOR NEW CONSTRUCTION FOR 721-11/12/13

(l+l) module	3 Stories or less	More than 3 stories
Sleeping/Living Area *	46 sq. m	46 sq. m
Core Area/Circulation/MEC	20 sq. m	24 sq. m
Total Module Allowance	66 sq. m	70 sq. m **

* Includes MEC (mechanical, electrical and communication) space inside the module. This does not include circulation outside the module or MEC space outside the module. The module total allowance of 46 sq. m only refers to the sleeping quarters, closets, bathroom counter/microwave/refrigerator area, interior circulation, and associated MEC space inside the module. All new bachelor quarters will have an additional space for a core area plus circulation and MEC requirements.

** Applies to any bachelor quarters over 3 stories, all exterior corridor style bachelor quarters and special design requirements for historical preservation, etc. For interior corridor bachelor quarters, 3 stories or less, modules between 66-70 sq. m must be individually justified.

The one plus one module is sized for one E5-E9 or two El-E4 personnel. Refer to Table 721-11. All construction projects will identify maximum occupancy or the number of El-E4 personnel that can occupy the quarters and the intended use capacity. The intended use capacity cannot exceed the number from the R-19 except for rounding purposes.

There are three basic entry styles for the (1 + 1) style apartments; exterior corridor style, interior corridor style and open landing access style. Open landing access style, generally preferred for economics, is not applicable over three stories. When sufficient real estate creates options as to style of bachelor quarters, an economic analysis is recommended.

CORE AREA

The typical core area to be provided for all BEQs is shown below. In design, installation commanders have flexibility to modify core space designations and/or functions to meet mission needs or local conditions.

Administration area consisting of lobby, front desk, office space, copier/computers

Public Toilets	Janitor's Closets	Linen Storage
Multi-purpose Room	Game Room	Vending
Community Kitchen	Central Laundry	Housekeeping
Mail Services	Bulk Storage	

Optional areas in addition to the module gross square footage if not provided within 1/2 kilometer.

Video Tape Room	Exercise Room	Video/Came Room
50,000 sq. mm/module	150,000 sq. mm/module	90,000 sq. mm/module

Excercise rooms may also be provided if the waiting list to use existing facilities averages over an hour. Video tape room and Video/Game rooms may also be provided where existing facilities have reached full capacity. All these areas are accounted for as part of the bachelor quarters.

PARKING FOR PERMANENT PARTY PERSONNEL

Automobile parking for 70% of the residents must be provided. Visitor parking for 1% of the residents with handicapped spaces as required by Navy Design Criteria. In addition, provide motorcycle parking for 5% of the residents arid bicycle parking for 15% of the residents. One car wash area with a water source and an oil separator will also be provided.

Note: Some overseas or CONUS Activities may have unique circumstances that require less parking. In these cases, parking will be based on a parking survey of current residents.

OUTSIDE RECREATION

Provide one sand volleyball court and one full outdoor basketball court per 300 residents if not available within 1/2 kilometer. Similar outdoor recreation facilities can be substituted. Picnic areas and barbecue areas are required for all bachelor quarters. All outdoor recreation used exclusively for bachelor quarters will be accounted under a bachelor quarters category code.

TABLE 721-11
Navy Permanent Bachelor Enlisted Quarters

RANK/RATE	OSD MINIMUM STANDARDS OF ACCEPTABILITY*	PLANNING CRITERIA FOR NEW CONSTRUCTION
E-7 - E-9 (721-13)	Private room and bath. Minimum 25 sq. m (270 SF) net living area.	Living room and sleeping room; 22 net sq. m sleeping/ living area, plus private bath, service area, approximately 4 net sq. m closets. Module is 46 gross sq. m.
E-5 - E-6 (721-12)	Private room and a bath shared with not more than one other. Minimum 12.5 sq. m (135 SF) net living area.	Sleeping room and living room occupied by one person; 22 net sq. m sleeping/ living area plus private bath, two closets approx 2 net sq. m each, and service area. Module is 46 gross sq. m.
E-l -E-4 (721-l 1)	Not more than four to a room. Central bath. Minimum 8.4 sq. m (90 SF) net living area.	Two sleeping rooms each occupied by one person; 11 net sq. m living area/ person, plus bath, two closets approx 2 net sq. m each, and service area. Module is 46 gross sq. m.

* OSD minimum standards of acceptability apply to billeting management rather than to facility condition for NFADB reporting purposes.

RENOVATION STANDARDS

Renovation work should use standards for new construction, but common sense and economics may justify variations. For example, oversized units in existing configurations like the 1983 two-plus-two style, can be cost effective when major work like bathrooms and block walls are left in place. This could happen when a 4 person module is converted to a 2 person module.

Under-sizing is not desirable, but when major expenses can be avoided with a renovation somewhere between construction standards and assignment standards, that option will need to be at least shown and discussed. Renovation below assignment standards normally will not be considered.

The renovation, conversion or replacement choices should be considered and addressed briefly on all renovation projects.

REPAIR STANDARDS

Repair work may be limited to original standards used for the existing buildings.

721-14 CLASS 'A' STUDENT DORMITORIES (PN)

Refer to Category Codes 721-21/22/23 for planning criteria. The category code is for inventory purposes and has no separate criteria.

PARKING

Provide automobile parking for 45% of the residents at Navy 'A' Schools and at USMC School of Infantry. In addition, provide motorcycle parking for 5% of the residents and bicycle parking for 25% of the residents. Provide visitor parking for 1% of the residents.

721-15 RECRUIT BARRACKS (PN)

Open bay designs will be constructed only for recruits, receiving barracks, and USMC School of Infantry.

TABLE 721-15
Recruit Barracks

RANK/RATE	OSD MINIMUM STANDARDS OF ACCEPTABILITY	PLANNING CRITERIA FOR NEW CONSTRUCTION
Recruit & Receiving Barracks, and USMC School of Infantry (721-15)	Open bay; central bath. Minimum 6.7 net sq. m (72 SF) net living area per person.	Open bay; central bath. Minimum 6.7 net sq. m sleeping area. Provide 13 gross sq. m per recruit.

Recruit quarters are open bay, central head facilities with net living area sized as one equal share of the open bay sleeping area. Typical sizes are 60 people per bay.

PARKING FOR RECRUITS AND USMC SCHOOL OF INFANTRY
Resident parking at USMC and Navy recruit barracks is not required. Provide 1% visitor spaces at Navy and USMC recruit barracks, however handicapped spaces are not required.

721-21/22/23 TRANSIENT BACHELOR ENLISTED QUARTERS (PN)

Hotels for Transient Personnel Units (TPU), deployed rotational units, ships crews in a commissioning, decommissioning, or overhaul status, students attending school less than 20 weeks, reserves on active duty training, (ACTDUTRA) and TDY personnel are covered under category code numbers 721-21/22/23.

GROSS PLANNING CRITERIA FOR NEW CONSTRUCTION FOR 721-21/22/23

(2+2) module	3 Stories or less	More than 3 stories
Sleeping/Living Area *	55 sq. m.	55 sq. m
Core Area /Circulation/ MEC	24 sq. m.	28 sq. m
Total Module Allowance	79 sq. m	83 sq. m **

* Includes MEC (mechanical, electrical and communication) space inside the module. This does not include circulation outside the module or MEC space outside the module. The module total allowance of 55 sq. m only refers to the sleeping quarters, closets, bathroom, small counter/microwave/refrigerator unit, interior circulation, and associated MEC space inside the module.

** Bachelor quarters larger than 79 sq. m must be individually justified. Bachelor Quarters constructed in extreme climates may individually justify the need for more mechanical space.

There are two basic entry styles for the (2+2) style hotels; exterior corridor style and interior corridor style. The (2+2) module is sized for one E7-E9, two E5-E6, or four E1-E4 personnel. Refer to Table 721-21. All construction projects will identify maximum occupancy or the number of E1-E4 personnel that can occupy the quarters and the intended use capacity. The intended use capacity cannot exceed the number from the R-19 except for rounding purposes.

See Category Code 721-11/12/13 for core area. On bases where weight rooms are for members only, excercise rooms in transient quarters are encouraged.

TABLE 721-21
Navy Transient Bachelor Enlisted Quarters

RANK/RATE	OSD MINIMUM STANDARDS OF ACCEPTABILITY*	PLANNING CRITERIA FOR NEW CONSTRUCTION
E-7 - E-9 (721-13)	Private room and bath. Minimum 23.2 sq. m (250 SF) net living area.	Private room and bath; 36 net sq. m sleeping/ living area, plus private bath, service area, and built in closets. Module is 55 gross sq. m.
E-5 - E-6 (721-12)	Private room and a bath shared with not more than one other. Minimum 12.5 sq. m (135 SF) net living area.	Private room and shared bath; 18 net sq. m sleeping/ living area, plus shared bath, service area, and built in closets. Two persons/ module. Module is 55 gross sq. m.
E-l -E-4 (721-11)	Not more than four to a room. Central bath. Minimum 8.4 sq. m (90 SF) net living area.	Shared room and bath; 9 net sq. m sleeping/living area, plus shared bath service area, and built in closets. Four persons/ module. Module is 55 gross sq. m.

* OSD minimum standards of acceptability apply to billeting management rather than to facility condition for NFADB reporting purposes.

PARKING FOR TRANSIENTS
Automobile parking for 70% of the residents must be provided. Visitor parking for 1% of the residents with handicapped spaces as required by Navy Design Criteria. In addition, provide motorcycle parking for 5% of the residents and bicycle parking for 15% of the residents. One car wash area with a water source and an oil separator will be provided.

Note: Some overseas or CONUS Activities may have unique circumstances that require less parking. In these cases, parking will be based on a parking survey of current residents.

721-24/25/26 MARINES - BACHELOR ENLISTED QUARTERS (PN)

GROSS PLANNING CRITERIA FOR NEW CONSTRUCTION FOR 721-24/25/26
(2+0) module

Sleeping/Living Area *	59 sq. m
Core Area /Circulation/MEC	26 sq. m
Total Module Allowance	85 sq. m

* Includes MEC (mechanical, electrical and communication) space inside the module. This does not include circulation outside the module or MEC space outside the module. The module total allowance of 59 sq. m only refers to the sleeping quarters, closets, bathroom, bulk storage, counter/microwave/refrigerator unit, interior circulation, and associated MEC space inside the module. All new bachelor quarters will have an additional space for a core area plus circulation and MEC requirements.

The Marines will use the (1+1) module in Table 721-11 only where approved by Headquarters USMC. The (2+0) module consists of two rooms each with a bath and is sized for two E5-E9 or four El-E4 personnel. Refer to Table 721-24. All construction projects will identify maximum occupancy or the number of El-E4 personnel that can occupy the quarters and the intended use capacity. The intended use capacity cannot exceed the number from the FSR except for rounding purposes.

See Category Code 721-11/12/13 for core area. On bases where weight rooms are for members only, excercise rooms in transient quarters are encouraged.

TABLE 721-24
Marine Corps Bachelor Enlisted Quarters

RANK/RATE	OSD MINIMUM STANDARDS OF ACCEPTABILITY*	PLANNING CRITERIA FOR NEW CONSTRUCTION
USMC E6-E9 (721-26)	Private room and bath. Minimum 25 sq. m (270 SF) net living area.	Private living room/ sleeping room; 18 sq.m net living area plus private bath, bulk storage and service area. Two persons/module. Module is 59 gross sq. m.
USMC E5 (721-25)	Private room and a bath shared with not more than one other. Minimum 12.5 sq. m(135 SF) net living area.	Private living/ sleeping room; 18 sq m net living area plus private bath, bulk storage and service area. Two persons/module. Module is 59 gross sq. m.
USMC E1-E4 (721-24)	Not more than four to a room. Central bath. Minimum 8.4 sq. m (90 SF) net living area.	Sleeping room, bulk storage, service area, and bath occupied by no more than two persons; 9 sq. m net living area per person. Four persons/module. Module is 59 gross sq. m.

* OSD minimum standards of acceptability apply to billeting management rather than to facility condition for NFADB reporting purposes.

There are two basic entry styles for the (2+0) style bachelor apartments; interior and exterior corridor style. Marine Corps bachelor quarters should generally be traditional/modem layout, of rectangular footprint, 2 to 3 stories in height, and of masonry construction. Excessive floors, or other unusual footprints/profiles which increase construction costs are deemed uneconomical and unacceptable. Barracks which deviate from this policy will be reviewed on a case by case basis, within resource/funding constraints. Planning criteria applies to all styles.

PARKING

Automobile parking for 70% of the residents must be provided. Visitor parking for 1% of the residents with handicapped spaces as required by Design Criteria. In addition, provide motorcycle parking for 5% of the residents and bicycle parking for 15% of the residents. One car wash area with a water source and an oil separator will be provided.

Note: Some overseas or CONUS Activities may have unique circumstances that require less parking. In these cases, parking will be based on a parking survey of current residents.

OUTSIDE RECREATION

Provide one sand volleyball court and one full basketball court per 300 residents if not available within 1/2 kilometer. Similar outdoor recreation facilities can be substituted Picnic areas and barbecue areas are required for all bachelor quarters.

OUTDOOR INDIVIDUAL MILITARY WASH AREA (USMC)

Provide outdoor equipment wash facilities (when required) at USMC bachelor quarters. The number of faucets/wash outlets shall be determined by the installation commander/resident FMF unit.

721-30 CIVILIAN BACHELOR HOUSING (PN)

Quarters and messing facilities for civilian grades GS-6 and below will be provided only at installations that are remote from municipal areas or where civilians are required to be housed on station for security reasons.

Facilities planning for civilians will be the same as for military personnel of equivalent rank. Table 721-30 provides the military and civilian schedule of equivalent grades as established by the Department of Defense.

TABLE 721-30
Military and Civilian Equivalent Grade Schedule

Military Grade Group	Civilian Grade Group	
	General Schedule	Wage System
E-7 to E-9	GS-6	WS-1 through WS-7 WL-1 through WL-5 WG-9 through WG-11
E-5 to E-6	GS-5	
E-4	GS-4	
E-l to E-3	GS-1 to GS-3	WG-1 through WG-8

721-31 CIVILIAN BACHELOR HOUSING BASE OPERATING SUPPORT - CONTRACTORS (PN)

No criteria for this facility are currently available.

72l-40 DISCIPLINARY/RESTRICTED BARRACKS (MN)

This Facility is to be used for berthing personnel in disciplinary holding of restricted status. The Disciplinary/Restricted Barracks may be an area within a regular enlisted or transient personnel quarters that is designated by the commanding officer for use as:

1. Disciplinary Holding Barracks. Berthing facilities for personnel in a holding status pending legal or administrative action or when assigned extra duty status.

2. Restricted Barracks. Berthing for personnel undergoing punitive restriction or restriction in lieu of arrest. Personnel under punitive restriction will not be co-mingled with personnel restricted in lieu of arrest.

OPNAVINST 1626 provides detailed policy and description of security features utilized in Disciplinary/Restricted Barracks. Berthing space will be in open bay with a minimum of 72 SF net living area per person. The facility is not located within an approved place of confinement (Brig).

72l-45 DINING FACILITY - ATTACHED (PN)

This code is to be used only in cases where the dining facility is an integral part of the BEQ. For planning guidance see category code 722-10. Enlisted Dining Facility.

721-46 BERTHING - NAVAL HOME

The Navy has authorized only one Naval Home. The home provides a residence for qualified retired Navy, Marine Corps, and Coast Guard personnel.

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722 UNACCOMPANIED PERSONNEL HOUSING-MESS FACILITIES

This group includes closed dining facilities for unaccompanied personnel. For clubs and open mess facilities, see the appropriate codes in 740 series.

722 10 ENLISTED DINING FACILITY (PN)
722 31 CIVILIAN DINING FACILITY (PN)

Code 722 31 is to be used only for inventory purposes where there are existing separate dining facilities for civilians. For planning purposes,

General. Dining facilities for enlisted personnel shall provide for cafeteria style feeding of short order and regular meals.

Projects are subject to review by the Navy Food Service System Office, Commandant of the Marine Corps and subsequently by DOD Food Service Facility and Equipment Planning Board. See Step 2 for specific guidance.

Dining facility requirements may be generated in three basic steps: (1) determination of serving requirements (2) analysis of existing facilities, and (3) determination of space requirements.

Planning Steps.

STEP - 1 DETERMINATION OF SERVING REQUIREMENTS

The number of enlisted personnel to be served during a meal period shall be determined by multiplying the maximum unaccompanied personnel housing projected occupancy by the appropriate percentage(s), as provided in Table 722-10A. Personnel on separate rations shall not be included in the serving requirements when planning new dining facilities, or retaining and modernizing permanent facilities. The average on-board count of crews of ships entitled to rations-in-kind while shipboard dining facilities are untenable but crew is living on board, shall be added to projected housing occupancy figure.

TABLE 722-10A
Personnel To Be Served

Type of Mission/Operation	Percentage To Be Served(2)
Training	
Basic and/or Recruit Training.....	95%
Mobilization/Annual Training.....	95%
Advanced Individual Training.....	90%
Service Schools, Recruit Reception Stations.....	85%

Table continued on next page

TABLE 722-10A (continued)
Personnel To Be Served

Type of Mission/Operation	Percentage To Be Served (2)
Permanent Party	
Remote Locations	90%
Naval Stations	
Air Stations	
Support Activities, Construction Battalions, Shipyards, Weapon Stations.....	70%
Personnel Transfer and Overseas Processing Centers.....	50%
Brig (1)	110%

(1) 100% should be applied against the maximum capacity of prisoners in order to determine the serving requirements.
(2) Officers and civilians shall not be included in the serving requirement when planning, retaining or modernizing enlisted personnel dining facilities, except in overseas or remote locations where support is authorized.

STEP - 2 ANALYSIS OF EXISTING FACILITIES

New dining facilities shall not be planned solely to support an additional unaccompanied personnel housing increment. They shall be justified based on an evaluation of existing dining facilities capacity, age, condition, and location of facilities relative to work and housing areas. Due to numerous changes in food service operations within recent years, it is necessary to re-evaluate the capacities of dining facilities constructed utilizing earlier criteria. While overall square foot authorization for new facilities are generally applicable to determination of capacities of existing facilities, there are many independent factors which will limit capacity. Certain types of these limiting parameters are as follows:

1. Storage Capacity

2. Service Capacity - A properly equipped and manned regular meal serving line can sustain a service rate of 8 personnel per minute. A properly equipped and manned short-order to-order serving line can sustain a service rate of 5 personnel per minute.

3. Seating Capacity - The eating time per person is an average of 18 minutes.

4. Meal Periods - For planning purposes the total serving/eating time (meal period) should not be less than 90 minutes or more than 160 minutes.

5. Service Period - For planning purposes the total service time should not be less than 72 minutes or more than 142 minutes.

6. Equipment Capacity

The Navy Food Service system Office or Commandant of the Marine Corps, Code LFS-4 should be consulted for planning and evaluating assistance. As a minimum, DOD Construction Criteria Manual (DOD 4270.1M) requires documentation that the above offices have reviewed, validated and approved all of their respective MILCON, O&M and minor construction food service facility projects prior to submission for OSD approval.

STEP 3 - DETERMINATION OF SPACE REQUIREMENTS

The authorized floor areas are based on the serving requirement and shall conform to Table 722 10B. For Shore Facilities Planning System documentation purposes, the sizes of dining facilities are expressed as total feeding capacity in number of personnel.

TABLE 722-108
Space Criteria For Enlisted Personnel Dining Facilities

Serving Requirement - Number of Enlisted Personnel To Be Served	Gross Square Foot Area (1) (2) (3)
less than 40	(4)
40 to 80	3,500
81 to 150	5,000
151 to 250	6,400
251 to 400	8,900
401 to 650	12,900
651 to 1,000	17,200
1,001 to 1,500	20,800
1,501 to 2,200	29,500
2,201 to 3,000	36,300
3,001 to 4,000	44,900
4,001 to 5,000	52,000

NOTES:

(1) The gross SF includes: toilets facilities, receiving, storing, preparing, serving and dining areas. Mechanical spaces are not included and shall be added to gross SF areas. For planning purposes, the mechanical space can be assumed to be 5% of the gross S.F. area.

(2) Space for vestibules, interconnecting covered walks, enclosed corridors and other architectural devices for climate and comfort are not included in Table 722-10B and may be added, if need is fully justified. Aesthetic embellishments which add space to dining facilities are not justifiable.

(3) Space for in-flight kitchens is not included in Table 722-10B and may be added, if fully justified by the appropriate food service office.

(4) If the number of enlisted personnel is less than forty, then the requirement shall be determined by the Navy Food Service System Office.

Consolidation. Maximum effort shall be directed toward the consolidation and modernization of existing permanent facilities. The replacement of multiple existing temporary facilities with permanent consolidated facilities, shall be considered when appropriate.

When existing food service facilities are no longer required to support the mission, they may be converted to other use when economically feasible and the necessary funding is authorized.

Central Facilities. The establishment of central facilities for an installation's appropriated fund food service program such as: central food preparation, cold storage, meat-cutting and bakery facilities, utilizing MILCON, O&M, and minor construction funds shall be subject to the policies contained in DOD Directive 1338.10 (Department of Defense Food Service Program) and DOD Directive 4100.33 (Commercial and Industrial Activities; Operations of).

722 41 DINING FACILITY - COMMISSIONED PERSONNEL (PN)

The operation of closed messes in support of unaccompanied officers' quarters is being discontinued. New Commissioned Officers' Closed Mess Facilities will not be planned for new or existing quarters.

722 50 COLD STORAGE (EXTERIOR TO GALLEY) (SF)

This code is for inventory purposes only in cases where cold storage facilities are detached from the galley proper. There is no additional space allowance for galley cold storage, and therefore this space must be provided from within allowances authorized for dining facilities.

723 UNACCOMPANIED PERSONNEL HOUSING

723 20 LATRINE, DETACHED (SF)
723 30 LAUNDRY, DETACHED (SF)

Latrine and laundry facilities are planned as part of the bachelor quarters. Codes are listed for inventory purposes only.

723 40 GARAGE - DETACHED (SF)

Garages will not be planned in conjunction with troop housing. Code listed for inventory purposes only

723 50 WASH RACK - DETACHED (EA)

Wash racks for mess ha1l garbage containers will be planned as part of the gross dining facility area. Code listed for inventory purposes only.

723 60 TROOP HOUSING - OTHER DETACHED BUILDINGS (SF)
723 61 TROOP HOUSING - OTHER DETACHED FACILITIES (EA)

These codes are for inventory purposes only and are to be used for minor detached buildings and facilities directly relating to bachelor housing functions.

723 77 TROOP HOUSING STORAGE (READY ISSUE/SHOP STORES/MISC.) (SF)

Storage facilities for miscellaneous equipment and/or goods related to troop housing support will be provided only where it can be individually justified. There are no criteria for this type of facility. General information on normal stacking heights, SF per measurement ton requirements, and other parameters are provided in Category Code 440 series.

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724 UNACCOMPANIED OFFICER PERSONNEL HOUSING BACHELOR OFFICER QUARTERS (PN)

See Military Handbook 1036 for design criteria.

724-11 BOQ (W1-02) (PN)
724-12 BOQ (03 AND ABOVE) (PN)

Bachelor Officer Quarters (BOQ) will be planned for personnel in officers' grades who come within the following classifications:

1. Unaccompanied single
2. Unaccompanied married (overseas)
3. Nurses
4. Students
5. Transients
6. Rotational

PLANNING CRITERIA

At established Navy and Marine Corps installations, the BOQ programming requirements are derived from the unaccompanied personnel Housing Survey (R-19) or Facilities Support Requirement (FSR) document, respectively. For broad planning and programming purposes where survey figures are not available, the requirements may be determined by contacting the EFD or EFA bachelor quarters program management office.

GROSS PLANNING CRITERIA FOR NEW CONSTRUCTION FOR 724-11/12

	3 Stories or less	More than 3 stories
Sleeping/Living Area *	46 sq. m	46sq.m
Core Area/Circulation/MEC	20 sq. m	24sq.m
Total Module Allowance	66 sq. m	70sq.m**

*Includes MEC (mechanical, electrical and communication) space inside the module. This does not include circulation outside the module or MEC space outside the module. The module total allowance of 46 sq. m only refers to the sleeping quarters, closets, bathroom, bulk storage (USMC only), counter/microwave/refrigerator area, interior circulation and associated MEC space inside the module. All new bachelor quarters will have an additional space for a core area plus circulation and MEC requirements.

** Applies to bachelor quarters over 3 stories, all interior corridor style bachelor quarters and special design requirements for historical preservation, etc. For interior corridor bachelor quarters 3 stories or less, modules between 66-70 sq. m must be individually justified.

A module is sized for one W1-010 personnel. Refer to Table 724-1. All construction projects will identify maximum occupancy or the number of W1-W5 personnel that can occupy the quarters and the intended use capacity. The intended use capacity cannot exceed the number from the R-19/FSR except for rounding purposes.

There are three basic entry styles for bachelor quarters, exterior corridor style, interior corridor style and open landing access style. Open landing access style, generally preferred for economics, is not applicable over three stories. When sufficient real estate creates options as to style of BOQ, an economic analysis is recommended.

CORE AREA

The typical core area to be provided for all BOQs is shown below. In design, installation commanders have flexibility to modify core space designations and/or functions to meet mission needs or local conditions.

Administration area consisting of lobby, front desk, office space, copier/computers

Public Toilets	Janitor's Closets	Linen Storage
Multi-purpose Room	Game Room	Vending
Community Kitchen	Central Laundry	Housekeeping
Mail Services	Bulk Storage	

Optional areas in addition to the module gross square footage if not provided within 1/2 kilometer.

Video Tape Room	Exercise Room	Video/Game Room
50,000 sq. mm/module	150,000 sq. mm/module	90,000 sq. mm/module

Exercise rooms may also be provided if the waiting list to use existing facilities averages over an hour. Video tape room and Video/Game rooms may also be provided where existing facilities have reached full capacity. All these areas are accounted for as part of the bachelor quarters.

Table 724-l

Navy and Marine Corps Bachelor Officer Quarters

RANK/RATE	OSD MINIMUM STANDARDS *	PLANNING CRITERIA FOR NEW CONSTRUCTION
O-3 - O-10 CCN 724-12	Private room consisting of a sleeping/living room, private bath, access to kitchen or officer's dining facility. Minimum 38 sq. m (400 NSF) net living area.	Living room and sleeping room; 22 net sq. m sleeping/ living area, plus private bath, kitchenette, and approximately 4 net sq. m closets. Module is 46 gross sq. m.
W-3-W-5 CCN 724-11	Private room consisting of a sleeping/living room, private bath. Minimum 38 sq. m (400 NSF) net living area.	Living room and sleeping room; 22 net sq. m sleeping/ living area plus private bath, kitchenette, and approximately 4 net sq. m closets. Module is 46 gross sq. m.
O-1-O-2 W-1-W-2 CCN 724-11	Private suite consisting of a sleeping/living room, private bath. Minimum 24 sq. m (250 NSF) net living area.	Living room and sleeping room; 22 net sq. m sleeping/ living area plus private bath, kitchenette, and approximately 4 net sq. m closets. Module is 46 gross sq. m.
Navy Officer Candidate School (OCS)	Minimum 6.7 net sq. m (72 SF) net living area per person, not more than four to a room; central bath.	Two persons per room; 9 net sq. m sleeping/ living area, plus shared bath, service area, and built in closets. Four persons/ module. Module is 55 gross sq. m.

* OSD minimum standards of acceptability apply to billeting management rather than to facility condition for NFADB reporting purposes.

PARKING

Automobile parking for 80% of the residents must be provided. Visitor parking for 1% of the residents with handicapped spaces as required by Navy/Marine Corps Design Criteria. In addition, provide motorcycle parking for 5% of the residents and bicycle parking for 15% of the residents. One car wash area with a water source and an oil separator will be provided unless available within one kilometer.

OUTSIDE RECREATION

Provide one sand volleyball court and one full basketball court per 300 residents if not available within 1/2 kilometer. Similar outdoor recreation facilities can be substituted. Picnic areas and barbecue areas are required for all bachelor quarters.

OUTDOOR INDIVIDUAL MILITARY WASH AREA (USMC)

Provide outdoor equipment wash facilities (when required) at USMC bachelor quarters. The number of faucets/wash outlets shall be determined by the installation commander/resident FMF unit.

RENOVATION STANDARDS

Renovation work should use standards for new construction, but common sense and economics may justify variations. For example, oversized units in existing configurations, can be cost effective when major work like bathrooms and block walls are left in place.

The renovation, conversion or replacement choices should be considered addressed briefly on all renovation projects.

REPAIR STANDARDS

Repair work may be limited to original standards used for the existing buildings.

724-22 CIVILIAN QUARTERS GS-7 AND ABOVE (PN)

Housing and messing facilities for civilian grades comparable to officers will be provided only at installions that are remote from municipal areas or where civil&u are required to be housed on-station for security reasons.

Facilities planning for civilians will be the same as for military personnel of equivalent rank. Table 724-22 provides the military and civilian schedule of equivalent grades as established by the Department of Defense.

Table 724-22
Military and Civilian Equivalent Grade Schedule

Military Grade Group	Civilian Grade Group		
	General Schedule	Teachers (20 U.S.C. 901-907)	Wage System
0-7 to 0-10	GS-16 to GS-18	-	-
0-6	GS-15	-	-
0-5	GS-13 and GS-14	-	WS-14 through WS-19 WL-15 and Production Support Equivalents
0-4	GS-12	Class IV and class V	
0-3	GS-10 and GS-11	Class I, Step 5 through step 15 Class II and Class III	WS-8 through WS-13 WL-6 through WL-14 WG-12 through WS-15 and Production Support Equivalents
0-2 w-3 and W-4	GS-8 and GS-9	Class I, Step 3 and Step 4	
0-1 W-1 and W-2	GS-7	class I, step 1 and Step 2	

724-30 DINING FACILITY (ATTACHED) - COMMISSIONED PERSONNEL (MN)

The operation of closed messes in support of officers' quarters is being discontinued. New Commissioned Officers' Closed Mess dining facilities will not be planned for new or existing BOQ's.

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725 UNACCOMPANIED PERSONNEL

725 10 TROOP HOUSING - EMERGENCY BUILDING (MN)
725 11 TROOP HOUSING - EMERGENCY FACILITY (EA)

These may be hutments (Quonsets), tent frames with floors and may be either permanent, semipermanent, or temporary types of facilities.

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730 COMMUNITY FACILITIES - PERSONNEL SUPPORT AND SERVICES

The following category codes are covered in this group:

730 10 FIRE STATION
730 11 FIRE HOSEDRYING STRUCTURE
730 12 FIRE CART /HOSE DRYING FACILITY
730 13 ISSUE/RETAIL CLOTHING AND UNIFORM CENTER
730 15 BRIG
730 20 POLICE STATION
730 25 GATE/SENTRY HOUSE
730 30 BAKERY
730 35 LOCKER ROOM
730 36 LUNCH/LOCKER ROOM
730 40 LAUNDRY/DRY CLEANING PLANT
730 42 RECRUIT TAILORING SHOP
730 45 DEPENDENT SCHOOL - NURSERY SCHOOL
730 50 DEPENDENT SCHOOL - KINDERGARTEN
730 55 DEPENDENT SCHOOL - GRADE SCHOOL
730 60 DEPENDENT SCHOOL - HIGH SCHOOL
730 65 FALLOUT SHELTER
730 66 MISC. PERSONNEL WEATHER SHELTER
730 67 BUS STATION
730 70 DECONTAMINATION FACILITY
730 75 PUBLIC TOILET
730 76 KENNEL
730 77 PERSONNEL SUPPORT STORAGE (READY ISSUE/SHOP STORES/MISC.)
730 78 DAIRY PLANT
730 80 EMPLOYEES PARKING BUILDING
730 81 REHABILITATION CENTER (FOR DRUGS AND/OR ALCOHOL)
730 82 BEVERAGE CONTAINER RECYCLING CENTER
730 83 RELIGIOUS MINISTRY FACILITIES
730 85 POST OFFICE

730 10 FIRE STATION (sq.m./SF)

The space criteria shown below should apply to fire stations with structural and brush fire missions and should be used as guidance when planning fire stations for air crash rescue missions.

a. One-Company Satellite Fire Stations. One-company satellite fire stations should provide two stalls for two or more pieces of fire fighting equipment; male and female shower and toilet facilities; and dormitory rooms for one fire company. The facility should also provide an alarm room; combination dayroom and training area; dining area; exercise room; fire inspector's office; hose dryer space; kitchen; medical supply storage are shift supervisor's office; workroom; and storage space required for these functional areas. The **gross area** for these functions should not exceed **502 sq.m. (5,400 sf).**

b. One-Company Headquarters Fire Stations. One-company headquarters fire stations should provide all of the functions listed in paragraph (a), above, plus a bedroom, office, and shower and toilet facilities for the fire chief. The **gross area** for these functions should not exceed **539 sq.m. (5,800 sf).**

c. Two-Company Satellite Fire Stations. Two-company satellite fire stations should provide three stalls for three or more pieces of fire fighting equipment; male and female shower and toilet facilities; and dormitory rooms for two fire companies. The facility should also provide an alarm room; dayroom; dining area; exercise room; fire inspector's office; hose dryer space; kitchen; medical supply storage area; shift supervisor's office; training room; workroom; and storage space required for these functional areas. The **gross area** for these functions should not exceed **725 sq.m. (7,800 sf).**

d. Two-Company Headquarters Fire Stations. Two-company headquarters fire stations should provide all of the functions listed in paragraph(c) above, plus a bedroom, office, and shower and toilet facilities for the fire chief. 'The **gross area** for these functions should not exceed **762 sq.m. (8,200 sf).**

e. Mechanical Equipment Room Space. This type of space as required should be added to the gross areas shown above when determining a single gross area figure for each facility.

See Category Code 14125 for combined structural and fire/rescue station at air installations.

730 11 FIRE HOSE DRYING STRUCTURE (EA)

730 12 FIRE CART/HOSE DRYING FACILITY (sq.m./SF)

Category Code 730 11 and 12 are for inventory purposes only in cases where these facilities are provided in a separate building or structure. For planning purposes, they are to be considered as part of the fire station, Code 730 10.

730 13 ISSUE/RETAIL CLOTHING AND UNIFORM CENTER (sq.m./SF)

This is a retail outlet for military clothing and accessories. See Table 730-13 for gross area allowances.

TABLE 730-13
Space Allowances for Retail Clothing Store

Military Strength	sq.m.	SF
up to 600	186	2,000
601 to 1,500	297	3,200
1,501 to 3,000	390	4,200
3,001 to 5,000	483	5,200
5,001 to 10,000	595	6,400
over 10,000	622	6,700

Since this facility is operated by NAVRESSO and Marine Corps Exchange Service, at some installations it is integrated with the Exchange Retail Store, code 740-01. Where this occurs, the space for category code 740-01 may be increased by a proportionate amount of that shown in Table 730-13 to account for common use areas, such as administration, fitting rooms, storage and others. Individual justification is required.

73015 BRIG (sq.m./SF)

Design Criteria: MIL-HDBK-1037/4

This code is to be used for facilities whose primary purpose is the confinement of personnel. A facility with confinement as a secondary use should be coded according to its primary use. For example, a restricted barracks is coded as a facility in the appropriate code of the 721 group.

BFR entries for brigs shall be made only at activities where such facility is authorized by SECNAV. This insures strategic distribution of the facilities. Where planning for a brig is authorized, space allowances are in accordance with Table 730-15A and Table 730-15B. The prisoner capacity is 0.5% of the total military strength in the area served by the facility. This figure may be adjusted by the Bureau of Naval Personnel to compensate for local variations in projected prisoner population. The adjusted figures are available from the Bureau of Naval Personnel (PERS-84).

A request for approval of the establishment of a brig as a naval place of confinement shall be submitted to the Secretary of the Navy via the chain of command and the Bureau of Naval Personnel or Commandant of the Marine Corps, as appropriate.

TABLE 730-15A
Space Allowances for Correctional Centers

Capacity	Gross Area per Prisoner sq.m.	S F
Up to 25	51	550
50	41	440
150	33	350
250	31	330
400	28	300

The gross area allowances shown include facilities for housing, training, welfare, administration, and recreation. The space for prisoner berthing must have a minimum of 7 sq.m. (72 SF) net sleeping area per man. All cells should be planned for single occupancy and be of 6' x 8' x 8' minimum dimensions.
Where facilities are to include space for gainful employment, they will be programmed on the basis of identified equipment requirements but not to exceed 7 sq.m. (75 gross SF) per prisoner.

The brig shall be sited where it is free from safety hazards due to its extended evacuation time. The size of site and its location in relation to other activity facilities shall be agreed between the using activity, PERS-84 and NAVFAC Code 20.

The structure and its functional components shall be planned in accordance with the guidelines contained in SECNAVINST 1640.9A and NAVFAC DM-37. The following list and Table 730-15B highlight the components which normally should be considered when planning for a brig. The list is not intended to be all inclusive nor all components may be required at all locations. It should be used only for guidance or as a check list. Figures shown on Table 730-15B are net square meter (net square feet) and are intended to be utilized for planning physical layout. The size of the spaces may vary depending on the particular needs of the activity.

A. Administrative Section. Admin. section; Brig Officer's office; prisoner, visitor and legal visiting rooms.

B. Prisoner Processing. Receiving and release room; prisoner storage; holding cell.

C. Medical Exam Spaces. Doctor, Dentist and Psychiatrist.

D. Dining Facilities. Brigs with 100 prisoners or less should cater food from existing base facilities where practical; brigs over 100 prisoners use cat. code 722-10 criteria.

E. Prisoners Quarters. Cells or secure rooms will have single occupancy 6' x 8' x 8' minimum dimension and the total number shall not exceed 15% of prisoner capacity. Dormitories will berth 85% of prison capacity; maximum 35 prisoners per dormitory and 7 sq.m. (72 SF) net sleeping area per prisoner.

F. Other Miscellaneous Spaces As Required. Staff lounge, classrooms, vocational shop, laundry, chapel counseling, library and recreation facilities should be planned based upon local needs.

Brig Capacity
Number of Prisoners

Type of Space	U/M	50	100	150	200	250	300
Aministrative Section	sq.m.	151	251	251	269	288	288
	SF	1620	2700	2700	2900	3100	3100
Prisoner Processing	sq.m.	67	82	82	93	93	93
	SF	720	880	880	1000	1000	1000
Control Room	sq.m.	13	13	13	13	22	22
	SF	140	140	140	140	240	240
Barber Shop	sq.m.	17	22	22	22	22	22
	SF	180	240	240	240	240	240
Library	sq.m.	19	37	37	74	74	74
	SF	200	400	400	800	800	800
Medical Exam Room	sq.m.	17	28	28	28	39	39
	SF	180	300	300	300	420	420
Staff Lounge W/Toilet	sq.m.	20	42	42	42	42	42
	SF	220	450	450	450	450	450
Chapel, Auxiliary Multipurpose Classroom, Magistrate	sq.m.	46	93	93	139	139	186
	SF	500	1000	1000	1500	1500	2000
Special Quarters and Security Cell (6' x 8' 2') 1830 x 2440 x 610mm	EA	8	12	16	22	26	32
Segregation Cell (6' x 8' x 8') 1830 x 2440 x 2440mm	EA	2	4	6	8	10	12
Mail Office	sq.m.	11	11	22	22	33	33
	SF	120	120	240	240	360	360
Counselor's Office Supervisors, Training	sq.m.	26	39	46	46	52	52
	SF	280	420	490	490	560	560
Exchange	sq.m.	11	11	22	22	33	33
	SF	120	120	240	240	360	360
Recreational							
Equip. Storage	SF	140	140	140	240	240	240

730 20 POLICE STATION (sq.m./SF)

Use this code for planning police stations or guardhouses that house the shore patrol and military and civilian police forces for a station or area. The space allowance provides space for all or part of the following: quarters far the guards; detention area for prisoners; armory; administration; communication; fingerprint room, laboratories, file space; storage; training and briefing; dayroom; maintenance of official vehicles; miscellaneous related support.

Planning factors are based on the extent of coverage given by the police force housed in the station.

1. For a police force that has functions limited to law enforcement within an installation, with no detention responsibilities, plan on the basis of 5 sq.m. (50 SF) per person employed at the police station. This includes the total of all persons in administrative functions and on patrols, for all shifts.

2. For a police force responsible for patrolling a metropolitan area and/or requiring detention facilities, individual justification for space requirements is needed.

730 25 GATE/SENTRY HOUSE (sq.m./SF)

The gate/sentry house may vary in size from a simple sentry shelter to a building housing a gate guard office, clerical office, and waiting room. See table 730-25 for space allowances.

TABLE 730-25
Space Allowances for Gate/Sentry Houses

Location		Gross Area allowance
Gate of small activity	6	64 SF
Major gate at medium to large activity	56 (50 gate house & 3 sentry house)	604 SF (540 gate house & 64 sentry house)
Secondary gate at medium to large activity	6	64 sentryhouse

The differentiations between small and medium activities and between major and secondary gates are not given here. A reasonable approach should be taken. If the function requires no more than two guards at a time and no waiting room for persons awaiting clearance, then a sentry house is adequate. Some industrial installations may have an employment office, first aid room, and safety office located at the gate house. Space for these functions are planned and inventoried as Category Code 610 10 using the appropriate planning factors.

730 30 BAKERY (sq.m./SF)

The establishment of bakeries is governed by provisions of DOD Instruction 4100.33 - Commercial or Industrial Activities - Operation of. Normally a bakery will be authorized only at locations where commercial sources are not available. See Table 730-30 for space allowances. The rated capacities given are for 8-hour per day operation and increase in direct proportion to the increase in hours of operation.

TABLE 730-30
Space Allowances for Bakeries

Number of Persons Served	Gross Area sq.m.	Gross Area SF	**Rated Capacity** kilograms	**Rated Capacity** pounds
Bread Bakery				
3,000	418	4,500	560	1,500
8,400	483	5,200	1,570	4,200
16,000	762	8,200	3,130	8,400
26,900	929	10,000	5,010	13,425
Pastry Bakery			(servings)	
2,500	167	1,800	5,000	
5,000	274	2,950	10,000	
10,000	311	3,350	20,000	
20,000	451	4,850	40,000	

730 35 LOCKER ROOM (sq.m./SF)

This facility provides locker space for the belongings of military personnel who must vacate their quarters for extended periods of time, for those whose allotted storage space is not sufficient, and for other uses as deemed justified by the Commanding Officer. See Table 730-35 for space allowances. They include space far lockers, toilets, showers, janitor storage, laundry machines, office, and utilities. (Do not double count with other CCNs such as gyms, fitness etc.)

This category code must be individually justified for **Marine Corps Activities.**

TABLE 730-35
Space Allowances for Locker Rooms

EM Strength Supported	Number of Lockers	Gross Area per Locker sq.m.	Gross Area per Locker S F
up to 500	Strength X 0.285	1	11.5
501 to 6,000	Strength X 0.285	1	10.0
Over 6,000	Strength X 0.285	1	9.0

730 36 LUNCH/LOCKER ROOM (sq.m./SF)

This facility is generally provided only to support industrial operations and requires specific justification. No planning factors are available.

730 40 LAUNDRY/DRY CLEANING PLANT (sq.m./SF)

The establishment of these facilities is governed by provisions of DOD Instruction 4100.33 - Commercial or Industrial Activities - Operation of. Normally they will be authorized only in locations where commercial facilities are not available. See Table 730-40 for space allowances. For combination with exchange-operated facilities, see notes in Category Code 740 13 and 740 15.

TABLE 730-40
Space Allowances for Laundries and Dry Cleaning Plants

Number of Persons Served	Gross Area(1) Laundries and Dry Cleaning Plants	
	sq.m.	SF
0 to 2,000	Not Authorized	Not Authorized
2,001 to 4,000	790	8,500
7,001 to 10,000	1,020	11,000
15,001 to 30,000	4,180	45,000

(1) Does not include boiler plants which are sized as required and are carried under Category Code 821 50.

730 42 RECRUIT TAILORING SHOP (sq.m./SF)

This facility may be planned at recruit training or officer candidate processing activities. No criteria is available for this code, each requirement will require individual justification.

730 45 DEPENDENT SCHOOL - NURSERY SCHOOL (sq.m./SF)

This code is used for inventory purposes only. Supervised care for 3 and 4 year old children of military facilities should be included in Child Development Centers, Category Code 740 74.

730 50 DEPENDENT SCHOOL-KINDERGARTEN (sq.m./SF)
730 55 DEPENDENT SCHOOL-GRADESCHOOL (sq.m./SF)
730 60 DEPENDENT SCHOOL-HIGHSCHOOL (sq.m./SF)

The planning and programming for dependent school facilities overseas is currently under the cognizance of Department of Defense Dependent Schools (DODDS), 2461 Eisenhower Avenue, Alexandria, VA 22332. Assistance related to school facility matters may be obtained from DODDS or their overseas field offices. In addition, DODDS has occasionally promulgated supplemental planning guidance which can be obtained from cognizant EFD's. Each DODDS region has comprehensive education specifications which should be used in planning dependant school facilities.

The following general notes may be of assistance for preliminary school facilities planning:

1. Dependents school facilities in any overseas area will be planned to accommodate all DOD dependents (Army, Navy, Air Force, and Marine) and dependents of other Federal agencies in the area. In estimating the number of school-age dependents to provide for, the following may prove helpful:

   (a) If an existing school facility is to be expanded, a local survey to determine the average number of school-age children per family may be most accurate.

   (b) If a new school is to be established, the following Navy stat&tics may serve as a guide:
   (For Marine overseas the number of accompanied tours is a function of available housing and is managed by CMC D C/S, manpower. These proportions should be used as moving their families)

   (1) Of all officer personnel assigned overseas 62.14% will move families. These families average 1.73 minor dependents per family with 50% of school-age.

   (2) Of all enlisted personnel assigned overseas 31.63% will move families. These families average 1.68 minor dependents per family with 50% school-age.

   (c) The average number of school-age dependents per family may vary from area to area and from mission to mission and may at times exceed one per family. The superintendent/director far dependents' education may provide assistance in this area.

2. In estimating the distribution of dependents by grade, the following average Navy statistics considering all families may help:

Kindergarten	.08 pupils/family
Grade School 1-6	.52 pupils/family
High School 7-12	.26 pupils/family

Count all families, with or without children. Again the superintendent/director for dependent's education in the area may provide assistance.

This scope should be adequate to house the total educational program as developed by the superintendent/director for the area. However, the superintendent/director may wish to alter the utilization of the space to a degree to meet unique requirements of the educational program or the geographic location.

730 65 FALLOUT SHELTER (sq.m./SF)

There are two kinds of fallout shelters: dual-purpose and single-purpose. A dual-purpose fallout shelter is one which, as a primary purpose, satisfies some other basic requirement such as housing, administrative, storage, etc. and as a secondary purpose, it can provide fallout protection. A single-purpose fallout shelter is a structure or part of a structure whose primary purpose is fallout protection. Dual-purpose shelters are designed in the real property according to their primary purpose. Single-purpose shelter are designated in the inventory as Code 730 65. The construction of single-purpose fallout shelters is not presently authorized. The designation of the number of fallout shelter spaces on existing or new military construction is not presently required.

730 66 MISCELLANEOUS PERSONNEL WEATHER SHELTER (sq.m./SF)

Shelters may be established at bus stops or other locations as required. Provide 0.5 sq.m. (5 SF) per person to be accommodated.

73067 BUS STATION (sq.m./SF)

A bus station is a terminal with space for a waiting room and ticket sales. It may be planned as required. Provide 2 sq.m. (20 gsf) per person for the expected size of waiting group.

730 70 DECONTAMINATION FACILITY (sq.m./SF)

This is usually an integral part of a pressurized protective shelter and therefore is not planned separately.

730 75 PUBLIC TOILET (sq.m./SF)

Use this code for inventory of all detached comfort stations except for those in the troop housing area. Use Category Code 723 20 Latrine. Separate public toilets arc to be planned. Examples of exceptions arc for isolated outdoor industrial facilities and firing ranges. Where public toilets are required, consult the appropriate DM's far plumbing design. For example: for training facilities, see DM 27.

730 76 KENNEL (sq.m./SF)

The assistant CNO for Naval Investigative Matters and Security (OP-09N) is the Navy Program Manager with the responsibility to review and approve future Military Working Dog (MWD) facility construction programs. Major Claimants must submit program requirements to OP-09N for approval.
For Marine Corps activities, the project manager for MWD requirements is the Security Branch (Code POS-41). Program requirements should be submitted to Headquarters USMC D C/S for Plans, Policies, and Operations.

Use the following criteria to plan kennel facilities:

1. Kennels arc provided at stations assigned working dogs or requiring quarantine facilities. Before considering new construction, Activities must consider using existing facilities or consolidating support functions with other activities.

2. Locate the kennel adjacent to or in proximity to an existing military police facility that provides 24 hour observation of the kennel and also to eliminate the need for separate exterior lighting and fencing.

3. Allow a maximum of 7 square meters (75 square feet) per dog for the kennel area including circulation space.

4. Allow a maximum of 14 square meters (150 square feet) support area for food preparation, treatment and work space.

Suggested floor plans, construction criteria for a typical 4 dog kennel and approval procedures are provided in OPNAVINST 5585.2, published in January 1985.

5. Kennel surfaces must be impervious. Surfaces shall have a liquid glaze applied.

730 77 PERSONNEL SUPPORT STORAGE (READY ISSUE/SHOP STORES/MISC.)(sq.m./SF)

(Not applicable to Marine Corps activities)

Storage facilities for miscellaneous goods related to personnel support facilities will be provided only where it can be individually justified. There are no criteria for this type of facility. General information on normal stacking heights, square meter per measurement metric ton (SF per measurement ton) requirements, and other parameters are provided in Category Code 440 series.

730 78 DAIRY PLANT (sq.m./SF)

No planning factors are available.

730 80 EMPLOYEES PARKING BUILDING (sq.m./SF)

A multilevel parking garage may be planned for nonorganizational vehicles only where justified by land restrictions and economic considerations. Allow 33 sq.m. (40 SY) for each passenger vehicle. See Table 852-10 for authorized spaces.

730 81 REHABILITATION CENTER FOR DRUGS AND/OR ALCOHOL (sq.m./SF)

This facility will provide the necessary administration, counseling, training, berthing, and recreation for rehabilitation of eligible Navy, Marine Corps and other personnel suffering from alcoholism, drug dependency and/or compulsive overeating.

A typical Alcohol Rehabilitation Center (ARC) is composed of three major components which are: Berthing, Administration, and Operational Support area. The berthing requirements for all patients are based upon the criteria for category code 721-14, Unaccompanied Personnel Housing - Bachelor Enlisted Quarters (Class A Student Barracks) in order to be compatible and consistent with the Navy's treatment modality of group therapy. Each "group sized" bay or module will accommodate 12 beds and an appropriately shared head/shower. Identical berthing modules for female patients should be provided in a separate and distinct location. The number of modules required varies with patient load. A 120 patient facility requires 12 12-bed modules; the apparent extra modules are required to accommodate female patients, patients awaiting transportation and any group overflow.

The Administration requirements are derived by using the criteria established for category code 610-10, Administration, keeping in mind that administration includes both command oriented and patient affairs.

The Operational Support Area is composed of all those remaining facilities required for the ARC to accomplish the assigned mission. Included within this area is sufficient space for the following types of functions: group therapy rooms, some with discreet observation capability; multi-purpose room, large enough to accommodate entire facility population; a visitors lounge with some privacy; traditional classrooms with audiovisual capability; library; patients lounge; secure medical exam room and a small laboratory capability; and storage space. A planning factor of 18 square meter (190 gross square feet) per patient is used to provide for these facilities. In the event that no parking is available, the criteria for category code 852-10, Parking Area, is used to determine the parking space requirements for the organizational and nonorganizational vehicles.

The following example illustrates the methodology used to determine the space requirements for a typical ARC treating 120 patients and having a staff complement of 50 personnel.

	COMPONENT	**GROSS AREA**
Berthing-Class A Student (Cat Code 721-14):	120 patients X 7 sq.m.(72 sf)/patient =	803 sq.m.(8,640 sf)
Net to gross conversion = (Includes lounges, general circulation, mechanical space etc.)	1.71 X 803 sq.m.(8,640 sf)=	1,370sq.m(14,774 gsf)
Administrative Office (Cat Code 6 lo- 10):	14 sq.m(150 gsf) X 50 personnel =	697 sq.m(7,500 gsf)
Organizational Support Area:	120 patients X 190 gsf per patient =	2,120sq.m.(22,800 gsf)
	Total Area for Typical 120 patient ARC =	**4,190 sq.m.(45,000 gsf)**

Parking (Cat Code 852-10)

Non-Organizational		
Admin = 50pn X 60%(factor)	35 spaces	
Patient = 120pn X 75%	90 spaces	
	Total: 125 spaces @ 30 sq.m.(35 sq yds) =	3,660 sq.m.(4,375 sq yds)
Organizational		
Vans = 10pn X 75%	8 spaces @ 33 sq.m.(40 sq yds) =	268 sqm.(320 sq yds)
	Total Parking Space =.....	**3,930 sq.m.(4,695 sq yd)**

NOTE: These planning factors are the maximum space allowances for this type of facility. Smaller areas are permitted, as appropriate. However, in all cases, the berthing requirements must conform with the Class A Student space requirement as given in the criteria for category code 721-14, Bachelor Enlisted Quarters.

730 82 RECYCLING CENTER (sq.m./SF)

This facility serves as a collection, sorting, storage and shipping center for recyclable materials and products Recycled materials are forwarded to other government or commercial recycling centers. There are no planning criteria for this facility, each requirement will require individual justification with detailed data on operational methods, equipment required, volume of processed containers and need for enclosed building space, if any.

730 83 RELIGIOUS MINISTRY FACILITIES (sq.m./SF)

Project Review: EFD - CHIEF OF CHAPLAINS (OP-097) -- NAVFAC HQ (15)
commandant of the Marine Corps (CMC) code LFL
Design Criteria: NAVFAC DM 37.06 (Will be revised to Mil-Hdbk - 1037/6 Religious Ministry Facilities)

I. RELIGIOUS MINISTRY FACILITIES (RMF). Department of the Navy policy is that commanders and commanding officers will provide for the free exercise of religion by sea service personnel and their dependants through Command Religious Programs. Religious Ministry Facility (RMF) is a generic term for facility assets used to support Command Religious Programs. RMFs must therefore accommodate the religious rights and needs of a multi-faith, inter-generational, culturally diverse sea service population.

Space Criteria for RMFs are determined by five factors: **Population** for whom ministry will be provided, **types of religious programming** to be provided, **environmental factors, number of seats** in each RMF, and **number of RMFs** at the installation.

Chief of Chaplains as technical sponsor for RMFs and Director of Religious Ministries for the Department of the Navy under SECNAVINST 1730.7 will make the final determination of the number, and size of each RMF at an installation, and the allocation of space within each RMF.

RMFs within hospitals are treated as a unique requirement.

A. INSTALLATION POPULATION

1. **Installation population** is defined as military strength assigned to the military installation plus their dependents.

2. For **multiple installations** located in the same geographic area, installation population is defined as the military strength, plus their dependents, for whom ministry should be provided at the RMF. The **Chief of Chaplains** will decide which military strength, plus their dependents, will be used to calculate each installation's space allowance for an RMF(s) when there are multiple installations in the same geographic area This should be determined when developing the Basic Facilities Requirement (BFR). The same military strength can never be used to justify a space allowance for RMFs at more than one installation. Minis&y provided for personnel and their dependents remains the responsibility of the command to which the personnel are attached.

3. For **Training installations,** a weighted average on board count of students should be included in the military strength.

4. **Authorized civilian personnel,** and their dependents, shall be included in the population count when dependent on the military installation for religious support.

STEP 1: Determine Installation Population

- Using the definitions above, determine the **military strength** (and civilian when applicable) for whom ministry will be provided at the RMF(s).

- Determine the number of **dependents** from actual **Family Housing Survey figures.** If actual data is unavailable, estimate the number of dependents by first determining the number of military personnel (and civilian when applicable) with dependents. Multiply this number by Navy and Marine Corps service-wide average number of dependents (currently 2.6).

- Add the **military strength** (civilian when applicable) with the dependents from the steps above to determine the **Total Installation Population = _____ p n .**

B. ENVIRONMENTAL ADJUSTMENT FACTORS (EAFs)

1. The **EAF** is based on the number of **major faith group facilities** in the surrounding civilian community within 8 km (5 miles) of the installation gate. For this criteria, use only these major faith groups: **Baptist/Independent Fundamentalists, Disciples of Christ/Methodist/Presbyterian/United Church of Christ, Episcopalian/Lutheran/Pentecostal, and Roman Catholic.**

2. **Factors determining Geographical Distribution of Housing**

CLOSE	**80%** or more of installation population reside on installation or within a distance of **three kilometers (two miles).**
NORMAL	Less than **80%** of installation population reside on installation or within a distance of **three kilometers (two miles)** but more than **40%** reside within a distance of **eight kilometers (five miles).**
DISTANT	Less than **40%** of installation population reside on installation or within a distance of **eight kilometers (five miles).**

STEP 2: Use EAFs to adjust Installation Population

- Count the number of **major faith groups** which have at least one facility within **eight kilometers (five miles)** of the installation gate.

- Determine the **housing distribution** from the definitions above.

- **Refer to Table 730-83A** below. Find the number of major denomination churches determined and read across the table to find the **Housing Adjustment. Multiply** this **factor** by the **total installation population** (determined in STEP 1) which will give you an **Adjusted Installation population =_____pn.**

TABLE 730-83A
Environment Adjustment Factors for RMFs

Number of **major faith group facilities** in the surrounding civilian community within **8 kilometers (5 miles)** of the installation gate.	**HOUSING**		
	CLOSE	NORMAL	DISTANT
0	1.00	0.69	0.46
1	0.84	0.63	0.43
2	0.76	0.58	0.38
3	0.69	0.52	0.35
4	0.61	0.46	0.30
5	0.53	0.40	0.26

C. NUMBER OF RMFs

STEP 3: Determine Total Number of Common Assembly Seats below:

- Use **Adjusted Installation Population** (STEP 2) and **Table 730-83B** to determine the total number of **Common Assembly seats =_____** for the installation (column 2, Table 730-83B).

TABLE 730-83B
Number of Seats in Common Assembly Areas at an Installation

Column 1. Adjusted Installation Population	Column 2 Number of Common Assembly Seats	Column 1 (cont.) Adjusted Installation Population	Column 2 (cont.) Number of Common Assembly seats
up to 500	**35**	13,001 to 14,000	**1,800**
501 to 1,000	**200**	14,001 to 15,000	**2,000**
1,001 to 1,500	**300**	15,001 to 16,000	**2,100**
1,501 to 2,000	**400**	16,001 to 17,000	**2,100**
2,001 to 2,500	**500**	17,001 to 18,000	**2,200**
2,501 to 3,000	**600**	18,001 to 19,000	**2,200**
3,001 to 3,500	**700**	19,001 to 20,000	**2,300**
3,501 to 4,000	**800**	20,001 to 21,000	**2,400**
4,001 to 5,000	**900**	21,001 to 22,000	**2,400**
5,001 to 6,000	**1,000**	22,001 to 23,000	**2,500**
6,001 to 7,000	**1,100**	23,001 to 24,000	**2,500**
7,001 to 8,000	**1,200**	24,001 to 25,000	**2,600**
8,001 to 9,000	**1,300**	25,001 to 26,000	**2,700**
9,001 to 10,000	**1,400**	26,001 to 27,000	**2,700**
10,001 to 11,000	**1,500**	27,001 to 28,000	**2,800**
11,001 to 12,000	**1,600**	28,001 to 29,000	**2,900**
12,001 to 13,000	**1,700**	29,001 to 30,000	**3,000**
		For each additional 1,000 add	**60**

STEP 4: Determine Number of RMFs

- Use the total umber of seats in common assembly areas at an installation (STEP 3), the installation's mission, the types of religious programming required to adequately meet the religious needs and rights of assigned sea service personnel and their dependents, and economical considerations to determine the number of RMFs. RMFs will normally be built in one or a combination of several sizes up to a maximum of 600 seats in common assembly areas, ie., the sum of the seating in all of the common assembly areas within the RMF should generally not exceed 600 seats. Smaller size RMFs are intended primarily for use at small installations. For example, to satisfy a requirement for 1200 seats, two 600 seat RMFs should be planned rather than three 400 seat RMFs on a typical Navy base; a 1200 seat RMF is more practical at a training center. **Typically RMF's will be built with the largest common assembly space seating from 250pn to 500pn.** Some installations, such as training centers, may want the convenience of one large RMF assembly area under one roof to accommodate the different congregations in separate areas. Except in unique situations, and with the concurrence of the Chief of Chaplains, the total requirements at an installation will not exceed that authorized by Table 730-83C.

D. SPACE ALLOCATION FOR RMFs

1. RMF's are comprised of six (6) different types of spaces (an approximate percentage of total space is in parenthesis): **1. Worship** (35-85%), **2. Religious Education** (10-40%), **3. Pastoral Counseling** (1-12%) **4. Fellowship** (1-20%) **5. Pastoral Administration** (1-20%), and **6. Utility/Support** (1-5%). Adequate and appropriate provisions for all six types should be provided within the criteria. These are contingent on the mission of the installation, religious programming, and needs/rights of assigned personnel and their dependents. **The Chief of Chaplains will decide space allocations within RMFs.**

2. Within each of the six different types of spaces, part of the requirement will depend primarily upon the **number of RMFs at an installation** and part of the requirement will depend primarily upon the **adjusted installation population.** Examples of the former include **sacristy, reconciliation room, chancel, reception, and kitchen.** Examples of the latter include **religious education spaces, chaplain's offices and fellowship halls.** Thus the square foot requirement for each RMF has two separate components each of which must be determined separately.

STEP 5: Determine Total First Component Requirements Based Primarily upon the Number of RMFs

- Use the **number of seats for each RMF** (STEP 4) to determine the **first component** of the gross square foot requirement for the RMF from Column 2 in Table 730-83C. The first component is that portion of the requirement which is primarily dependent upon the number of common assembly seats in that RMF. First component total of **RMF Gross Area Requirement** = _____ (sum of the first components of RMF Gross Req. for each RMF).

TABLE 730-83C
First Component of RMF Gross Area Requirement (for each RMF)

Column 1. Number of Assembly Seats	**Column 2 First Component RMF Gross Area sq.m.**	**SF**
35	**186**	**2,000**
200	**604**	**6,500**
300	**794**	**8,550**
400	**948**	**10,200**
500	**1,070**	**11,500**
* 600	**1,240**	**13,320**
700	**1,370**	**14,700**
800	**1,490**	**16,000**
900	**1,590**	**17,100**
1,000	**1,670**	**18,000**
1,100	**1,740**	**18,700**
(Maximum for one RMF) 1200	**1,780**	**19,200**

*** When greater than 600 seats, consider the use of multiple RMFs. Use this table to size each one.**

STEP 6: Determine Second Component Requirements Based Primarily upon the Adjusted Installation Population

- **Use the adjusted installation population** (STEP 2) to determine the **second component** of the gross square meter (square foot) requirement for RMFs at the installation from Column 2 of Table 730-83D. The second component is that portion of the requirement which is primarily dependent upon the adjusted installation population. Total second component of **RMF Gross Area Requirement for the installation =**_____ .

TABLE 730-83D
Second Component of RMF Gross Area Requirement

Column 1. Adjusted Installation Population	Column 2 Second Component RMF Gross Area sq.m.	SF	Column 1 (cont.) Adjusted Installation Population	Column 2 (coot.) Second Component RMF Gross Area sq.m.	SF
UP to 500	93	1,000	13,001 to 14,000	1,390	14,920
501 to 1,000	372	4,000	14,001 to 15,000	1,460	15,760
1,001 to 1,500	411	4,420	15,001 to 16,000	1,540	16,600
1,501 to 2,000	450	4,840	16,001 to 17,000	1,620	17,440
2,001 to 2,500	489	5,260	17,001 to 18,000	1,700	18,280
2,501 to 3,000	528	5,680	18,001 to 19,000	1,788	19,120
3,001 to 3,500	567	6,100	19,001 to 20,000	1,850	19,960
3,501 to 4,000	606	6,520	20,001 to 21,000	1,930	20,800
4,001 to 5,000	684	7,360	21,001 to 22,000	2,010	21,640
5,001 to 6,000	762	8,200	22,001 to 23,000	2,090	22,480
6,001 to 7,000	840	9,040	23,001 to 24,000	2,170	23,320
7,001 to 8,000	918	9,880	24,001 to 25,000	2,240	24,160
8,001 to 9,000	996	10,720	25,001 to 26,000	2,320	25,000
9,001 to 10,000	1,070	11,560	26,001 to 27,000	2,400	25,840
10,001 to 11,000	1,150	12,400	27,001 to 28,000	2,480	26,680
11,001 to 12,000	1,230	13,200	28,001 to 29,000	2,560	27,520
12,001 to 13,000	1,310	14,080	29,001 to 30,000	2,530	28,360
			For each additional 1,000 add	78	840

STEP 7: Allocate Second Component of Gross Area Requirement to each RMF

- Apportion the total installation second component Gross Area requirement determined in STEP 6 among each of the RMFs authorized for the installation in STEP 4. Factors to be considered in the apportionment of Gross Area in each RMF are the Installation's Mission, the Installation's Geography, and Religious Programming. The Chief of Chaplains shall approve the apportionment.

Examples: 1. A large installation with a remote family housing may want one RMF in the housing area and another adjacent to the BEQs.
2. A training command may want one RMF for students and another for permanent population.

STEP 8: Determine the Total Gross Area Requirement for each RMF at the installation

- To determine the total gross area requirement for each RMF at an installation, add the first component requirement (STEP 5) to the second component requirement (STEP 7) and multiply the sum by a factor of 1.1 (this allows for mechanical, electrical and communication equipment spaces).

Total Gross Area Requirement for the RMF = (STEP 5_____ + STEP 7_____) x (1.1)

R M F = _____ Gross Area

STEP 9: Determine the Total Installation RMF Gross Area Requirement

- Repeat STEP 8 for each RMF at the installation.

- The **total installation RMF Gross Area Requirement** is the sum of the **Gross Area Requirements for each RMF** at the installation (include any RMF within a hospital which is part of the installation).

Total Installation RMF Requirement = _____Gross Area

II. **HOSPITAL RMFs.** To serve patients and staff personnel on duty within composite medical facilities, in-hospital RMFs may be provided. The hospital RMF will be coded as Category Code 730-83. **Space allocated to the hospital RMF is to be included in the installation totals computed above.** Use Table 730-83E to compute Hospital RMFs.

TABLE 730-83E
Space Allocations for Hospital RMFs

Hospital Size (Beds)	**Gross Area** Note (1) sq.m.	SF
26 to 99	34	364
100 to 199	102	1,100
Over 200	130	1,400

(1). Add an additional 5-10% (dependent on local conditions) of the buildings gross area for mechanical, electrical, and communication equipment space(s)

730 84 (RELIGIOUS EDUCATION FACILITY) is Deleted. The criteria is incorporated in RELIGIOUS MINISTRY FACILITIES CCN 730 83.

730 85 POST OFFICE (sq.m.SF)

Central Post Office. Space allowances for central post offices are given in Table 730 85. These figures represent normal allowances and are given for general guidance. Additional space may be provided if a central post office serves specialized functions on an installation such as:

1. Postal directory.

2. Nonresident schools.

3. Major and subordinate headquarters, commands, personnel centers, service schools, major hospitals, air material areas, supply depots.

4. Carrier delivery to family housing units.

5. Activities generating high volume of accountable mail that requires overnight vault storage.

6. Self-service postal units installed within the lobby of the facility.

At CONUS installations (see footnote 4 of Table 730-85), the determination of specific total requirements and provisions for the specialized functions listed above, shall be coordinated with the U.S. Postal Services Regional Postmaster General. This should be accomplished during the initial planning stage and the DD Form 1391 should be annotated to that effect.

Postal Service Center. When justified by specific requirements and approved by the U.S. Postal Services Regional Postmaster General, a postal service center may be provided at which mail may be deposited and picked up by individual post office box holders, as opposed to bulk distribution of mail to the various elements on a military installation. A postal service center may be combined with, or separate from, a central or branch post office. The number of boxes shall not exceed the number of unmarried and unaccompanied married military and civilian personnel plus 25% to accommodate specific key personnel and compensate for box reassignment vacancy period. Space allowances per box are given in Table 730 85.

Branch Post Offices. At large installations with personnel concentrations located at such a distance from the central post office that service through the latter is impractical, branch offices, each not exceeding 139 sq.m. (1,500 GSF) may be provided.

For Basic Facility Requirement purposes, the total requirement for Code 730 85 is the sum total of central post offices, postal service centers and branch post offices.

TABLE 730 85
Space Allowances for Post Offices

Installation Population (1)	Central Post Office Gross Area (2)		Postal Service Center Gross Area Per Box (3)			
			CONUS (4)		OVERSEAS (5)	
	sq.m.	SF	sq.mm.	SF	sq.mm.	SF
up to 500	37	400	55700	0.60	55700	0.60
501 to 1,000	56	600	55700	0.60	55700	0.60
1,001 to 2,500	162	1,750	55700	0.60	46500	0.50
2,501 to 4,500	272	2,925	55700	0.60	46500	0.50
4,501 to 7,500	418	4,500	55700	0.60	41800	0.45
7,501 to 11,500	588	6,325	55700	0.60	37200	0.40
11,501 to 16,500	766	8,250	55700	0.60	37200	0.40
16,501 to 22,500	941	10,125	55700	0.60	37200	0.40
22,501 to 28,500	1,160	12,525	55700	0.60	37200	0.40
28,501 to 34,500	1,390	14,925	55700	0.60	37200	0.40
34,501 to 40,500	1,610	17,325	55700	0.60	37200	0.40
40,501 to 46,500	1,830	19,725	55700	0.60	37200	0.40
46,501 to 52,500	2,060	22,125	55700	0.60	37200	0.40
52,501 to 58,500	2,280	24,525	55700	0.60	37200	0.40

(1) In Conus, installation population consists of assigned military personnel. For overseas areas, personnel working on the installation.
(2) Excludes space required for loading platforms.
(3) Number of boxes shall not exceed the number of unmarried and unaccompanied married military and civilian personnel plus 25% for key official military and civilian personnel needs.
(4) CONUS includes the 50 States and all other geographical area in which the U.S. Postal Service operates.
(5) Use 55700 sq.mm. (0.60 SF) per box throughout when the postal service center is separated from the central post office.

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740 COMMUNITY FACILITIES - MORALE, WELFARE AND RECREATION (INTERIOR)

This section contains criteria for the following facilities;

740 01	EXCHANGE RETAIL STORE
740 02	LOCATION EXCHANGE
740 03	EXCHANGE CENTRAL ADMINISTRATION
740 04	EXCHANGE FOOD SERVICE
740 05	EXCHANGE SNACK STAND
740 07	EXCHANGE AUTO PARTS STORE
740 08	EXCHANGE FOOD STORE (OVERSEAS)
740 09	EXCHANGE SERVICE OUTLETS
740 12	RED CROSS/NAVY RELIEF
740 13	EXCHANGE LAUNDRY PLANT
740 15	EXCHANGE DRY CLEANING PLANT
740 16	EXCHANGE MAINTENANCE SHOP
740 17	EXCHANGE CENTRAL SUPPORT FACILITY
740 18	BANK
740 19	CREDIT UNION
740 20	TEMPORARY LODGING FACILITIES
740 21	VISITORS RECEPTION CENTER
740 22	TRANSIENT HOUSING
740 23	COMMISSARY
740 24	COMMISSARY COLD STORAGE
740 25	FAMILY SERVICES CENTER
740 26	INSTALLATION RESTAURANT
740 27	ARMED FORCES RADIO/TV STATION
740 28	AMUSEMENT CENTER
740 29	AREA/REGIONAL EXCHANGE ADMIN FACILITY
740 30	EXCHANGE SERVICE AND AUTO REPAIR STATION
740 31	EXCHANGE SUPPLEMENTAL GASOLINE STATION
740 32	EXCHANGE CUSTOMER OPERATED CAR WASH
740 34	THRIFT SHOP
740 35	HOBBY SHOP - AMATEUR RADIO
740 36	HOBBY SHOP - CRAFT TECH
740 37	MWR EQUIPMENT RENTAL CENTER
740 38	HOBBY SHOP - AUTOMOTIVE
740 39	ENTERTAINMENT WORKSHOP

This section contains criteria for the following facilities; (continued)

740 40	**BOWLING CENTER**
740 42	**FLEET RECREATION CENTER**
740 43	**GYMNASIUM**
740 45	**FITNESS CENTER**
740 46	**ROLLER/ICE SKATING RINK**
740 47	**RECREATION INFORMATION, TICKETS AND TOURS OFFICE**
740 48	**CONTRACTED LEISURE TRAVEL AGENCY**
740 50	**FIELD HOUSES**
740 52	**GUN SKEET AND/OR TRAP BUILDING**
740 53	**SWIMMING POOL - INDOOR (includes poolside deck and bathhouse)**
740 54	**RECREATION CENTER**
740 55	**YOUTH CENTER**
740 56	**THEATER**
740 60	**COMMISSIONED OFFICER'S MESS, OPEN**
740 63	**ENLISTED CLUB**
740 64	**ENLISTED MESS, OPEN**
740 66	**PETTY OFFICERS' MESS, OPEN/STAFF SNCO CLUB**
740 67	**CONSOLIDATED OFFICER/ENLISTED PERSONNEL MESS, OPEN**
740 69	**FIRST, SECOND AND THIRD CLASS PETTY OFFICERS' MESS OPEN/N CLUB**
740 70	**CHIEF PETTY OFFICERS' MESS OPEN**
740 71	**CLASS VI PACKAGE STORE**
740 74	**CHILD DEVELOPMENT CENTER**
740 75	**NAVY FLYING CLUB FACILITY**
740 76	**LIBRARY**
740 77	**COMMUNITY STORAGE (READY ISSUE/SHOP STORES/MISC.)**
740 78	**RECREATION PAVILION**
740 79	**RIDING STABLES**
740 80	**GOLF CLUBHOUSE**
740 81	**MWR RENTAL CABIN**
740 82	**PUBLIC TELEPHONE FACILITY**
740 84	**INDOOR PLAYING COURTS**
740 85	**EXCHANGE CENTRAL WAREHOUSE**
740 86	**EXCHANGE INSTALLATION WAREHOUSE**
740 87	**MARINA SUPPORT BUILDING**
740 88	**EDUCATIONAL SERVICES OFFICE**
740 89	**BATHHOUSE - (Category Code has been deleted. Criteria incorporated into CCN 740 53, "SWIMMING POOL - INDOOR")**

GENERAL NOTES

SPACE ALLOWANCES

These allowances apply to all funding sources and types of construction.

Facilities shall be planned to meet the specific requirements of an installation and not arbitrarily to the maximum allowances indicated. An installation will not automatically qualify for all facilities listed but only for those for which specific requirements exist

Minor exchange facilities operated for the convenience of nonexchange activities that are an integral part of these activities such as barber shops in clubs; food, retail outlets in air terminals, hospitals, schools or large administration buildings; food service in bowling alleys, operations buildings, and service clubs; and snack facilities in theaters are included in the space allowances authorized for the nonexchange activities.

Mechanical Equipment Rooms. Mechanical equipment room space as required should be added to the gross area in the criteia tables. This space varies from 5-10% of the gross area.

CONVERSION OF EXISTING FACILITIES

A new facility will be provided only when no existing available structure will satisfy the requirements. When an existing structure is converted for morale, welfare or recreational uses, the space allowances may be increased by not more than 20 percent when necessary to effect economical use of the existing structure. This increase is not allowed in cases where an existing structure is expanded by new construction to accommodate such uses.

ENVIRONMENTAL ADJUSTMENT FACTORS (EAF'S)

For exchange facilities this is a multiplier applied to the count of major customers to adjust for the effect of mission, availability of commercial facilities and availability of family housing.

For other facilities (only where specifically indicated under the respective codes), this is a multiplier applied to the space allowance to adjust for various environmental factors.

The allowance tables for facilities in the 740 series provide guidelines for maximum authorized space as prescribed by the MILITARY HANDBOOK (MIL-HDBK) 1190 of 11 Sept 1987, FACILITY PLANNING AND DESIGN GUIDE. Facilities shall be planned to meet specific requirements and not arbitrarily to the maximum allowances indicated. Consideration must be given to past and expected utilization of a particular facility, effects of off-installation housing, and nearby available civilian and other military facilities. To this end, a set of EAF's have been developed for a number of morale welfare and recreational facilities for inclusion in the planning procedure. These EAF's. may be in the form of a multiplier determined by environmental variables or in the form of a limiting factor if no environmental or utilization data is available. The values of EAF's and the variables to be considered are given under the codes specifically affected Further refinements of the EAFs can be anticipated.

As a general rule, the EAFs do not apply to overseas installations, however other military installations in close proximity should be considered as equivalent community support providers.

Exceptions to utilization of EAF's for other than exchange facilities will be justified and considered on an individual basis and will require approval of **BUPERS** or, in case of libraries and education centers, CNT.

For Marine Corps activities the application of EAF's, although not mandatory, should be a factor in any facility requirement analysis.

INSTALLATION MILITARY STRENGTH

The majority of space allowances are based on installation military strength which is basically defined as the entire complement of officers and enlisted personnel permanently assigned to said installation. If Army, Air Force or Coast Guard units are operating as tenants of the installation, their count may be included only if the host activity has the mission to provide morale welfare and recreational support to its tenants. This basic military strength may be modified as follows: (See NAVFACINST 11010.44E section 4.10 - 4-11 for further guidance in determining loading figures. For Marine Corps see MCO P11000.l2C, the Facility Support Requirements (FSR) is the base loading document to be used by Marine Corps activities)

1. Civilians may be counted only if authorized to receive personnel support.

2. Military dependents may be counted only if indicated in the respective allowance table and to the percentage authorized. If civilians are authorized support, their dependents may be included.

3. Retired personnel may be counted only if indicated in the respective allowance table and to the percentage authorized. Dependents of retired personnel are not counted. In locations where several military installations, regardless of which Service, are in close proximity, only those personnel supported by the installation in question may be counted.

4. Reservists. Eighty percent of average onboard count of reservists on weekend or two week duty may be counted when located at Commander, Naval Air Reserve commanded air stations. Twenty percent of average onboard count may be counted at other Navy installations supporting reserves. Reservists may be counted only for sizing facilities which are specifically affected by this group. Include Marine Corps Reserves.

5. Students, transients and other supported personnel may be counted, but with discretion. Only the average number on board may be used and only for sizing facilities which are specifically affected by this group.

USE OF DEFINITIVFS

Most of the space allowance figures have no matching definitive in NAVFAC P-272. In such cases, use the nearest definitive as a guide for detailed planning.

COVERED/ENCLOSED MALLS AND SIDEWALKS

Where elements of a community shopping center, such as the exchange main retail store, snack bar, exchange service outlets, commissary, credit union and a bank, are combined in a common structure and connected by a covered mall, space occupied by the mall will not be charged against (deducted from) space allowances for the respective elements. Likewise, where such elements are in proximity to each other and are connected by a covered walkway, space occupied by the covered walkway will not be charged against space allowances for the respective elements. Entrance canopies should not be counted against the building space allowance.

WAIVERS AND EXCEPTIONS

DOD waiver requests for projects which exceed the space allowances in the Military Handbook are no longer required. However, Congress directed that future MCON budget submissions include a certification that projects are within the criteria or scope prescribed in the Handbook. Exceptions must be documented The activity must provide detailed justification when criteria are exceeded. The justification must be attached to the Facility Study/DD Form 1391. NAVFAC will provide the certification statement for the budget submission.

CONSTRUCTION FROM PRIVATE FUNDS

The construction of exchange facilities on military installations may be accomplished from funds of commercial concerns or private individuals subject to the approval of the Secretary of their cognizant Military Department, when pertinent contracts between commercial concerns or private individuals and the exchange specifies that immediately upon completion title thereto passes to the government and stipulate conditions and restrictions that should prevent any future conflict with military requirements, and eliminate any future obligations against appropriated funds. The requirement for passage of the title should not apply to portable or relocatable buildings.

740 COMMUNITY FACILITIES - MORALE, WELFARE AND RECREATION (INTERIOR)

General Instructions

These notes apply to the revised criteria for the following facilities:

740 28 AMUSEMENTCENTER
740 38 HOBBY SHOP - AUTOMOTIVE
740 40 BOWLING CENTER
740 42 FLEET RECREATION CENTER
740 43 GYMNASIUM
740 45 FITNESS CENTER
740 47 RECREATION INFORMATION, TICKETS AND TOURS OFFICE
740 48 CONTRACTED LEISURE TRAVEL AGENCY
740 53 SWIMMING POOL - INDOOR (includes poolside deck and bathhouse)
740 54 RECREATION CENTER
740 55 YOUTH CENTER
740 80 GOLF CLUBHOUSE
740 81 MWR RENTAL CABIN
740 84 INDOOR PLAYING COURTS

USING THE CRITERIA

1. SIZE TO ACCOMMODATE DEMAND

The revised criteria provide a new approach to determine allowances for Morale, Welfare and Recreational (MWR) facilities. Facility allowances are sized to accommodate the projected demand for the anticipated functions. This sizing involves a three-step procedure:

A. Estimate Projected Demand

Calculate the peak-hour demand for each functional component of the facility using the demand calculation tables. Then apply any special adjustment factors in the criteria.

B. Determine Capacity Requirements

Derive the number of required functional units (for example, playing courts or training stations) by multiplying the demand by the capacity factors in the criteria.

C. Calculate Space Allowances

Apply the space allocation factors to determine the area required for each functional component. Add the areas for all components, plus support area factors indicated in the criteria, to determine the total facility allowance. For each step in this planning process, follow the calculations and instructions provided in the criteria for each facility type. In addition to the criteria stated in ***NAVFAC P-80,*** attention should be given to relevant planning information in the Base Master Plan, and existing Design Manuals, Military Handbooks or Instructions for the specific facility type.

The involvement of MWR representatives in the planning process is strongly recommended in order to ensure a match between program needs, and the types and the sizes of spaces to be provided.

2 . DEMAND FACTORS DERIVED FROM SMART COMPASS

A . Participation Factors for Each Population Category

Demand calculation involves application of Participation Factors provided in the criteria for each significant user population category - officers, enlisted personnel, retired military, and authorized civilians. These factors have been statistically derived to represent system-wide standards for **peak-hour participation** by each group, using data from the Smart Compass "Leisure Needs Survey" and other user surveys.

B . SMART COMPASS "Leisure Needs Survey"

The Smart Compass **"Leisure Needs Survey"** is a needs assessment of Morale, Welfare and Recreation (MWR) programs administered by the **Bureau of Naval Personnel** (BUPERS).

The **Leisure Needs Survey (LNS)** was implemented in 1985 to capture valid and reliable "installation specific" community leisure needs assessment information and comprehensive data for local management to use for short and long range Morale, Welfare and Recreation (MWR) program planning. Each Navy base with an MWR program is surveyed at least once every three years. The survey was scientifically developed by a team of experts made up of university professors with specialties in leisure studies and research statistics. The Navy regularly brings in subject matter experts from universities and the MWR profession to review and validate the results and update the survey process.

The LNS measures MWR user intentions and trends of active duty Navy, spouses, retirees and authorized civilian patrons of MWR services. The survey contains demographics of patrons, leisure time activity preferences, evaluation of services and facilities, and barriers to participation. The random sampling process in use was carefully developed to ensure that the sampling enables us to generalize from a small representative group to a larger one. The LNS is an accepted, reliable and validated survey tool used by many local commands to modify MWR programs and to justify the construction of MWR facilities.

For questions concerning **Smart Compass** contact the **Bureau of Naval Personnel, Code Pers-651. Summaries of the local Leisure Needs Survey** results are available in the **MWR office on each Navy base.**

For **Marine Corps Installations** results of the **MWR Construction Program** Patron Survey will be used to provide Marine Corps specific patron desires. Construction Program Patron Survey data is available from the **Commandant of the Marine Corps.**

C . Survey Data Already Incorporated in Factors

The Participation Factors already incorporate the demand implications of the Smart Compass data. Users of these criteria do not need to use any Smart Compass data in applying the demand calculation tables, **except as specified in the Bowling Center and Golf Course criteria.**

The Participation Factors may be revised periodically by NAVFAC HQ, BUPERS, and the Commandant of the Marine Corps (MWR). The most current figures must be used in all demand calculations.

3. SPACE ALLOWANCE FLEXIBILITY

A. Modular Space Allowances

For many of these criteria, usage demand, capacity requirements and space allowances are calculated separately for component function-areas of the facility, and then totalled to derive overall facility space allowances. This procedure is designed to respond to local variations in the set of activities and spaces provided, and the relative demand for different activities depending on the needs of the installation population. This approach can also accommodate diverse existing facility situations, when considering additions or complementary new facilities.

B. Space Programs versus Facility Allowances

These criteria are used to determine the total space allowance for a facility. Even though area calculations for functional components of the facility are used in deriving the overall allowance, this does not fix the space sizes of the component program areas of the facility. Local installation decisions, in the space programming and design process, should determine the appropriate allocation of areas for each function-space within the total facility allowance.

C. Local Variation

Local demand for program activities may depend on a variety of factors, in addition to the overall installation population, including:

(a) Proportion and relative participation of different user groups among the population.

(b) Specific program of activities provided.

(c) Competing on-base and off-base facilities providing similar programs.

(d) Geographic distribution and accessibility of the user populations.

(e) Local climate conditions and operating seasons.

(f) Overseas situations and local customs.

4. POPULATION BASIS FOR DEMAND CALCULATIONS

A. Use Base Loading Data

Population figures used in the demand calculations should be consistent with projected base loading data. Officers are O-1 through O-10. Enlisted are E-1 through E-9. Authorized Civilians are authorized DoD employees.

B. Deploy able Forces

For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all the nondeployable population, plus 67% of the deployable population, to reflect time away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations.

C. Dependent Demand Incorporated in Factors

Demand for facility use by dependent spouses and youth is already statistically incorporated in the Participation Factors provided in the criteria, as derived from system-wide utilization data.

D. Authorized Retirees

Retirees are all military retirees residing within a 30-minute drive of the installation. In the absence of other available installation data on authorized retiree population, the installation should use the DoD Statistical Report on the Military Retirement System (published by DoD, Office of the Actuary, RCS No. DDM (A) 1375), and apply the data for zip codes within a 30-minute drive of the installation.

E. Reservists

For demand calculations, reservist population should be included with the active duty military populations. Numbers of reservists should be counted according to the percentage factors indicated in Item 4, Reservists, of NAVFAC P-80, Section 740, General Notes, Installation Military Strength.

5. RECREATIONAL PLANNING CONTEXT

Planning for MWR facilities should involve consideration of the individual facility in relationship to a comprehensive recreational program and facilities plan for the installation. Consider the following factors, in addition to those relationships specifically indicated in the criteria for each facility:

- If other MWR facilities serving the same user population provide the same program activities, reduce the allowed capacity of the proposed facility by the capacity provided elsewhere at the installation.
- Consider collocating the facility with other recreational facilities providing complementary programs, to provide the users with the increased convenience and attractiveness of clustered activities, and to take advantage of potential savings in support space requirements and operating costs.
- Size and locate an individual facility appropriately to the target population and geographical area its particular function is designed to serve. Convenient access for users should be considered in balance with the need far efficient facility operation and avoidance of duplicate facilities.

740 01 EXCHANGE RETAIL STORE (sq.m./SF)

The exchange retail store is planned as part of an authorized Navy or Marine Corps Exchange. The store includes sales area, immediate back-up stock area, store office, toilets and circulation space. The space allowances for exchange retail stores are determined by point values, the latter being a function of geographic customers and Environmental Adjustment Factor (EAF).

Note: When CCN 730 13 (Issue/Retail Clothing and Uniform Center) is incorporated into CCN 740 01 (Exchange Retail Store) the additional area is added to 740 01.

GEOGRAPHICAL CUSTOMER

This designation applies to persons counted to determine the point value for a retail store. There are three categories of geographical customers:

1. Major customers. These are the total number of married military sponsors, (excluding married enlisted personnel in overseas unaccompanied areas), their dependents, single officers, exchange employees authorized exchange privileges and authorized civilian employees but not their dependents are counted (Note: in overseas areas the authorized civilian and their dependents are counted).

2. Single enlisted military customers. Married enlisted personnel in overseas unaccompanied areas are counted as single enlisted personnel.

3. Retired customers (but **not** their dependents). In areas of fleet concentration (e.g., San Diego, Norfolk) or where military installations of other Services are in close proximity, there may be several retail stores drawing geographical customers from overlapping areas. The planner is cautioned to make sure that the same geographical customer is not counted for more than one retail store when determining space allowances for the retail stores. Provision should be made for coordination of planning within the areas serviced by the several retail stores so that multiple counting does not occur. This applies only to the process of counting for determining the sixes of retail stores. It in no way implies that those counted will be restricted to patronage of a specific store.

ENVIRONMENTAL ADJUSTMENT FACTOR

This is a multiplier applied to the count of major customers only. It adjusts for the effect of mission, availability of commercial shopping facilities, and the availability of family housing.

GENERAL NOTE FOR EXCHANGE FACILITIES

Increases, not to exceed 20% for space allowances, may be made in the various types of exchange facilities, provided that **the aggregate total authorized for all types at an installation is not exceeded.**

HIGH SALES IMPACT

To meet exceptional circumstances involving abnormally high customer patronage which result in abnormally high sales, an increase not to exceed 20 percent of the computed space allowance for the main retail store may be added to that allowance without any corresponding deduction in space allowances for other exchange activities. (For this purpose, abnormally high sales will be identified as follows: the normally authorized store size will be determined from table 740 01E; the projected sales per square meter (foot) will be computed; sales will be considered abnormally high where those projected sales per square meter (foot) exceed by more than 10 percent the average sales per square meter (foot) for existing stores of similar size.) Such an increase may not be combined with the space adjustment permitted in the general note above but does not preclude a further addition of up to 10 percent when necessary to effect economical and efficient use of an existing building being converted to retail store use.

PROCEDURE FOR DETERMINING SPACE ALLOWANCE

Step 1. Determine the number of major customers based upon projected numbers of all officers, married enlisted and authorized civilian employees. Add the number of authorized dependents only. Enter Table 740-01A for the point value. Determine environmental adjustment factor from Table 740-01B and multiply the obtained point value by this factor.

If dependent figures are not available, current Navy and Marine Corps grade distribution and marital rates are hated on page 710-1. After determining the number of married personnel, the number of dependents may be e&mated by multiplying the married count by 2.8 for officers/civilian equivalent and 2.4 for enlisted /civilian equivalent.

Step 2. Determine the number of single enlisted personnel, and married unaccompanied enlisted personnel overseas and enter Table 740-01C for the point value.

Step 3. Determine the number of retired personnel and enter Table 740-01D for the point value. Do not count their dependents.

The numbers of all military personnel receiving retired pay, listed by first three digits of ZIP code of mailing address, is prepared by the Data Services Center, Comptroller, Headquarters USAF, and published periodically. NAVFAC Headquarters distributes this report to all Field Divisions.

Step 4. Add point values obtained by Steps 1 through 3. Enter Table 740-01 E for retail store space allowances.

See Figure 740-01 for sample calculations.

In overseas areas where a group of military installations of one or more Services are located within an area with a radius of up to 40 kilometers (25 miles), a community shopping center may be provided to serve these installations. This facility should preferably be located at one of the installations and contain a main exchange store, service outlets and cafeteria. In such cases, any retail facilities (Code 740 01 and 740 09) on the individual participating installations shall be planned to meet specific requirements and not arbitrarily to the maximum allowances.

TABLE 740-01A

Point Values for Major Customers (Officers, Married Em and Dependents)

Customers	Points	Customers	Points	Customers	Points	Customers	Points	Customers	Points	Customers	Points	Customers	Points
0-62	1	8301-8395	101	17801-17902	201	28001-28107	301	38701-38811	401	48801-48914	501	61201-61216	601
63-124	2	8396-8490	102	17903-18004	202	28108-28214	302	38812-38922	402	48915-50028	502	61217-61332	602
125-186	3	8491-8585	103	18005-18106	203	28215-28321	303	38923-39033	403	50029-50142	503	61333-61448	603
187-248	4	8586-8680	104	18107-18208	204	28322-28428	304	39034-39144	404	50143-50256	504	61681-61796	604
249-310	5	8681-8775	105	18209-18310	205	28429-28535	305	39145-39255	405	50257-50370	505	61717-61912	605
311-372	6	8776-8870	106	18311-18412	206	28536-28642	306	39256-39366	406	50371-50484	506	61913-62028	606
373-434	7	8871-8965	107	18413-18514	207	28643-28749	307	39367-39477	407	50485-50598	507	62029-62144	607
435-496	8	8966-9060	108	18515-18616	208	28750-28856	308	39478-39588	408	50599-50712	508	62145-62260	608
497-558	9	9061-9155	109	18617-18718	209	28857-28963	309	39589-39699	409	50713-50826	509	62261-62376	609
559-620	10	9156-9250	110	18719-18820	210	28964-29070	310	39700-39810	410	50827-50940	510	62377-62492	610
621-689	11	9251-9345	111	18821-18922	211	29071-29177	311	39811-39921	411	50941-51054	511	62493-62608	611
690-758	12	9346-9440	112	18923-19024	212	29178-29284	312	39922-40032	412	51055-51168	512	62609-62724	612
759-827	13	9441-9535	113	19025-19126	213	29285-29391	313	40033-40143	413	51169-51282	513	62725-62840	613
828-896	14	9536-9630	114	19127-19228	214	29392-29498	314	40144-40254	414	51283-51396	514	62841-62956	614
897-965	15	9631-9725	115	19229-19330	215	29499-29605	315	40255-40365	415	51397-51510	515	62957-63072	615
966-1034	16	9726-9820	116	19331-19432	216	29606-29712	316	40366-40476	416	51511-51624	516	63073-63188	616
1035-1103	17	9821-9915	117	19433-19534	217	29713-29819	317	40477-40587	417	51625-51738	517	63189-63304	617
1104-1172	18	9916-10010	118	19535-19636	218	29820-29926	318	40588-40698	418	51739-51852	518	63305-63420	618
1173-1241	19	10011-10105	119	19637-19738	219	29927-30033	319	40699-40809	419	51853-51966	519	63421-63536	619
1242-1310	20	10106-10200	120	19739-19840	220	30034-30140	320	40810-40920	420	51967-52080	520	63537-63652	620
1311-1386	21	10201-10295	121	19841-19942	221	30141-30247	321	40921-41031	421	52081-52194	521	63653-63768	621
1387-1462	22	10296-10390	122	19943-20044	222	30248-30354	322	41032-41142	422	52195-52308	522	63769-63884	622
1463-1538	23	10391-10485	123	20045-20146	223	30355-30461	323	41143-41253	423	52309-52422	523	63885-64000	623
1539-1614	24	10486-10580	124	20147-20248	224	30462-30568	324	41254-41364	424	52423-52536	524	64001-64116	624
1615-1690	25	10581-10675	125	20249-20350	225	30569-30675	325	41365-41475	425	52537-52650	525	64117-64232	625
1691-1766	26	10676-10770	126	20351-20452	226	30676-30782	326	41476-41586	426	52651-52764	526	64233-64348	626
1767-1842	27	10771-10865	127	20453-20554	227	30783-30889	327	41587-41697	427	52765-52878	527	64349-64464	627
1843-1918	28	10866-10960	128	20555-20656	228	30890-30996	328	41698-41808	428	52879-52992	528	64465-64580	628
1919-1994	29	10961-11055	129	20657-20758	229	30997-31103	329	41809-41919	429	52993-53106	529	64581-64696	629
1995-2070	30	11056-11150	130	20759-20860	230	31104-31210	330	41920-42030	430	53107-53220	530	64697-64812	630
2071-2151	31	11151-11245	131	20861-20962	231	31211-31317	331	42031-42141	431	53221-53334	531	64813-64928	631
2152-2232	32	11246-11340	132	20963-21064	232	31318-31424	332	42142-42252	432	53335-53448	532	64929-65044	632
2233-2313	33	11341-11435	133	21065-21166	233	31425-31531	333	42253-42363	433	53449-53562	533	65045-65160	633
2314-2394	34	11436-11530	134	21167-21268	234	31532-31638	334	42364-42474	434	53563-53676	534	65161-65276	634
2395-2475	35	11531-11625	135	21269-21370	235	31639-31745	335	42475-42585	435	53677-53790	535	65277-65392	635
2476-2556	36	11626-11720	136	21371-21472	236	31746-31852	336	42586-42696	436	53791-53904	536	65393-65508	636
2557-2637	37	11721-11815	137	21473-21574	237	31853-31959	337	42697-42807	437	53905-54018	537	65509-65625	637
2638-2718	38	11816-11910	138	21575-21676	238	31960-32066	338	42808-42918	438	54019-54132	538	65626-65740	638
2719-2799	39	11911-12005	139	21677-21778	239	32067-32173	339	42919-43029	439	54133-54246	539	65741-65856	639
2800-2880	40	12006-12100	140	21779-21880	240	32174-32280	340	43030-43140	440	54247-54360	540	65857-65972	640
2881-2965	41	12101-12195	141	21881-21982	241	32281-32387	341	43141-43251	441	54361-54474	541	65973-66088	641
2966-3050	42	12196-12290	142	21983-22084	242	32388-32494	342	43252-43362	442	54475-54588	542	66089-66204	642
3051-3135	43	12291-12385	143	22085-22186	243	32495-32601	343	43363-43473	443	54589-54702	543	66205-66320	643
3136-3220	44	12386-12480	144	22187-22288	244	32602-32708	344	43474-43584	444	54703-54816	544	66321-66436	644
3221-3305	45	12481-12575	145	22289-22390	245	32709-32815	345	43585-43695	445	54817-54930	545	66437-66552	645
3306-3390	46	12576-12670	146	22391-22492	246	32816-32922	346	43696-43806	446	54931-55044	546	66553-66668	646
3391-3475	47	12671-12765	147	22493-22594	247	32923-33029	347	43807-43917	447	55045-55158	547	66669-66784	647
3476-3560	48	12766-12860	148	22595-22696	248	33030-33136	348	43918-44028	448	55159-55272	548	66785-66900	648
3561-3645	49	12861-12955	149	22697-22798	249	33137-33243	349	44029-44139	449	55273-55386	549	66901-67016	649
3646-3730	50	12956-13050	150	22799-22900	250	33244-33350	350	44140-44250	450	55387-55500	550	67017-67132	650
3731-3818	51	13051-13145	151	22901-23002	251	33351-33457	351	44251-44361	451	55501-55614	551	67133-67248	651
3819-3906	52	13146-13240	152	23003-23104	252	33458-33564	352	44362-44472	452	55615-55728	552	67249-67364	652
3907-3994	53	13241-13335	153	23105-23206	253	33565-33671	353	44473-44583	453	55729-55842	553	67365-67480	653
3995-4082	54	13336-13430	154	23207-23308	254	33672-33778	354	44584-44694	454	55843-55956	554	67481-67596	654
4083-4170	55	13431-13525	155	23309-23410	255	33779-33885	355	44695-44805	455	55957-56070	555	67597-67712	655
4171-4258	56	13526-13620	156	23411-23512	256	33886-33992	356	44806-44916	456	56071-56184	556	67713-67828	656
4259-4346	57	13621-13715	157	23513-23614	257	33993-34099	357	44917-45027	457	56185-56298	557	67829-67944	657
4347-4434	58	13716-13810	158	23615-23716	258	34100-34206	358	45028-45138	458	56299-56412	558	67945-68060	658
4435-4522	59	13811-13905	159	23717-23818	259	34207-34313	359	45139-45249	459	56413-56526	559	68061-68176	659
4523-4610	60	13906-14000	160	23819-23920	260	34314-34420	360	45250-45360	460	56527-56640	560	68177-68292	660
4611-4700	61	14001-14095	161	23921-24022	261	34421-34527	361	45361-45471	461	56641-56754	561	68293-68408	661
4701-4790	62	14096-14190	162	24023-24124	262	34528-34634	362	45472-45582	462	56755-56868	562	68409-68524	662
4791-4880	63	14191-14285	163	24125-24226	263	34635-34741	363	45583-45693	463	56869-56982	563	68525-68640	663
4881-4970	64	14286-14380	164	24227-24328	264	34742-34848	364	45694-45804	464	56983-57096	564	68641-68756	664
4971-5060	65	14381-14475	165	24329-24430	265	34849-34955	365	45805-45915	465	57097-57210	565	68757-68872	665
5061-5150	66	14476-14570	166	24431-24532	266	34956-35062	366	45916-46026	466	57211-57324	566	68873-68988	666
5151-5240	67	14571-14665	167	24533-24634	267	35063-35169	367	46027-46137	467	57325-57438	567	68989-69104	667
5241-5330	68	14666-14760	168	24635-24736	268	35170-35276	368	46138-46248	468	57439-57552	568	69105-69220	668
5331-5420	69	14761-14855	169	24737-24838	269	35277-35383	369	46249-46359	469	57553-57666	569	69221-69336	669
5421-5510	70	14856-14950	170	24839-24940	270	35384-35490	370	46360-46470	470	57667-57780	570	69337-69452	670
5511-5602	71	14951-15045	171	24941-25042	271	35491-35597	371	46471-46581	471	57781-57894	571	69453-69568	671
5603-5694	72	15046-15140	172	25043-25144	272	35598-35704	372	46582-46692	472	57895-58008	572	69569-69684	672
5695-5786	73	15141-15235	173	25145-25246	273	35705-35811	373	46693-46803	473	58009-58122	573	69685-69800	673
5787-5878	74	15236-15330	174	25247-25348	274	35812-35918	374	46804-46914	474	58123-58236	574	69801-69916	674
5879-5970	75	15331-15425	175	25349-25450	275	35919-36025	375	46915-47025	475	58237-58350	575	69917-70032	675
5971-6062	76	15426-15520	176	25451-25552	276	36026-36132	376	47026-47136	476	58351-58464	576		
6063-6154	77	15521-15615	177	25553-25654	277	36133-36239	377	47137-47247	477	58465-58578	577		
6155-6246	78	15616-15710	178	25655-25756	278	36240-36346	378	47248-47358	478	58579-58692	578		
6247-6338	79	15711-15805	179	25757-25858	279	36347-36453	379	47359-47469	479	58693-58806	579		
6339-6430	80	15806-15900	180	25859-25960	280	36454-36560	380	47470-47580	480	58807-58920	580		
6431-6523	81	15901-15995	181	25961-26062	281	36561-36667	381	47581-47691	481	58921-59034	581		
6524-6616	82	15996-16090	182	26063-26164	282	36668-36774	382	47692-47802	482	59035-59148	582		
6617-6709	83	16091-16185	183	26165-26266	283	36775-36881	383	47803-47913	483	59149-59262	583		
6710-6802	84	16186-16280	184	26267-26368	284	36882-36988	384	47914-48024	484	59263-59376	584		
6803-6895	85	16281-16375	185	26369-26470	285	36989-37095	385	48025-48135	485	59377-59490	585		
6896-6988	86	16376-16470	186	26471-26572	286	37096-37202	386	48136-48246	486	59491-59604	586		
6989-7081	87	16471-16565	187	26573-26674	287	37203-37309	387	48247-48357	487	59605-59718	587		
7082-7174	88	16566-16660	188	26675-26776	288	37310-37416	388	48358-48468	488	59719-59832	588		
7175-7267	89	16661-16755	189	26777-26878	289	37417-37523	389	48469-48579	489	59833-59946	589		
7268-7360	90	16756-16850	190	26879-26980	290	37524-37630	390	48580-48690	490	59947-60060	590		
7361-7454	91	16851-16945	191	26981-27082	291	37631-37737	391	48691-48801	491	60061-60174	591		
7455-7548	92	16946-17040	192	27083-27184	292	37738-37844	392	48802-48912	492	60175-60288	592		
7549-7642	93	17041-17135	193	27185-27286	293	37845-37951	393	48913-49023	493	60289-60402	593		
7643-7736	94	17136-17230	194	27287-27388	294	37952-38058	394	49024-49134	494	60403-60516	594		
7737-7830	95	17231-17325	195	27389-27490	295	38059-38165	395	49135-49245	495	60517-60630	595		
7831-7924	96	17326-17420	196	27491-27592	296	38166-38272	396	49246-49356	496	60631-60744	596		
7925-8018	97	17421-17515	197	27593-27694	297	38273-38379	397	49357-49467	497	60745-60858	597		
8019-8112	98	17516-17610	198	27695-27796	298	38380-38486	398	49468-49578	498	60859-60972	598		
8113-8206	99	17611-17705	199	27797-27898	299	38487-38593	399	49579-49689	499	60973-61086	599		
8207-8300	100	17706-17800	200	27899-28000	300	38594-38700	400	49690-49800	500	61087-61200	600		

TABLE 740 01B
Environmental Adjustment Factors

		CONUS		
MISSION	AVAILABILITY OF		FAMILY HOUSING ***	
	COMPARABLE	ADEQUATE AVAILABILITY	NORMAL AVAILABILITY	INADEQUATE AVAILABILITY
	COMMERCIAL	OF ON-INSTALLATION	OF ON-INSTALLATION	OF ON-INSTALLATION OR
	FACILITIES	OR OFF-INSTALLATION	OR ADJACENT OFF-	ADJACENT OFF-
*	**	HOUSING	INSTALLATION HOUSING	INSTALLATION HOUSING
	GOOD	1.15	0.95	0.75
	NORMAL	1.20	1.00	0.80
NORMAL	POOR	1.25	1.05	0.85
	HARDSHIP	1.30	1.10	0.90
	GOOD	1.30	1.05	0.80
	NORMAL	1.35	1.10	0.85
SPECIAL	POOR	1.40	1.15	0.90
	HARDSHIP	1.45	1.20	0.95
		OVERSEA		
MISSION	COMMUNITY	COMMUNITY STORE	INSTALLATION MAIN	INSTALLATION MAIN STORE
	STORE SERVING	SERVICE AREA IN 16 KM	STORE MORE THAN 16 KM	WITHIN 16 KM (10 MILES) OF
	AREA IN 40 KM	(10 MILE) RADIUS	(10 MILES) DISTANT FROM	COMMUNITY STORE
(*)	(25 MILE) RADIUS		COMMUNITY STORE	
NORMAL	1.70	1.20	1.00	0.80
SPECIAL	1.90	1.40	1.20	1.00

* MISSION (Applicable to CONUS & OVERSEA):

1. SPECIAL - Any installation that includes a major or intermediate command headquarters (i.e., Hq. First Army, Hq. Strategic Air Command, Hq. 8th Air Force).
2. NORMAL - All other installations.

** AVAILABILITY OF COMPARABLE COMMERCIAL FACILITIES (Applicable to CONUS only) (Shopping communities having at least one major department or discount store, and/or a substantial representation of food supermarkets, drug stores, variety stores, hardware stores, clothing stores and specialty stores.)

Categories:
1. GOOD - Within 8 kilometers (5 miles) of the exchange main retail store.
2. NORMAL - Between 8 and 16 kilometers (5 and 10 miles) of the exchange main retaiI store.
3. POOR - Between 16 and 32 kilometers (10 and 20 miles) of the exchange main retail store.
4. HARDSHIP - More than 32 kilometers (20 miles) from the exchange main retail store.

*** HOUSING - AVAILABILITY OF ON-INSTALLATION OR ADJACENT OFF-INSTALLATION HOUSING (Applicable to CONUS only)

Categories:
1. ADEQUATE - 80% or more of married personnel reside within 3 kilometers (2 miles) of installation gate.
2. NORMAL - More than 40% but less than 80% of married personnel reside within 8 kilometers (5 miles) of installation gate.
3. INADEQUATE - 40% or less of married personnel reside within 8 kilometers (5 miles) of installation gate.

TABLE 740-01C
Point Values for Single and Married but Unaccompanied Enlisted Customers

Customers	Points	Customers	Points	Customers	Points	Customers	Points	Customers	Points
0-60	1	2001-2210	21	6701-7325	41	23201-24370	61	46601-47770	81
61-90	2	2211-2420	22	7326-7950	42	24371-25540	62	47771-48940	82
91-120	3	2421-2630	23	7951-8575	43	25541-26710	63	48941-50110	83
121-160	4	2631-2840	24	8576-9200	44	26711-27880	64	50111-51280	84
161-200	5	2841-3050	25	9201-9825	45	27881-29050	65	51281-52450	85
201-240	6	3051-3260	26	9826-10450	46	29051-30220	66	52451-53620	86
241-280	7	3261-3470	27	10451-11075	47	30221-31390	67	53621-54790	87
281-320	8	3471-3680	28	11076-11700	48	31391-32560	68	54791-55960	88
321-360	9	3681-3890	29	11701-12325	49	32561-33730	69	55961-57130	89
361-400	10	3891-4100	30	12326-12950	50	33731-34900	70	57131-58300	90
401-560	11	4101-4360	31	12951-13975	51	34901-36070	71	58301-59470	91
561-720	12	4361-4620	32	13976-15000	52	36071-37240	72	59471-60640	92
721-880	13	4621-4880	33	15001-16025	53	37241-38410	73	60641-61810	93
881-1040	14	4881-5140	34	16026-17050	54	38411-39580	74	61811-62980	94
1041-1200	15	5141-5400	35	17051-18075	55	39581-40750	75	62981-64150	95
1201-1360	16	5401-5660	36	18076-19100	56	40751-41920	76	64151-65320	96
1361-1520	17	5661-5920	37	19101-20125	57	41921-43090	77	65321-66490	97
1521-1680	18	5921-6180	38	20126-21150	58	43091-44260	78	66491-67660	98
1681-1840	19	6181-6440	39	21151-22175	59	44261-45430	79	67661-68830	99
1841-2000	20	6441-6700	40	22176-23200	60	45431-46600	80	68831-70000	100

TABLE 740-01D
Point Values for Retired Customers

Customers	Points	Customers	Points	Customers	Points	Customers	Points	Customers	Points
0-110	1	9631-9890	61	24451-24710	121	40051-40310	181	55651-55910	241
111-170	2	9891-10130	62	24711-24970	122	40311-40570	182	55911-56170	242
171-230	3	10131-10370	63	24971-25230	123	40571-40830	183	56171-56430	243
231-290	4	10371-10610	64	25231-25490	124	40831-41090	184	56431-56690	244
291-350	5	10611-10850	65	25491-25750	125	41091-41350	185	56691-56950	245
351-410	6	10851-11090	66	25751-26010	126	41351-41610	186	56951-57210	246
411-470	7	11091-11330	67	26011-26270	127	41611-41870	187	57211-57470	247
471-530	8	11331-11570	68	26271-26530	128	41871-42130	188	57471-57730	248
531-590	9	11571-11810	69	26531-26790	129	42131-42390	189	57731-57990	249
591-650	10	11811-12050	70	26791-27050	130	42391-42650	190	57991-58250	250
651-770	11	12051-12290	71	27051-27310	131	42651-42910	191	58251-58510	251
771-880	12	12291-12530	72	27311-27570	132	42911-43170	192	58511-58770	252
881-1010	13	12531-12770	73	27571-27830	133	43171-43430	193	58771-59030	253
1011-1130	14	12771-13010	74	27831-28090	134	43431-43690	194	59031-59290	254
1131-1250	15	13011-13250	75	28091-28350	135	43691-43950	195	59291-59550	255
1251-1370	16	13251-13490	76	28351-28610	136	43951-44210	196	59551-59810	256
1371-1490	17	13491-13730	77	28611-28870	137	44211-44470	197	59811-60070	257
1491-1610	18	13731-13970	78	28871-29130	138	44471-44730	198	60071-60330	258
1611-1730	19	13971-14210	79	29131-29390	139	44731-44990	199	60331-60590	259
1731-1850	20	14211-14450	80	29391-29650	140	44991-45250	200	60591-60850	260
1851-2000	21	14451-14690	81	29651-29910	141	45251-45510	201	60851-61110	261
2001-2150	22	14691-14930	82	29911-30170	142	45511-45770	202	61111-61370	262
2151-2300	23	14931-15170	83	30171-30430	143	45771-46030	203	61371-61630	263
2301-2450	24	15171-15410	84	30431-30690	144	46031-46290	204	61631-61890	264
2451-2600	25	15411-15650	85	30691-30950	145	46291-46550	205	61891-62150	265
2601-2750	26	15651-15890	86	30951-31210	146	46551-46810	206	62151-62410	266
2751-2900	27	15891-16130	87	31211-31470	147	46811-47070	207	62411-62670	267
2901-3050	28	16131-16370	88	31471-31730	148	47071-47330	208	62671-62930	268
3051-3200	29	16371-16610	89	31731-31990	149	47331-47590	209	62931-63190	269
3201-3350	30	16611-16850	90	31991-32250	150	47591-47850	210	63191-63450	270
3351-3530	31	16851-17090	91	32251-32510	151	47851-48110	211	63451-63710	271
3531-3710	32	17091-17330	92	32511-32770	152	48111-48370	212	63711-63970	272
3711-3890	33	17331-17570	93	32771-33030	153	48371-48630	213	63971-64230	273
3891-4070	34	17571-17810	94	33031-33290	154	48631-48890	214	64231-64490	274
4071-4250	35	17811-18050	95	33291-33550	155	48891-49150	215	64491-64750	275
4251-4430	36	18051-18290	96	33551-33810	156	49151-49410	216	64751-65010	276
4431-4610	37	18291-18530	97	33811-34070	157	49411-49670	217	65011-65270	277
4611-4790	38	18531-18770	98	34071-34330	158	49671-49930	218	65271-65530	278
4791-4970	39	18771-19010	99	34331-34590	159	49931-50190	219	65531-65790	279
4971-5150	40	19011-19250	100	34591-34850	160	50191-50450	220	65791-66050	280
5151-5360	41	19251-19510	101	34851-35110	161	50451-50710	221	66051-66310	281
5361-5570	42	19511-19770	102	35111-35370	162	50711-50970	222	66311-66570	282
5571-5780	43	19771-20030	103	35371-35630	163	50971-51230	223	66571-66830	283
5781-5990	44	20031-20290	104	35631-35890	164	51231-51490	224	66831-67090	284
5991-6200	45	20291-20550	105	35891-36150	165	51491-51750	225	67091-67350	285
6201-6410	46	20551-20810	106	36151-36410	166	51751-52010	226	67351-67610	286
6411-6620	47	20811-21070	107	36411-36670	167	52011-52270	227	67611-67870	287
6621-6830	48	21071-21330	108	36671-36930	168	52271-52530	228	67871-68130	288
6831-7040	49	21331-21590	109	36931-37190	169	52531-52790	229	68131-68390	289
7041-7250	50	21591-21850	110	37191-37450	170	52791-53050	230	68391-68650	290
7251-7490	51	21851-22110	111	37451-37710	171	53051-53310	231	68651-68910	291
7491-7730	52	22111-22370	112	37711-37970	172	53311-53570	232	68911-69170	292
7731-7970	53	22371-22630	113	37971-38230	173	53571-53830	233	69171-69430	293
7971-8210	54	22631-22890	114	38231-38490	174	53831-54090	234	69431-69690	294
8211-8450	55	22891-23150	115	38491-38750	175	54091-54350	235	69691-69950	295
8451-8690	56	23151-23410	116	38751-39010	176	54351-54610	236	69951-70210	296
8691-8930	57	23411-23670	117	39011-39270	177	54611-54870	237	70211-70470	297
8931-9170	58	23671-23930	118	39271-39530	178	54871-55130	238	70471-70730	298
9171-9410	59	23931-24190	119	39531-39790	179	55131-55390	239	70731-70990	299
9411-9650	60	24191-24450	120	39791-40050	180	55391-55650	240	70991-71250	300

TABLE 740-01E
Space Allowances for Exchange Retail Stores

Points		Gross Area sq.m.	Gross Area SF
1		46	500
2		93	1,000
3		139	1,500
4		186	2,000
5		232	2,500
6		279	3,000
7		325	3,500
8 -9		372	4,000
10-12		465	5,000
13-15		557	6,000
16-21		697	7,500
22-28		836	9,000
29-36		975	10,500
37-45		1120	12,100
46-55		1280	13,800
56-67		1470	15,800
94-108		2040	22,000
109-128		2290	24,600
129-151		2510	27,000
152-180		2740	29,500
181-222		3010	32,400
223-274		3280	35,300
275-341		3550	38,200
342-412		3820	41,100
413-485		4090	44,000
486-568		4360	46,900
569-650		4650	50,000
For Each Addl. 100 pts.	Add	325	3,500

FIGURE 740-01
Sample Calculations - Exchange Retail Store

Example: Assume exchange is in CONUS; normal missions; comparable commercial facilities within 8 kilometers (5 miles) of exchange; 80% of married personnel live within 3 kilometers (2 miles) of station gate:

A. Point value for major customers (Use projected figures)

1. Base value

a.		Married military sponsors	4,000
b.		Dependents of above [1]	5,800
c.		Single officers	300
d.		Authorized civilian Employees and dependents [2]	100
e.	Total (1.a plus 1.b plus 1.c plus 1.d)		10,200
f.	Points from Table 740 01A (Based on A-1-e)		120

2. Adjustments for environment factors (Considers mission, availability of family housing and commercial shopping).

a.	Figure from Table 740 01B	1.15	
b.	Adjusted points for major customers (A.1.f multiplied by 2.a)		138

B. Point value for single enlisted personnel (Use projected figures)

1.	Single enlisted	11,300	
2.	Points from Table 740 01C (Based on B1)		48

C. Retired customers (currently registered DOD. Do not count dependents.)

1.	Retired military	1,390	
2.	Points from Table 740 01D (Based on C1)		17

D. Total points (A2b plus B2 plus C2) 203

E. Gross area[3] (from Table 740 01E) **3010 sq.m.(29,500 S.F.)**

[1] Projected on basis of current dependents' ration.

[2] Authorized civilian employees CONUS and Overseas. Dependents remote CONUS and Overseas.

[3] This allowance is for sales area, back-up stock, retail store office, heads, cashier cage, lobby and entrances. It does not include space for installation warehouse, central administration, location exchange, service outlets or other functional exchange activities for which separate space allowances are given.

740 02 LOCATION EXCHANGE (sq.m./SF)

Location exchanges are subsidiaries of an exchange and are intended for the purpose of providing convenient exchange coverage at an installation. Location exchanges may be planned only when authorized by the Navy Resale and Services Support Office or the Commandant of the Marine Corps. See Table 740 02 for maximum number of location exchanges at an installation. A gross area of 650 square meters (7,000 square feet) is authorized for each location exchange. However, space allowances for individual location exchange facilities may be adjusted upward or downward as long as the total space authorized for location exchanges is not exceeded. (Note that military members may be counted both for the Exchange Retail Store, category code 740 01, and a location exchange if both are authorized for a particular shore activity.) Location exchange facilities may be utilized for any of the authorized exchange activities or service outlets as required.

TABLE 740 02
Number of Authorized
Location Exchanges

Military Strength	Authorized
up to 2,500	None
2,500 to 5,000	1
5,001 to 7,500	2
7,501 to 10,000	3
For each additional 2500 or any portion thereof	1

740 03 EXCHANGE CENTRAL ADMINISTRATION (sq.m./SF)

This is space required for the general administrative effort of au exchange such as accounting, payroll, personnel, purchasing or warehousing. Space required for this facility will be calculated using code 610 10. (Administrative Office) criteria. Administrative space required for an individual exchange facility, such as office space in warehouses, cafeterias, main retail store or location exchange, shall be provided out of the space authorized for the individual facility.

740 04 EXCHANGE FOOD SERVICE (sq.m./SF)

These facilities include: cafeterias, specialty shops similar to deli, fast food and pizza, bake shops, and ice cream shops. The total space allowance is given in Table 740 04A. Food serving facilities operated in and for the sole convenience of nonexchange activities such as bowling alleys, theaters, air terminals and similar, is already included in the basic space allowance for such activities.

TABLE 740-04A
Space Allowances for Exchange Food Service

Military Strength	**Gross Area** CONUS sq.m.	CONUS SF	OVERSEAS sq.m.	OVERSEAS SF
up to 500	172	1,850	204	2,200
501 to 1,000	251	2,700	297	3,200
1,001 to 3,000	502	5,400	585	6,300
3,001 to 5,000	687	7,400	743	8,000
5,001 to 7,000	864	9,300	910	9,800
7,001 to 10,000	994	10,700	1050	11,300
10,001 to 15,000	1170	12,600	1240	13,300
15,001 to 20,000	1560	16,800	1650	17,800
20,001 to 30,000	1730	18,600	1820	19,600
For each additional 5,000 add	46	500	46	500

In overseas areas where a shopping center is planned to serve a group of military installations of one or more Services, food service may be provided to serve such community shopping center. Space allowances are given in Table 740-04B. This space is in addition to the individual food service allowances for each of the participating installations.

TABLE 740-04B
Space Allowances for Exchange Food service at
Community Shopping Centers (Overseas)

Authorized Customers (1)	**Gross Area** sq.m.	SF	
1,001 to 3,000	501	5,400	
3,001 to 5,000	585	6,300	
5,001 to 7,000	743	8,000	
7,001 to 10,000	910	9,800	
10,001 and up	1050	11,300	(maximum)

(1) Authorized strength consists of military strength and dependents in the area served by the shopping center.

740 05 EXCHANGE SNACK STAND (sq.m./SF)

At installations with military strength over 3,000, snack stands may be provided to supplement main exchange food services. Each snack stand shall not exceed 84 sq.m. (900 gross SF) area. The nunber of snack stands authorized is given in Table 740-05A.

TABLE 740-05A
Number of Authorized
Exchange Snack Stands

Military Strength	**Authorized**
up to 3,000	None
3,001 to 5,000	1
5,001 to 10,000	2
10,001 to 20,000	3
20,001 to 30,000	4
For each additional 10,000 add	1

In addition, each air station may provide a snack bar located in or adjacent to the operations area. Space allowances are given in Table 740-05B.

TABLE 740-05B
Space Allowances for
Flight Line Snack Bars

Military Strength	**Gross Area** sq.m.	SF
up to 1,000	46	500
1,001 to 5,000	102	1,100
5,001 to 10,000	194	2,090
10,001 and up	248	2,670 (maximum)

740 07 EXCHANGE AUTO PARTS STORE (sq.m./SF)

Exchange parts sales stores may be operated independently or with other retail outlets, service stations, or garages. The space allowances for such stores are in addition to other exchange space allowances and are given in table 740-07.

TABLE 740-07
Exchange Auto Parts Sales Stores

Number of Vehicles	**Gross Area** sq.m.	SF
up to 300	93	1,000
301 to 600	163	1,750
601 to 1,800	288	3,100
1,801 to 3,000	399	4,300
3,001 to 4,300	539	5,800
4,301 to 6,100	711	7,650
over 6,100	929	10,000

740 08 EXCHANGE FOOD STORE (OVERSEAS) (sq.m./SF)

In overseas areas where the need has been clearly established, food retail sales outlets may be authorized to operate independently or in conjunction with other exchange outlets or cafeterias. The space allowances for such stores are in addition to other exchange space allowances and are given in Table 740-08 below.

TABLE 740-08
Exchange Food Stores (Overseas)

Military Strength	**Gross Area** sq.m.	SF
up to 500	none	none
501 to 1,001	93	1,000
1,001 to 3,000	130	1,400
3,001 to 5,000	167	1,800
5,001 to 7,000	242	2,600
7,001 to 10,000	279	3,000
10,001 to 15,000	325	3,500
15,001 to 20,300	358	3,850
20,301 to 25,000	372	4,000
over 25,000	381	4,100

740 09 EXCHANGE SERVICE OUTLETS (sq.m./SF)

Exchanges are authorized outlets for basic services in conjunction with the retail store. Space authorized for these outlets are in addition to the main retail store and are given in Table 740-09A. Allowances for beauty shops are based on the number of authorized customers and are given in Table 740-09B.

In addition to specific outlets as listed in Tables 750-09A and B, special outlets may be authorized for which no distinct space allowances are given. Examples of such outlets are: CONUS and OVERSEAS - taxicab and bus service spaces, toylands, flower shops, baggage checkpoints; OVERSEAS only - steam-bath facilities, new car sales points, stock investment offices. Special outlets shall not duplicate activities directly operated by the exchange and separate justification is required.

TABLE 740-09A
Space Allowances for Exchange Service Cutlets

Military Strength (1)	Barber Shop (2) 1st		Barber Shop (2) 2nd		Shoe Repair Shop		Tailor Shop (3)		Valet Service (3)		Coin Operated Laundry & Dry Cleaning	
	sq.m.	SF	sq.m.	SF	sq.m.	SF	sq.m.	SF	sq.m.	SF	sq.m.	SF
Up to 500	28	300	0	0	0	0	19	200	28	300	0	0
501 to 1,00036	390	0	0	21	225	19	200	60	650		1 @ 70	750
1,001 to 3,00054	580	0	0	33	350	20	220	102	1,100		1 @ 107	1,150
3,001 to 5,00063	680	28	300	46	500	37	400	102	1,100		1 @ 107	1,150
5,001 to 7,00072	780	36	390	58	625	60	650	121	1,300		1 @ 177	1,900
7,001 to 10,000	78	840	43	460	70	750	65	700	121	1,300	1 @ 200	2,150
10,001 to 15,000	84	900	54	580	84	900	74	800	121	1,300	1 @ 200	2,150
15,001 to 20,000	89	960	63	680	84	900	84	900	139	1,500	2 @ 177	1,900
20,001 to 25,000	89	960	72	780	84	900	84	900	139	1,500	2 @ 177	1,900
25,001 to 30,000	89	960	78	840	84	900	84	900	139	1,500	2 @ 200	2,150
For each additional 5,000 add	6	60	6	60	5	50	5	50	9	100	1 @ 107	1,150

Military Strength (1)	Radio-TV Repair Shop		Portrait studio		Watch Repair Shop		Optical Shop		Personal Services (4)	
	sq.m.	SF	sq.m.	SF	sq.m.	SF	sq.m.	SF	sq.m.	SF
Up to 500	0	0	0	0	0	0	0	0	0	0
501 to 1,000	43	460	69	740	14	150	43	460	14	150
1,001 to 3,000	56	600	69	740	22	240	43	460	22	240
3,001 to 5,000	78	840	69	740	29	310	43	460	29	310
5,001 to 7,000	98	1,060	69	740	29	310	43	460	29	310
7,001 to 10,000	119	1,280	86	930	37	400	43	460	37	400
10,001 to 15,000	119	1,280	86	930	37	400	56	600	37	400
15,001 to 20,000	137	1,480	94	1,010	43	460	72	780	43	460
20,001 to 25,000	137	1,480	94	1,010	43	460	72	780	43	460
25,001 to 30,000	156	1,680	94	1,010	43	460	85	910	43	460
For each additional 5,000 add	11	120	7	80	6	60	12	130	6	60

(1) For overseas area community shopping centers, space allowances may be based on total customer count which may include military personnel, authorized civilians and dependents in the area served by the shopping center.
(2) For installations over 2500 strength, additional barber shops may be added within branch exchange allowances. Barber shops need not be collocated and may vary in size within total space allowances.
(3) Tailor shop and valet service may be combined in a single facility.
(4) Provides services such as: flower and crated fruit orders, package and gift wrap service, commercial money orders, travelers checks, Western Union Telegraph, transportation and theater tickets, and any other services of similar nature.

TABLE 740-09B
Space Allowances for Exchange Beauty Shops

Authorized Customers(1)	Gross Area	
	sq.m.	SF
Up to 250	37	400
251 to 500	74	800
501 to 1,000	111	1,200
1,001 to 1,500	163	1,750
1,501 to 2,000	206	2,220
2,001 to 2,500	230	2,480
For each additional 500 add	23	250

(1) Authorized customers include: dependent females over 18 years of age, military and other authorized female personnel living within three kilometers (two miles) of a military installation or within eight kilometers (five miles) of an overseas community shopping center in which the beauty shop is located.

740 12 RED CROSS/NAVY RELIEF (sq.m./SF)

Space for Red Cross and/or Navy Relief functions can be provided within the Family Services Center (Code 740 25) when available. This space however should not be counted against the requirements for Family Services Center. Space may be provided in other facilities on base when available. This space is not counted against Navy requirements.

740 13 EXCHANGE LAUNDRY PLANT (sq.m./SF)

See Code 740 15 for description and space allowances.

740 15 EXCHANGE DRY CLEANING PLANT (sq.m./SF)

Laundry and dry cleaning plants, which may be operated under the exchange service, normally shall be limited to nonappropriated fund laundering and cleaning. Space allowances are given in Table 740-15. On installations where both appropriated fund (Code 730 40) and nonappropriated fund (Codes 740 13 and 740 15) facilities are to be provided, the total space shall not exceed the criteria established for appropriated fund facilities (Code 730 40, Table 730-40).

TABLE 740-15
Space Allowances for Exchange Laundry and Dry Cleaning Plants

Military Strength	Gross Area Laundry Plant sq.m.	Gross Area Laundry Plant SF	Gross Area Dry Cleaning Plant sq.m.	Gross Area Dry Cleaning Plant SF
up to 500	279	3,000	93	1,000
501 to 1,000	557	6,000	93	1,000
1,001 to 3,000	650	7,000	93	1,000
3,001 to 5,000	743	8,000	186	2,000
5,001 to 7,000	836	9,000	279	3,000
7,001 to 10,000	883	9,500	325	3,500
10,001 to 15,000	929	10,000	372	4,000
15,001 to 30,000	1,390	15,000	650	7,000
For each additional 5,000 add	93	1,000	46	500

740 16 EXCHANGE MAINTENANCE SHOP (sq.m./SF)

The total space that may be provided for local repair of exchange equipment and fixtures is given in Table 740-16.

TABLE 740-16
Space Allowances for
Exchange Maintenance Shops

Military Strength	Gross Area sq.m.	Gross Area SF
up to 500	None	None
501 to 1,000	35	380
1,001 to 3,000	56	600
3,001 to 5,000	70	750
5,001 to 7,000	102	1,100
7,001 to 10,000	139	1,500
10,001 to 15,000	209	2,250
15,001 to 20,000	279	3,000
20,001 to 30,000	344	3,700
For each additional 5,000 add	33	350

740 17 EXCHANGE CENTRAL SUPPORT FACILITY (sq.m./SF)

Central support facilities not otherwise identified herein will be considered on an individual basis. Such facilities are normally provided in overseas areas and may comprise: central kitchens, bakeries, refrigerated storage plants, central repair shops, processing plants. They are sized and located depending upon the magnitude and dispersion of the exchange activities to be supported. Requests for establishment of such facilities will be submitted to the Assistant Secretary of the Navy (S&L) for approval.

740 18 BANK (sq.m./SF)

Banks may be established only when they are authorized by the U.S. Treasury Department. Normally there will be only one banking facility at each installation. Branch banks, providing complete services, shall not be established without prior approval. Space allowances are given in Table 740-18.

TABLE 740-18
Space Allowances for Banks

Personnel Strength (1)	**Gross Area** sq.m.	SF	Personnel Strength (1)	**Gross Area** sq.m.	SF
up to 1,000	139	1,500	7,001 to 9,000	517	5,560
1,001 to 2,000	221	2,375	9,001 to 11,000	592	6,375
2,001 to 3,000	302	3,250	11,001 to 13,000	668	7,190
3,001 to 4,000	337	3,625	13,001 to 15,000	743	8,000
4,001 to 5,000	372	4,000	15,001 to 17,000	929	10,000
5,001 to 6,000	406	4,375	17,001 to 20,000	1,210	13,000
6,001 to 7,000	441	4,750	over 20,000	(2)	

(1) Active duty military personnel assigned to an installation and stationed within a commuting area not served by another military banking office plus civilian employees of the installation.

(2) Determined by Engineering Study.

740 19 CREDIT UNION (sq.m./SF)

Credit unions are private cooperative savings and loan organizations. Facilities for a properly chartered credit union may be provided to serve military personnel, their dependents, and other personnel as permitted in the bylaws of the credit union. If a credit union on an installation restricts or limits membership of installation personnel, it will be denied free use of instalaltion facilities. In such cases another credit union which meets DOD requirements may be organized and provided with logistic support. Space allowances for credit unions are predicated on size of membership, number of transactions, assets, accounting methods, and number of employees. Each of the variables contributes a number of points, the sum of points determines space allowances. The allowance may be increased by 10 percent to accommodate future business expansion. See Table 740-19 for point values and space allowances.

TABLE 740-19
Point Values and Space Allowances for Credit Unions

Variables	**Points**	Variables	**Points**
Members		**Transactions Per Day**	
0 to 1,000	2	0 to 99	1
1,000 to 2,500	4	100 to 299	2
2,501 to 7,500	6	300 to 499	3
7,501 to 12,000	8	500 to 749	4
12,001 to 20,000	10	750 to 999	5
For Each Additional 10,000, add	2	For each additional 500, add	1
Accounting		**Employees**	
Machines	1	2 to 5	1
Manual	2	6 to 9	2
		10 to 13	3
		14 to 17	4
		18 to 21	5
		22 to 25	6
		For each additional 3, add	1

TOTAL POINTS = _____
(Use table below for Gross Area)

Point Totals	Gross Area sq.m.	Gross Area S F	Point Totals	Gross Area sq.m.	Gross Area SF
Minimum	74	800	18	576	6,200
5	93	1,000	19	669	7,200
6	121	1,300	20	762	8,200
7	158	1,700	21	855	9,200
8	204	2,200	22	948	10,200
10	260	2,800	23	1040	11,200
12	325	3,500	24	1130	12,200
14	399	4,300	25	1230	13,200
16	483	5,200	For each additional factor, add	93	1,000

GROSS AREA = _____

740 20 TEMPORARY LODGING FACILITIES (sq.m./SF)

NOTE: This facility is not to be listed as a Basic Facility Requirement.

These facilities are temporary living accommodations which normally are rented for a service charge for overnight or short term use to authorized personnel such as: official military or civilian visitors to the installation, visitors to installation personnel, transient personnel or families awaiting assignment to quarters. Included are motels, hotels, mobile homes, cottages and apartments. Where such facilities are authorized for new construction, they shall be of motel type with bath and with kitchenettes, if required. Living units with kitchenettes shall contain no more than 42 square meter (450 square feet) of living area and those without kitchenettes no more than 425 square feet. Appropriate circulation, administration, mechanical and service space will be provided.

NOTE: All leasing, conversion, or construction projects for temporary lodging facilities, regardless of scope and funded by nonappropriated fund activities will be forwarded for review and approval to Assistant Secretary of Defense (I&L).

740 21 VISITORS RECEPTION CENTER (sq.m./SF)

A visitors reception center is limited to installations performing basic training. It serves as a point of contact between trainees and visiting relatives or friends. Approximate planning factor is 0.14 square meter (1.5 square feet) per recruit.

740 22 TRANSIENT HOUSING (sq.m./SF)

A. NAVY:

NOTE: This facility is not to be listed as a Basic Facility Requirement.

Transient housing are Bureau of Naval Personnel (BUPERS)-operated living accommodations rented for a service charge to fleet personnel families of ships undergoing repair. This code is for inventory purposes only and is applicable only to housing units removed from the family housing inventory (Category Group 710) and designated for this purpose by the Chief of Naval Operations.

B. MARINE CORPS:

These quarters are operated primarily to provide a service to duty transient personnel and TAD students, and to conserve appropriated funds through reduced per diem payments. Guidance is provided in the Marine Corps Order P11000.22

740 23 COMMISSARY (sq.m./SF)

The Navy Commissary Systems were consolidated into the Defense Commissary Agency (DeCA) along with the other services on 1 October 1991. All Commissary construction planning, programming and execution has been transferred to that organization. NAVRESSO will no longer be responsible for this program.

Questions regarding Commissary construction plans, policies, procedures and sizing should be directed to the Defense Commissary Agency, Directorate of Facilities, Plans and Programs Division, Fort Lee Virginia, 23801-6300. Commercial telephone number is (804) 734-2312/2294 Fax # is (804) 861-4036

740 24 COMMISSARY COLD STORAGE (sq.m./SF)

(See CC 740 23 above for planning procedures)

740 25 FAMILY SERVICES. CENTER (sq.m./SF)

Project Review: EFD - NAVFAC HQ (20) -- Bureau of Naval Personnel (BUPERS) Code Pers -661C
Commandant of the Marine Corps (CMC) code MHF
Design Criteria: NAVFAC DM 37.05 (Family Services Centers will be included in the proposed Mil-Hdbk-1037/5 Community Facilities), **FSC Staffing Manual**

Family Service Centers (FSCs) may be established as required to provide **information and referral services, education and training services, and counseling services** for the **active duty population** with services usable to **dependents and retirees.** The centers require open areas such as visiting rooms and conference areas with the majority of space allotted to **individual offices** conductive to execution of high quality and confidential service delivery.

Space Allowances provide for **baby/toddler play areas, waiting room, record storage, individual counselor offices, administrative areas, storage areas for hospitality kit, general storage, conference rooms, staff areas, and classroom spaces for training exercises conducted by all FSCs.**

Capacity shah be determined by actual count of **active duty** and **full time reserve** military personnel receiving installation support who are entitled to FSC services. **Overseas** areas should **include the number of DOD** employees entitled to services. Justification remains the responsibility of the sponsoring command with requirements based on local needs. Adjust these figures for any projected increase/decrease in military population or mission changes.

New activities having no historical backup: Determine the total number of **active duty** and **full time reserve** personnel **receiving direct installation support**

Compare population totals to population per class sizes in the FSC Staffing Standards Manual to determine the number of staff personnel required for the FSC. **Determine Class type using Table 740 25A** (consult Pers-661C (DSN 227-6604) to ensure that the information in Table 740 25A reflect the latest standards) **and then use Table 740 25B for sizing. If the activity is not in Table 740 25A, use the activity's military population in Table 740 25D to determine the requirements** (Gross area for each class is at the bottom of the column).

The Delta column in Table 740 25A indicates additional personnel associated with a particular activity class.

For **Marine Corps Activities use Table 740 25C to determine requirements.**

Note: 1.) Many service agencies such as NADSAP, Navy-Marine Corps Relief, American Red Cross and CAA are co-located with FSCs. These areas are not a part of the Family Services Center and should not be counted against the requirements. For Red Cross see CC 740 12.

2.) Gross area for volunteers will be 14 square meter (150 gross square feet) per person. The number of volunteers per facility will be based on historical data for FSC volunteers at the local level. Requests for volunteer gross area for individual FSCs must be submitted to BUPERS-66 for review.

Table 740 25A
(Naval Activities)

	CLASS	TYPE	DELTA (+ -)
Adak	I	B	+1
Alameda	V	B	+1
Annapolis	I		
Atsugi	I		
Bangor	III	AB	+2
Barbers Point	III	E	
Bermuda	I		
Brunswick	II	B	+1
Cecil Field	IV	ABE	+2
Charleston	VI	BC	+2
~~Chase Field~~	~~I~~	~~K~~	
China Lake			
Corpus Christi	I	B	+1
Dahlgren	I		
Dallas	I	B	+1
Earle	II		
Edzel	I		
Everett	I	J	
Fallon	I		
Ft. Meade	I		
Gaeta	I		
Great Lakes	V	FB	+1
Guam	IV	BB	+2
Guantanamo	II		
Gulfport	II	B	+1
Idaho Falls			
Ingleside	I	J	
Jacksonville	V		
Keflavic	I	B	+1
Key West	II	AB	+2
Kings Bay	III		
Kingsville	I		
La Maddalena	I		
Lemore	III	A	+1
Little Creek	V	ABE	+2
London	I		
Long Beach	V	BK	+1
Mare Island	III	B	+1
Marietta	I		
Mayport	VII		
Memphis	IV	BD	+1
Meridian	I	D	+1
Miramar	IV	ABE	+2

	CLASS	TYPE	DELTA (+ -)
Mobile	I	J	
Moffett Field	III	BK	+1
Naples	II	BBCC	+4
NDW	V	B	+1
Newport	III	D	+1
New London	V	B	+1
New Orleans	II	BBC	+3
New York	I	BJ	+1
Norfolk	VIII	BBCCHHI	+7
North Island	V	BE	+1
NPS	II	B	+1
Oceana	V		
Okinawa	II		
Orlando	V	BF	+1
Panama	I		
Panama City			
Pascagoula	I	J	
Pax River	II		
Pearl Harbor	V	B	+1
Pensacola	IV	BDC	+2
Philadelphia	IV	BK	+1
Point Hueneme	II	B	+1
Point Loma	II	ABE	+2
Point Mugu	II		
Portsmouth NH	I		
~~Portsmouth VA~~	~~(Satellite)~~		
Puget Sound	IV	BC	+2
Roosevelt Roads	II	BC	+2
Sasebo	II	C	+1
Rota	II	BC	+2
San Diego	VII	B	+1
Scotia			
Sigonella	II	BBC	+3
South Weymouth	I		
Subase San Diego	III	ABE	+2
~~Subic Bay~~	~~III~~	~~BK~~	~~+1~~
Treasure Island	II		
Wahaiawa	I		
Whidbey Island	IV	AB	+2
Whiting Field	I	D	+1
Willow Grove	I	B	+1
Yokosuka	IV	A	+1
Yorktown	IV		

Key To **TYPE** code:

A - Deploying Base (10 + Deploying Units)
B - Retirees/ Other Military
C - Operates Remote Site
D - Training Command
E - Two Plus FSCS In Area
F - Recruit Training Command
G - Significant Population Served By Other FSCS
H - Contract Monitor
I - Contract Administrator
J - Size Based On Homeporting Projections
K - Base Closure

N.B. Additional justifiable staff for program requirements must be approved by the program manager in PERS-66

Table 740 25B (NAVY)

CLASS	I			II			III			IV		
Military Population	2K			2-4K			4-7K			7-10K		
FUNCTION	Pn	Net Area sq.m.	SF	Pn	Net Area sq.m.	SF	Pn	Net Area sq.m.	SF	Pn	Net Area sq.m.	SF
DIRECTOR	1	14	150	1	14	150	1	14	150	1	14	150
DEPUTY DIRECTOR	1	14	150	1	14	150	1	14	150	1	14	150
Human Services Analyst												
Chief of Counseling							1	18	190	1	18	190
Counselor	1	14	150	2	28	300	2	28	300	2	28	300
Social Work Assistant												
Family Advocacy Spec.	1	14	150	1	14	150	1	14	150	2	28	300
Information&Referral Coord.							1	8	90	1	8	90
Information&Referral Spec.	1	8	90	1	8	90	1	8	90	1	8	90
Community Services Supr.										1	14	150
Program Coordinator	1	9	100	1	9	100	1	9	100	1	9	100
Program Coordinator (Child)												
Program Specialist (1/SK)							1	8	90	1	8	90
Outreach Specialist												
Spouse Employ.Assist. Prog.	1	9	100	1	9	100	1	9	100	1	9	100
Spouse Employ. Assit. Spec.												
Return & Reunion Spec.										1	8	90
Community Specialist												
Community Assistant												
Relocation Coordinator (NC)	1	8	90	1	8	90	1	8	90	1	8	90
Relocation Specialist										1	6	60
Special Project												
Volunteer Coordinator							1	8	90	1	8	90
Financial Educator				1	8	90	1	8	90	1	8	90
Management Inform. Sys.							1	8	90	1	8	90
Admin.(1/YN)	2	17	180	2	17	180						
Admin.(1/YN3)							2	17	180	3	25	270
FAP												
Prevention Education Spec.	1	14	150	1	14	150	1	14	150	2	28	300
Admin. Assistant												
RAP/TAMP												
Section Manager	1	14	150	1	14	150	1	14	150	1	14	150
RAP/TAMP Counselor	1	14	150	2	28	300	2	28	300	3	42	450
RAP Counselor												
TAMP Counselor												
RAP/TAMP Counselor												
ADP/Admin Assistant	1	9	100	1	9	100						
ADP Operator							1	9	100	1	9	100
Admin. Assistant							1	9	100	1	9	100
CLASSROOM/CONFERENCE Rm		65	700		65	700		65	700		65	700
STAFF LOUNGE		19	200		19	200		19	200		19	200
LOBBY		23	250		23	250		23	250		23	250
RECEPTION	1	14	150		14	150		14	150		14	150
CHILD CARE		19	200		19	200		19	200		19	200
JANITOR CLOSET		9	100		9	100		9	100		9	100
HOSPITALITY KIT STORAGE		37	400		37	400		37	400		37	400
STORAGE		9	100		9	100		9	100		9	100
TOTAL PN. (STAFFING)	15			18			24			22		
TOTAL NSF		354	3,810		390	4,200		451	4,850		529	5,69
GSF (NSF + 25% Cir. + 5-10% Mech. Elec.&Communications)		473	5,100		522	5,600		603	6,500		708	7,600

Table 740 25B (NAVY)

CLASS	V			VI			VII			VIII		
Military Population	10-20K			20-40K			40-70K			70+K		
FUNCTION	Pn	Net Area sq.m.	SF	Pn	Net Area sq.m.	SF	Pn	Net Area sq.m.	SF	Pn	Net Area sq.m.	SF
DIRECTOR	1	14	150	1	14	150	1	14	150	1	14	150
DEPUTY DIRECTOR	1	14	150	1	14	150	1	14	150	1	14	150
Human Services Analyst										1	8	90
Chief of Counseling	1	18	190	1	18	190	1	18	190	1	18	190
Counselor	4	56	600	4	56	600	5	70	750	5	70	750
Social Work Assistant	1	14	150	2	28	300	2	28	300	2	28	300
Family Advocacy Spec.	2	28	300	2	28	300	2	28	300	2	28	300
Information&Referral Coord.	1	8	90	1	8	90	1	8	90	1	8	90
Information&Referral Spec.	1	8	90	2	17	180	2	17	180	2	17	180
Community Services Supr.	1	14	150	1	14	150	1	14	150	1	14	150
Program Coordinator	1	9	100	1	9	100	1	9	100	1	9	100
Program Coordinator (Child)							1	9	100	1	9	100
Program Specialist (1/SK)	3	25	270	4	33	360	5	42	450	6	42	540
Outreach Specialist							1	8	90	1	8	90
Spouse Employ.Assist. Prog.	1	9	100	1	9	100	1	9	100	1	9	100
Spouse Employ. Assit. Spec.	1	8	90	1	8	90	1	8	90	1	8	90
Return & Reunion Spec.	1	8	90	1	8	90	1	8	90	1	8	90
Community Specialist				1	8	90	1	8	90	1	8	90
Community Assistant										1	8	90
Relocation Coordinator (NC)	1	8	90	1	8	90	1	8	90	1	8	90
Relocation Specialist	1	6	60	1	6	60	1	6	60	1	6	60
Special Project				1	8	90	1	8	90	1	8	90
Volunteer Coordinator	1	8	90	1	8	90	1	8	90	1	8	90
Financial Educator	1	8	90	1	8	90	1	8	90	1	8	90
Management Inform. Sys.	1	8	90	1	8	90	1	8	90	1	8	90
Admin.(1/YN)												
Admin.(1/YN3)	3	25	270	5	42	450	6	50	540	7	59	630
FAP												
Prevention Education Spec.	2	28	300	3	42	450	3	42	450	3	42	450
Admin. Assistant				1	9	100	1	9	100	1	9	100
RAP/TAMP												
Section Manager	1	14	150	1	14	150	1	14	150	1	14	150
RAP/TAMP Counselor	3	42	450	4	56	600	4	56	600			
RAP Counselor										3	42	450
TAMP Counselor										3	42	450
RAP/TAMP Counselor												
ADP/Admin Assistant												
ADP Operator	1	9	100	1	9	100	1	9	100	2	19	200
Admin. Assistant	1	9	100	1	9	100	1	9	100	2	19	200
CLASSROOM/CONF Rm		74	800		74	800		93	1000		93	1000
STAFF LOUNGE		28	300		28	300		28	300		28	300
LOBBY		33	350		33	350		33	350		33	350
RECEPTION	1	14	150	1	14	150	1	14	150	1	14	150
CHILD CARE		19	200		19	200		19	200		19	200
JANITOR CLOSET		9	100		9	100		9	100		9	100
HOSPITALITY KIT STORAGE		37	400		46	500		46	500		46	500
STORAGE		9	100		9	100		9	100		9	100
TOTAL PN. (STAFFING)	37			47			52			60		
TOTAL NSF		591	6,360		739	7,950		805	8,670		899	9,680
GSF (NSF + 25% Cir. + 5-10% Mech. Elec.&Communications)		790	8,500		989	10,650		1,077	11,600		1,202	12,950

MARINE CORPS FAMILY SERVICE CENTER

Table 740 25C

CLASS Military Population (Active Duty) FUNCTION	SMALL (Under 10,000) Pn	Net Area sq.m.	 SF	LARGE (10,000 and OVER) Pn	Net Area sq.m.	 SF
DIRECTOR	1	14	150	1	14	150
Deputy Director	1	14	150	1	14	150
SNOIC	1	9	100	1	9	100
Program Coordinator	1	9	100	1	9	100
Information & Referral Specialist	1	8	90	2	17	180
Family Readiness/ Vol Coordinator	1	8	90	1	8	90
Admin	2	17	180	3	25	270
Chaplain	1	14	150	1	14	150
Family Counselor	1	14	150	1	14	150
Financial Counselor	1	14	150	1	14	150
CAREER RES. MGMT CENTER						
Career Res Manager	1	14	150	1	14	150
Tamp Counselor	1	14	150	2	29	300
Program Analyst	1	8	90	2	17	180
RELOCATION SECTION						
Relocation Manager	1	14	150	1	14	150
Relocation Counselor	1	14	150	2	28	300
Program Analyst	1	14	150	2	28	300
FAMILY ADVOCACY						
FAP Manager	1	14	150	1	14	150
Clinical Supervisor				1	190	190
Counselor	2	28	300	4	56	600
Admin. Assistant				1	9	100
Prevention Specialist				4	56	600
Community Health Nurse	1	8	90	4	33	360
Social Worker	1	14	150	3	42	450
CLASSROOM/CONFERENCE Rm		65	700		74	800
STAFF LOUNGE		23	250		28	300
LOBBY		23	250		28	300
RECEPTION	1	14	150	1	14	150
CHILD CARE		19	200		19	200
JANITOR CLOSET		9	100		9	100
HOSPITALITY KIT STORAGE		37	400		46	500
STORAGE		9	100		9	100
TOTAL PN. (STAFFING)	23			42		
TOTAL Net Area		464	4940		722	7820
GROSS AREA (Net area+ 25% Cir. +5-10% Mech. Elec.&Communications)		**618**	**6,600**		**966**	**10,500**

740 26 INSTALLATION RESTAURANT (sq.m./SF)

Restaurants for civilian employees may be established where adequate food services are not available. For more than 5000 employees, more than one restaurant may be provided. An economic analysis is needed to support the financial stability for such facilities. Space allowances are given in Table 740-26.

TABLE 740-26
Space Allowances for Installation Restaurants

Number of Civilian Employees	**Gross Area**	
	sq.m.	**SF**
up to 500	None(1)	None(1)
501 to 700	455	4,900
701 to 1,000	808	8,700
1,001 to 1,500	1,160	12,500
1,501 to 2,000	1,460	15,700
2,001 to 2,500	1,780	19200
2,501 to 3,000	2,120	22,800
3,001 to 3,500	2,510	27,000
3,501 to 4,000	2,830	30,500
4,001 to 4,500	3,150	33,900
over 4,500	3,440	37,000

(1) Consider snack bar or vending machine service.

740 27 ARMED FORCES RADIO/TV STATION (sq.m./SF)

A radio and/or TV station is normally established in overseas locations to provide U.S. installation population with entertainment and news coverage. As a rule, the coverage radius is limited to the installation and immediate vicinity and the facilities are restricted for transmission of prerecorded program material, however if justified, limited studio facilities may be provided. At the present, no space criteria are available for this type of facility. Requirements must be developed on an individual basis.

740 28 AMUSEMENT CENTER (sq.m./SF)

Project Review: Base MWR representatives, EFD, NAVFAC HQ, BUPERS (Pers-656D)
Design Criteria: *(Military Handbook is not currently available)*

1. **GENERAL.** See General Notes to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** Amusement Centers are recreational facilities which cater largely to the leisure needs of younger active-duty personnel and youth from military families. The types of games to be accommodated in an Amusement Center should be revenue-generating, and typically include pool/billiard tables, video games and pinball machines.

3. **RELATED FACILITIES.** In general, development of stand-alone Amusement Centers is not recommended. Consideration should be given to collocating Amusement Centers with related recreational or residential facilities in order to: (i) take advantage of potential savings in space requirements and operating costs; and (ii) benefit from the greater patron traffic generated by clustered facilities. These related recreational facilities include the following:

   - 740 40 Bowling Center.
   - MWR recreational and food service facilities such as Clubs and Recreation Centers.
   - Community support facilities, particularly those in high visibility, high traffic locations such as Base Exchanges.
   - Dormitory clusters or waterside piers accommodating vessels with significant numbers of younger, ship-based personnel.

4. **SPACE ALLOWANCE.** The maximum space allowances for Amusement Centers are determined according to the sizing criteria presented in Table 740 28A below. Planning considerations include the following:

   - The overall sizing of an Amusement Center should be determined on the basis of a return-on-investment analysis. An analysis of the capital investment, and projected costs and revenues must be undertaken to demonstrate the financial viability of the proposed project
   - Installations far removed from off-base recreation alternatives, and with a larger proportion of young, single active-duty personnel and teens from military families, particularly if this population has limited access to personal transportation, may experience a greater demand for Amusement Centers.
   - This type of facility may also be in greater demand at overseas installations where there are limited off-base recreation alternatives, or access is impeded by language or cultural differences.

TABLE 740 28A
MAXIMUM SPACE ALLOWANCE FOR AMUSEMENT CENTER

Installation Population	Active-Duty Max. Gross Area sq.m	SF	Notes
less than 5,000	0	0	(1), (2)
5,000 to 10,000	344	3,700	(2), (3)
more than 10,000	567	6,100	(2), (3)

Notes for Space Allowance Table:

(1) On installations with a population of less than 5,000 active-duty personnel, Bowling Centers Recreation Centers and Clubs may include the types of uses accommodated in Amusement Centers.

(2) Population numbers should be consistent with projected base loading data. For facility planning purposes at installations with deployable forces, the active-duty demand population is comprised of all of the non-deployable population, plus two-thirds of the deployable population, to reflect time away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations.

(3) 242 sq.m. (2,600 GSF) is the recommended minimum size for an economically virble facility.

sq.m. = square meter
GSF = Gross Square Feet

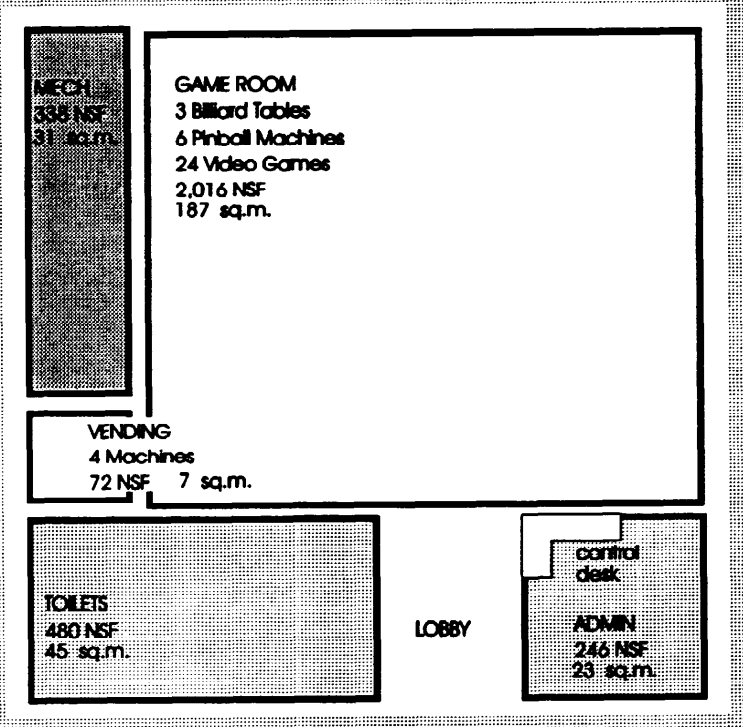
5. **ILLUSTRATIVE SPACE PROGRAMS.** Three space programs for minimum, medium and large Amusement Centers are presented to illustrate possible breakdowns of the overall space allowances into their primary functional. components, with their respective sizes and capacities. These space programs are for illustrative purposes only.

6. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a medium-size Amusement Center. This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram is for illustrative purposes only.

AMUSEMENT CENTER (Category Code 740 28)

Sample Space Programs

Functional Component / Sub-Component	Space Allocation Standard		MINIMUM SIZE FACILITY Capacity	Net sq.m.	Sub-Total Net sq.m.	MEDIUM SIZE FACILITY Capacity	Net sq.m.	Sub-Total Net sq.m.	LARGE SIZE FACILITY Capacity	Net sq.m.	Sub-Total Net sq.m.
ACTIVITY AREA											
Game Room					116			180			328
Billiard Tables	40	Net sq.m. per table	2	80		3	120		6	240	
Video Games	2	Net sq.m. per video game	18	36		24	48		36	72	
Pinball Machines	2	Net sq.m. per machine	0	0		6	12		8	16	
Vending Machines	2	Net sq.m. per machine	3	6	6	4	8	8	5	10	10
SUB-TOTAL ACTIVITY AREA					122			188			338
ACTIVITY SUPPORT											
Toilets (male and female)					36			48			60
Water Closets/Urinals	3	Net sq.m. per fixture	4	12		6	18		8	24	
Lavatories	3	Net sq.m. per fixture	4	12		6	18		8	24	
Handicap Toilets	6	Net sq.m. per toilet	2	12		2	12		2	12	
Administration					18			22			37
Control Desk/Sales	4	Net sq.m. per station	1	4		2	8		2	8	
Administrative Office	11	Net sq.m. per office	1	11		1	11		2	22	
Office Storage Area	30%	total Net sq.m. office		3			3			7	
SUB-TOTAL ACTIVITY SUPPORT					54			70			97
BUILDING SUPPORT					56			77			122
Entrance/Lobby/Circulation/ Housekeeping Supplies/Janitor's Closet Structure/Partitions	15-19%	total Net sq.m. for Activity Area and Activity Support		33			46			74	
Mechanical/Electrical/Communication Equipment Space	9-13%	total Net sq.m. for Activity Area and Activity Support		23			31			48	
TOTAL FACILITY ALLOWANCE (Gross sq.m.)					233			336			556



LAYOUT DIAGRAM - AMUSEMENT CENTER
Medium Size Facility

740 29 AREA/REGIONAL EXCHANGE ADMIN FACILITY (sq.m./SF)

This facility may be planned only when authorized by the Navy Resale System Office or CMC. This is space required for administrative functions supporting an area or regional exchange network. These requirements are over and above the allowances authorized for Code 740 03 (Exchange Central Administration) and will be calculated using Code 610 10 (Administrative Office) criteria.

740 30 EXCHANGE SERVICE AND AUTO REPAIR STATION (sq.m./SF)

This facility provides space for gasoline and oil sales, automotive parts and accessories sales, emergency service and automotive repair service. Under certain conditions, a service station may be supplemented by gasoline stations (see Code 740 31). Space allowances for service stations (as well as for gasoline stations, Code 740 31, and car wash facilities, Code 740 32) may be determined on the basis of either installation military strength or the number of authorized customer registered vehicles. The number of vehicles is the preferred basis for determination of space allowances and should be used whenever the vehicle count is available. Authorized space allowances may be increased by not more than 20 percent where one entrance to and one exit from a common interior driveway serves all repair bays. See Table 740-30 for space allowances. Protective canopies over pump islands may be provided without deduction from the allowance figure.

TABLE 740-30
Space Allowances for Exchange Service Stations

Military Strength - OR-	Authorized Customer Registered Vehicles	Gross Area: Gasoline & Service Stations sq.m.	Gross Area: Gasoline & Service Stations SF	Gross Area: Service Centers Additional Area sq.m.	Gross Area: Service Centers Additional Area SF
up to 500	up to 300	56	600	None	None
501 to 1,000	301 to 600	162	1,740	None	None
1,001 to 3,000	601 to 1,800	201	2,160	35	380
3,001 to 5,000	1,801 to 3,000	263	2,830	88	950
5,001 to 7,000	3,001 to 4,300	302	3,250	106	1,140
7,001 to 10,000	4,301 to 6,100	385	4,140	195	2,100
10,001 to 15,000	6,101 to 9,100	424	4,560	399	4,300
15,001 to 20,000	9,101 to 12,200	604	6,500	428	4,610
over 20,000	over 12,200	906	9,750	446	4,800

740 31 EXCHANGE SUPPLEMENTAL GASOLINE STATION (sq.m./SF)

In addition to service stations (Code 740 30), supplemental gasoline stations may be provided at installations having military strength over 3,000 or number of vehicles over 1,800 if any one of the following conditions exist: (1) the station layout is such that a single main station cannot properly satisfy the needs of the customer, or (2) additional pumping capacity is required but the existing service station site is so confined as to make expansion impractical. Each station is authorized a building, not exceeding 56 sq.m. (600 SF), for sales of basic automotive supplies. Gasoline stations provide no repair service. See Table 740-31 for number of stations authorized.

TABLE 740-31
Space Allowances for Exchange Gasoline Stations

Military Strength - OR -	Authorized Customer Registered Vehicles	Number of stations (1)
3,000 to 7,000	1,800 to 4,300	1
7,001 to 15,000	4,301 to 9,100	2
Over 15,000	over 9,100	3

(1)Each station is authorized one 56 sq.m. (600 SF) sales building.

740 32 EXCHANGE CUSTOMER OPERATED CAR WASH (sq.m./SF)

See Table 740-32 for number of authorized wash bays and total gross area of car wash.

TABLE 740-32
Space Allowances for Exchange Car Wash Facilities

Military Strength - OR -	Authorized Customer Registered Vehicles	Number of Wash Bays	**Gross Area** Building sq.m.	SF
800 to 3,000	500 to 1,800	1	67	720
3,001 to 5,000	1,801 to 3,000	2	110	1,180
5,001 to 7,000	3,001 to 4,000	3	152	1,640
7,001 to 10,000	4,001 to 6,000	4	195	2,100
10,001 to 15,000	6,001 to 9,000	5	238	2,560
15,001 to 20,000	9,001 to 12,000	6	281	3,020
over 20,000	over 12,000	7	323	3,480

740 34 THRIFT SHOP (sq.m./SF)

This is a nonprofit facility for the sale and purchase by military personnel of used apparel, furnishings and equipment See Table 740 34A for space allowances.

TABLE 740-34A
Space Allowances for Thrift Shops

Military Strength	**Gross Area** sq.m.	SF
up to 2,000	130	1,400
2,001 to 4,000	186	2,000
4,001 to 6,000	251	2,700
6,001 to 8,000	316	3,400
8,001 to 10,000	372	4,000
10,001 to 12,000	418	4,500
12,001 to 14,000	460	4,950
over 14,000	497	5,350

Environmental Adjustment Factors (EAF). The EAF's for thrift shops are to be applied only at installations with a military strength greater than 2,000. The EAF's are based on available on-installation housing and are given in Table 740-34B.

TABLE 740-34B
EAF's for Thrift Shops

Percentage of User Living on Installation (1)	**EAF**
0 - 51	0.70
52 - 75	0.80
76 - 90	0.95
91 - 100	1.00

(1) Estimate from Unaccompanied Personnel and Family Housing Survey.

740 35 HOBBY SHOP - AMATEUR RADIO (sq.m./SF)

There are no criteria for amateur radio hobby shops. Justification must be made on an individual basis.

740 36 HOBBY SHOP - CRAFTECH (sq.m./SF)

Space allowances are given in Table 740-36.

Environmental Adjustment Factors. For general planning purposes, the maximum authorized space allowance is 66% of the value obtained from Table 740-36. Any requirements above this must be justified by historical utilization data.

TABLE 740-36
Space Allowances for Arts and Crafts Hobby Shops

Military Population (1)	**Gross Area** sq.m.	SF	Military Population (1)	**Gross Area** sq.m.	SF
Up to 100	(2)	(2)	20,001 to 25,000	2,790	30,000
101 to 250	186	2,000	25,001 to 30,000	3,250	35,000
251 to 1,000	279	3,000	30,001 to 40,000	3,720	40,000
1,001 to 3,000	372	4,000	40,001 to 50,000	4,180	45,000
3,001 to 5,000	557	4,000	50,001 to 60,000	4,650	50,000
5,001 to 7,000	697	7,500	60,001 to 70,000	5,110	55,000
7,001 to 10,000	1,300	14,000	70,001 to 80,000	5,570	60,000
10,001 to 15,000	1,860	20,000	80,001 to 90,000	6,040	65,000
15,001 to 20,000	2,320	25,000	90,001 to 100,000	6,500	70,000

(1) Military population consists of active duty military personnel plus 70% of dependent population.
(2) Accommodate in Code 740 54 facilities (Recreation Center for small activities).

740 37 MWR EQUIPMENT RENTAL CENTER (sq.m./SF)

This facility provides storage/issue space for MWR recreation equipment and athletic gear.

TABLE 740-37
Space Allowances for
MWR Equipment Rental Center

Military Population (1)	Gross Area (2) sq.m.	SF
up to 1,000	325	3,500
1,001 to 2,000	465	5,000
2,001 to 4,000	697	7,500
4,001 to 8,000	929	10,000
8,001 to 12,000	1,160	12,500
12,001 to 20,000	1,490	16,000
20,001 to 50,000	1,900	20,500
50,001 to 100,000	2,790	30,000

(1) Military population consists of military strength plus 25% of dependent population.

(2) This allowance provides space for recreational and athletic equipment issue and storage. For administrative personnel provide an additional 7 sq.m. (80 SF) per employee.

Environmental Adjustment Factors. For general planning purposes, the maximum authorized space allowance is 75% of the value obtained from Table 740-37. Any requirements above this must be justified by historical utilization data.

740 38 HOBBY SHOP - AUTOMOTIVE (sq.m./SF)

Project Review: Base MWR representatives, EFD, NAVFAC HQ, BUPERS (Pers-656D)
Design Criteria *(Military Handbook is not currently available)*

1. GENERAL. See General Notes to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. DEFINITION. The mission of Automotive Hobby Shops is to provide their customers with a quality, value-based program for the maintenance, repair, modification and improvement of their own vehicles including cars, trucks, trailers, motorcycles, and bicycles. Automotive Hobby Shops are not full-service stations, but rather facilities where patron self-help is fostered and automotive skills are learned. Such facilities may also provide space for instructional programs, club meetings, administration, tool issuance, storage and parts sales.

3. RELATED FACILITIES. Automotive Hobby Shops may be collocated with complementary facilities such as self-service carwashes (Category Code 740 32) or other compatible MWR facilities such as Arts and Crafts Hobby Shop (Category Code 740 36). Such collocations will have the advantage of drawing more patrons to a single location offering a wider assortment of services.

4. AUTO BAY DEMAND. The primary functional component of an Automotive Hobby Shop are Auto Bays which are sized on the basis of the peak hour demand at each installation, as follows:

   a) Use projected base loading data to determine the population for each significant population category, as listed in Table 740 38A.

   b) Calculate peak hour demand for Auto Bays by multiplying the population for each category by participation factors found in Table 740 38A. Add the demand for all population categories to derive peak hour Total Demand for Auto Bays.

   c) Apply the installation mission adjustment factor (divide by 2) for those bases with large numbers of personnel in training schools or on routine deployment.

   d) Determine the number of indoor or outdoor Auto Bays required to satisfy peak hour demand by dividing the Total Demand by the following capacities per bay per hour and rounding to the nearest whole unit:

      - 1.5 users per indoor bay per hour

      - 1.0 user per outdoor bay per hour

      The split between indoor verses outdoor Auto Bays may be determined at the discretion of the local command. Facility planning considerations based on climatic factors are discussed below under section 4, Space Allowances.

Notes for Demand Calculation - Table 740 38A:

(1) Population numbers should be consistent with projected base loading data. Officers are O-1 through O-10 and enlisted are E-l through E9. Civilians are authorized DoD employees. Retirees are all military retirees within a 30-minute drive of the installation.

For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all the non-deployable population, plus two-thirds of the deployable population, to reflect time away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations.

(2) Use of facilities by spouses and dependents has been statistically incorporated in the participation factors used in the tables. These participation factors may be revised periodically by NAVFAC HQ and BUPERS, and the most current figures must be used in all demand calculations.

(3) **Installation Mission Adjustment Factor**

A factor that influences the use of an Automotive Hobby Shop is the type of installation and it's particular mission. For example, Naval Stations have significant numbers of active-duty personnel routinely deployed, thereby losing potential patronage. Statistics show that even though the automobiles of active-duty personnel are routinely used by spouses and dependents during times of deployment, the auto hobby facilities are seldom used by these population groups. Likewise, Naval installations which have a large percentage of their residents in training schools, with demanding study schedules, suffer declines in the use of Automotive Hobby Shops since those residents have fewer personally-owned vehicles and/or less leisure time. Therefore, if an installation has a large number of personnel in schools or on routine deployment -- greater than 50 percent of the active-duty population -- the total demand calculation derived in the steps indicated below in Table 740 38A should be adjusted by dividing by 2.

(4) **The number of Indoor versus Outdoor Auto Bays may be determined by the local Command. If Outdoor Auto Bays art provided, they will substitute for Indoor Auto Rays at the rate of 3 Outdoor Bays for every 2 Indoor Bays.**

TABLE 740 38A
AUTO BAY DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1), (2)	Enlisted	.....	x	.0034	=	.....	users
(1), (2)	Officers	.....	x	.0022	=	+	users
(1), (2)	Retirees	.....	x	.0004	=	+	users
(1), (2)	Authorized Civilians	.....	x	.0006	=	+	users
		Total Demand (round to the nearest whole unit)			=	.....	users
(3)		Divide by installation mission adjustment (for installations with more than 50 percent of their active-duty personnel in training schools or on routine deployment)				divide by 2.0	
		Adjusted Total Demand (round to the nearest whole unit)			=	.....	users
(4)		To calculate the number of Indoor Auto Bays divide by the capacity per auto bay				divide by 1.5	
		Total number of Indoor Auto Bays required to satisfy peak demand (round to the nearest even numbered whole unit)			=	.....	bays
(4)		LOCAL OPTION: If Outdoor Auto Bays are locally desired, substitute 3 Outdoor Bays for every 2 Indoor Bays					

4. **SPACE ALLOWANCE.** The maximum space allowance for an Automotive Hobby Shop is determined according to the sizing criteria presented in Table 740 38B.

In warm climates, many auto crafts activities can be performed outdoors or under canopies. Outdoor Auto Bays may, therefore, be used to increase the total work space allowed for an auto hobby shop located in a warm climate. Such covered outdoor spaces, however, should be properly shielded from climatic conditions such as wind-driven rain or dust and sand.

Conversely, in very cold climates, care should be exercised with designs which are drafty, uncomfortable and difficult to heat because of the large number of vehicular openings. The number of vehicular openings may be minimized be adopting a layout more common in commercial garages, with interior circulation to auto bays. However, a facility with a limited number of vehicular entrances will require more interior apace for maneuvering cars. In such circumstances, an economic analysis of the options is recommended. This analysis should balance the additional cost of constructing extra space for internal vehicular circulation against the reduced operating cost, the possible savings in perimeter walls, and the improved comfort and, therefore, potentially greater use by customers.

Full compliance with all applicable local, state, and federal environmental regulations is required in the planning and development of Automotive Hobby Shops at all Naval Installations. All facilities which have the potential far causing environmental contamination, such as, hydraulic lifts, oil tanks, drains, etc. must be appropriately designed with adequate safeguards. Furthermore, to avoid problems related to the safety of patrons and staff, provision of paint booths is not recommended.

TABLE 740 38B
SPACE ALLOWANCE FOR AUTO HOBBY SHOP

Note	Table	Functional Component	# Units	X	Space Allocation Factor	=	Total Net Area	Min. or Max. Net Area sq.m.(SF)
		ACTIVITY AREAS						
(1)	740 38A	Auto Stalls/Bays	.....	X	28 sq.m.(300 NSF) per bay	=	+	
		Machine Shop Workbenches (@ one bench per bay)	.....	X	6 sq.m.(65 NSF) per bench	=	+	
		Welding Area			25% total Net Area for workbenches	=	+	
		Engine Cages (@ one cage per bay)	.....	X	4 sq.m.(40 NSF) per cage	=	.....	
		Resale/Tool Issue		X	3 sq.m.(30 NSF) per bay	=	+	
		Classroom Teaching Area	.....	X	1 sq.m.(15 NSF) per seat	=	+	21(225)min 42(450)max
		Storage Area		X	25% total Net Area for classroom	=	+	
		Subtotal Activity Areas (Net Area)				=		
		ACTIVITY SUPPORT Customer Lounge			15% total Net Area workbenches	=	.....	4(40)min.
		Patron Support (including lockers, toilets, vending machines)			7-14% X subtotal Activity Areas	=	+	28(300)min.
		Administration			12-16% X subtotal Activity Areas	=	+	26(285)min.
		Subtotal Activity Support (Net Area)				=	.....	
		BUILDING SUPPORT Entrance/Lobby/Circulation/ Housekeeping Supplies/Janitor's Closet/ Structure/Partitions			13-17% X subtotal Activity Areas + subtotal Activity Support Areas	=	.....	
		Mechanical/Electrical/Communication Equipment Space			9-13% X subtotal Activity Areas + subtotal Activity Support Areas	=	.....	
		TOTAL FACILITY ALLOWANCE (Gross Area)				=	.....	

Notes for Space Allowance - Table 740 38B:

(1) 28 net sq.m. (300 NSF) per auto bay is an average figure. Actual bay sizes may vary, ranging from typically 27 net sq.m. (288 NSF) for muffler/tire/lubrication bays to 31 net sq.m. (336 NSF) for general repair/bodywork/steam cleaning bays.

sq.m.= square meter
NSF = Net Squre Feet
GSF = Gross Square Feet
Minimum or Maximum NSF = Minimum or maximum space allowance to be provided for the particular function or activity.

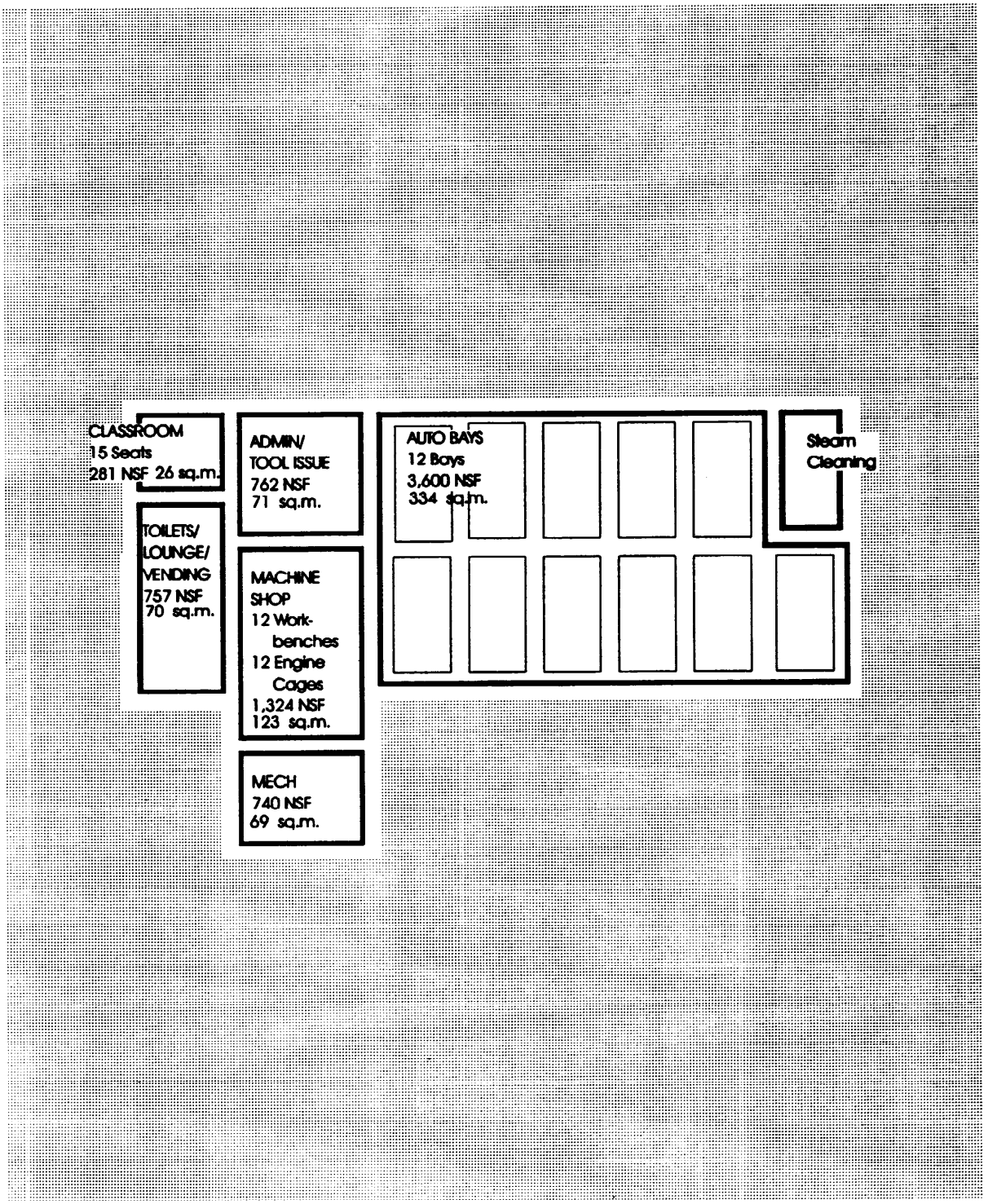
5. ILLUSTRATIVE SPACE PROGRAMS. Five space programs for extra-small, small, medium, large and extra-large Automotive Hobby Shops are presented to illustrate possible breakdowns of the overall space allowances into their primary functional components, with their respective sizes and capacities. These space programs are for illustrative purposes only.

6. SAMPLE LAYOUT DIAGRAM. A layout diagram is presented for a medium size Automotive Hobby Shop. This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram is for illustrative purposes only.

AUTOMOTIVE HOBBY SHOP (Category Code 740 38)

Sample Space Programs

Functional Component / Sub-Component	Space Allocation Standard		EXTRA-SMALL SIZE Capacity	Net sq.m.	Sub-Total Net sq.m.	SMALL SIZE Capacity	Net sq.m.	Sub-Total Net sq.m.	MEDIUM SIZE Capacity	Net sq.m.	Sub-Total Net sq.m.	LARGE SIZE Capacity	Net sq.m.	Sub-Total Net sq.m.	EXTRA LARGE SIZE Capacity	Net sq.m.	Sub-Total Net sq.m.
ACTIVITY AREA																	
Auto Stalls/Bays					56			112			336			672			840
General Repair & Tune-ups	28	Net sq.m. per stall	1	28		2	56		4	112		8	224		9	252	
Muffler & Tire Shop	28	Net sq.m. per stall	0	0		0	0		2	56		4	112		5	140	
Lubrication	28	Net sq.m. per stall	1	28		1	28		3	84		6	168		8	224	
Bodywork	28	Net sq.m. per stall	0	0		0	0		2	56		4	112		5	140	
Steam Cleaning	28	Net sq.m. per stall	0	0		1	28		1	28		2	56		3	84	
Machine Shop					23			46			138			276			345
Workbenches	6	Net sq.m. per bench	2	12		4	24		12	72		24	144		30	180	
Welding Area	25%	total Net sq.m. for workbenches		3			6			18			36			45	
Engine Cages	4	Net sq.m. per cage	2	8		4	16		12	48		24	96		30	120	
Tool Issue/Resale	3	Net sq.m. per bay	2	6	6	4	12	12	12	36	36	24	72	72	30	90	90
Classroom					0			19			19			38			38
Teaching Area	1	Net Area per seat	0	0		15	15		15	15		30	30		30	30	
Storage Area	25%	total Net Area for classroom		0			4			4			8			8	
SUB-TOTAL ACTIVITY AREA (Net SF)					85			189			319			1,058			1,313
ACTIVITY SUPPORT																	
Customer Lounge	15%	total Net sq.m. workbenches		2	2		4	4		11	11		22	22		27	27
Toilets (male and female)					28			28			60			80			80
Water closets/Urinals	3	Net sq.m. per fixture	0	0		0	0		4	12		6	18		6	18	
Lavatories	3	Net sq.m. per fixture	0	0		0	0		4	12		6	18		6	18	
Handicap Toilets	6	Net sq.m. per toilet	2	12		2	12		2	12		2	12		2	12	
Lockers (male and female)	2	Net sq.m. per person	8	16		8	16		12	24		16	32		16	32	
Vending Machines	2	Net sq.m. per machine	1	2	2	1	2	2	2	4	4	3	6	6	4	8	8
Administration					21			21			37			41			55
Control Desk	4	Net sq.m. per station	1	4		1	4		2	8		3	12		3	12	
Administrative Office	11	Net sq.m. per office	1	11		1	11		2	22		2	22		3	33	
Office Storage Area	30%	total Net sq.m. office		6			6			7			7			10	
SUB-TOTAL ACTIVITY SUPPORT (Net SF)					53			55			111			148			170
BUILDING SUPPORT																	
Entrance/Lobby/Circulation/ Housekeeping Supplies/Janitor's Closet/ Structure/Partitions	13-17%	total Net sq.m. for Activity Area and Activity Support		23	23		39	39		96	96		169	169		193	193
Mechanical/Electrical/Communication Equipment Space	9-13%	total Net sq.m. for Activity Area and Activity Support		18	18		29	29		70	70		121	121		133	133
TOTAL SPACE ALLOWANCE (Gross sq.m.)					179			311			807			1,495			1,809
Total Number of Bays					2			4			12			24			30
Total Gross sq.m. per Bay					90			78			67			62			60
Gross sq.m. per Bay (not incl. Mech. Space)					81			71			61			57			56



LAYOUT DIAGRAM - AUTOMOTIVE HOBBY SHOP
Medium Site Facility

740 39 ENTERTAINMENT WORKSHOP (SF)

This is a facility for the preparation and rehearsal of theatrical and musical entertainment programs, associated property storage and an office. See Table 740-39 for space allowances.

TABLE 740-39
Space Allowances for
Entertainment workshops

Military Strength	**Gross Area**	
	sq.m.	SF
Up to 850	325	3,500
3,001 to 5,000	836	9,000
5,001 to 15,000	1,300	14,000
Over 15,000	1,860	20,000

Environmental Adjustment Factors. Planning of entertainment workshops is authorized only in cases where complete justification can be provided. It must contain data such as historical participation or utilization figures and rationale for not using a theater stage, auditorium or other large gathering place if available on an installation.

740 40 BOWLING CENTER (SQ.M./SF)

Project Review: EFD, NAVFAC HQ, BUPERS (Pers-656D)
Commandant of the Marine Corps (CMC) code LFL
Design Criteria: *(Military Handbook is not currently available)*

1. **GENERAL.** See General Notes to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** Bowling Centers are recreational facilities which accommodate bowling and related functions, which may include: open bowling, leagues, tournaments, youth bowling, instruction, exhibitions, and support activities such as equipment sales and rental, food and beverage service, electronic and table games, and meetings.

3. **RELATED FACILITIES.** Consideration should be given to collocating the Bowling Center with the following recreational facilities in order to (i) take advantage of potential savings in space requirements and operating costs, and (ii) provide users with the increased convenience of clustered facilities:
   - 740 28 Amusement Center
   - MWR recreational and foodservice facilities, generally.

4. **BOWLING DEMAND.** The number of bowling lanes required in a Bowling Center is based on the usage demand at each installation, as follows:

   a) Use projected base loading data to determine the population for each significant population category, as listed in Table 740 40A.

   b) Calculate the annual bowling linage demand by multiplying the population for each category by participation factors drawn from the installation's most recent Smart Compass Leisure Needs Assessment data, and by adjustment factors as indicated in Table 740 40A. If Leisure Needs Assessment data is not available or not statistically valid, Navy-wide bowling percentages (available from BUPERS) should be used,

   c) Find the number of lanes required to accommodate the bowling linage demand in Table 740 40B. These allowances are based on the minimum number of lines required to generate sufficient revenues to meet standard operating expenses.

   d) Calculate the capacity requirements for foodservice and games components by multiplying the numbers of bowling lanes and of projected non-bowling patrons by the usage factors in Tables 740 40C through 40G. See Section 5, below, for explanation of these Tables.

   e) Multiply the number of units required for each functional component by the space allocation factors in Table 740 40. Add the net square area for all components and add support area factors as directed in Table 740 40, to derive the Total Facility Allowance.

   * For **Marine Corps Installations** use historical patron data to determine the participation factor.

TABLE 740 40A
BOWLING LINAGE DEMAND CALCULATION

Note	Population Category	Population (per base loading)	x	Participation Factor	x	Adjustment Factor			Lines Bowled per Year
(1),(2),(3)	Officers	.....	x	.....%	x	111	=		.....
(1),(2),(3)	Enlisted	.....	x	.....%	x	17	=	+	.....
(1),(2),(3)	Retirees	.....	x	.....%	x	31	=	+	.....
						Total Lines Bowled per Year	=	+	.....
(4)		Add linage for installations in locations with harsh or long winter						+	32,500
						Adjusted Total Linage Demand	=		.....

Notes for Bowling Linage Demand Calculation:

(1) Population numbers should be consistent with projected base loading data Officers are O-1 through O-10 and enlisted are E-l through E-9. Retirees are all military retirees within a 30-minute drive of the installation.

For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all of the non-deployable population, plus two-thirds of the deployable population, to reflect the away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations,

(2) Participation factors are to be taken from the installation's most recent Smart Compass Leisure Needs Assessment data. If Leisure Needs Assessment data is not available or not statistically valid, Navy-wide bowling percentages (available from BUPERS) should be used. Usage of facilities by spouses, dependents, and authorized civilians has been statistically incorporated in the participation factor. These participation factors may be revised periodically by NAVFAC HQ and BUPERS, and the most current figures must be used in all demand calculations. For Marine Corps Installations use historical patron data to determine the participation factor.

(3) Tbe adjustment factors modify linage demand to reflect differential usage patterns among the different user population catagories.

(4) Linage demand for installations in locations with harsh or long winters is adjusted by adding an extra 32,500 lines to the total number of lines bowled per year. This includes all installations located in the following states: Alaska, Colorado, Connecticut, Delaware, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming and the District of Columbia.

TABLE 740 40B
LANE ALLOWANCES FOR BOWLING CENTERS

Note	Lines Bowled per Year	Number of Lanes Authorized CONUS	Number of Lanes Authorized OCONUS
	Fewer than 10,000	0	0
(1)	10,000 - 18,000	2	2
(1)	18,001 - 36,000	4	4
(1)	36,001 - 54,000	6	6
(1)	54,001 - 69,120	8	8
(1)	69,121 - 86,400	10	10
(1)	86,401 - 107,640	12	12
	107,641 - 124,200	14	18
	124,201 - 140,760	16	20
	140,761 - 165,600	18	24
	165,601 - 231,840	24	32
	231,841 - 298,080	32	40
	298,081 - 364,320	40	50
	Each incremental increase of 17,280	additional 2	additional 2

Note for Bowling Lane Allowances:

(1) Bowling Centers with 12 lanes or fewer are generally considered uneconomic to operate. Centers of such size can only be approved in exceptional cases, with substantial justification of economic viability.

5. **DEMAND FOR FOODSERVICE AND GAMES.** The numbers of seats in the snack bar and lounge and the numbers of video games and pool/billiards tables required in the Bowling Center should represent the sum of the demand from both bowling patrons and other users - guests, spectators, and patrons primarily using the food service or games areas of the center. The size of the non-bowling clientele will depend on such local installation factors as the location of the facility, proximity of potential patron populations, competing food service and amusement center facilities, type and at&activeness of food service and games program operations, and historic usage patterns.

Demand for meeting/function room space must be based on other users than bowling patrons. The seat capacity requirement should be based on the type and size of specific functions for which there is a justifiable local demand.

Tables 740 40C through 40G provide usage factors for calculating the demand for the functional components in the foodservice and games areas.

Notes for Foodservice and Games Demand Calculation -Tables 740 40C through 40G:

(1) Use number of bowling lanes as derived in Table 740 40B.

(2) The projected number of non-bowling patrons for each functional component most be determined by the installation and justified based on analysis of specific local experience and requirements. In the absence of local installation data, assume that the numbers of seats required for non-bowling patrons in the foodservice areas, and the numbers of machines and tables for nun-bowling patrons in the games area, are equal to those calculated for the bowling patrons.

TABLE 740 40C
SNACK BAR DEMAND CALCULATION

Note	# Demand Units	x	Usage Factor	=	Peak Demand	
(1)	.....Bowling Lanes	x	.50 seats per lane	=	.....	seats
(2)	.....Non-Bowling Patrons per Peak Hour	x	.25 seat-hours per patron	=	+	seats
			Total Demand (round to the nearest whole unit)	=	.....	seats

TABLE 740 40D
LOUNGE DEMAND CALCULATION

Note	# Demand Units	x	Usage Factor	=	Peak Demand	
(1)	.....Bowling Lanes	x	.44 seats per lane	=	.....	seats
(2)	.....Non-Bowling Patrons per Peak Hour	x	.50 seat-hours per patron	=	+	seats
			Total Demand (round to the nearest whole unit)	=	.....	seats

TABLE 740 40E
COMBINED SNACK BAR/LOUNGE DEMAND CALCULATION

Note	# Demand Units	x	Usage Factor	=	Peak Demand	
(1)	.....Bowling Lanes	x	.72 seats per lane	=	.....	seats
(2)	.....Non-Bowling Patrons per Peak Hour	x	.33 seat-hours per patron	=	+	seats
			Total Demand (round to the nearest whole unit)	=	.....	seats

TABLE 740 40F
VIDEO GAMES DEMAND CALCULATION

Note	# Demand Units	x	Usage Factor	=	Peak Demand
(1) machines	.....Bowling Lanes	x	1.0 machines per lane	=	.....
(2) machines	.....Non-Bowling Patrons per Peak Hour	x	1.0 machine-hours per patron	=	+ .....
			Total Demand (round to the nearest whole unit) machines	=	.....

TABLE 740 40G
POOL/BILLIARDS DEMAND CALCULATION

Note	# Demand Units	x	Usage Factor	=	Peak Demand	
(1)	.....Bowling Lanes	x	.22 tables per lane	=	.....	tables
(2)	.....Non-Bowling Patrons per Peak Hour	x	.20 table-hours per patron	=	+	tables
			Total Demand (round to the nearest whole unit)	=	.....	tables

6. **SPACE ALLOWANCES.** Space allowances for Bowling Centers are determined according to the planning criteria presented in Table 740 40 below. The total allowance for a facility is the sum total of the space allowances for each functional component. The number of units of each component required to meet the demand is obtained from the calculations in Tables 740 40A through 740 40G.

TABLE 740 40
SPACE ALLOWANCES FOR BOWLING CENTERS

Note	Table	Functional Component	# Units	x	Space Allocation Factor	=	Total Net Area	Minimum or Maximum Net Area sq.m.(SF)
		ACTIVITY AREAS						
		Bowling						
	A,B	Bowling Lanes (incl. pinspotting, settee, promenade, lockers)	.....	x	60sq.m.(650 NSF) per lane	=	+	
	A,B	Workroom	.....	x	7sq.m.(70 NSF) per lane	=	+	11(120) min. 78(840) max.
		Food Service						
	C	Snack Bar (incl. seating, kitchen, serving counter, storage)	.....	x	3sq.m.(27 NSF) per seat	=	+	
	D	Lounge (incl. seating, bar, storage)	.....	x	2sq.m.(20 NSF) per seat	=	+	
(1)	E	Combined Snack Bar/Lounge (incl. seating, kitchen, serving counter, bar, storage)	.....	x	(2sq.m.25 NSF) per seat	=	+	
(2)		Meeting/Function Room	.....	x	1sq.m.(12 NSF) per seat	=	+	
		Games						
		Video Games	.....	x	3sq.m.(30 NSF) per machine	=	+	
		Pool/Billiards	.....	x	34sq.m.(370 NSF) per table	=	+	
					Subtotal Activity Areas	=	.....	
		ACTIVITY SUPPORT AREAS						
		Toilets			3% x Subtotal Activity Areas	=	+	
		Administration (incl. pro shop, control counter, storage)			3% x Subtotal Activity Areas	=	+	93(1,000) max.
					Subtotal Activity Support Areas	=	.....	
		BUILDING SUPPORT AREAS						
(3)		Lobby/Circulation/Structure/ Partitions/Janitor			4-5% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	+	
		Mechanical/Electrical/ Communication Equip. Space			5-10% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	+	
					TOTAL FACILITY ALLOWANCE	=	.....	Gross Area

Note for Space Allowance Table:

(1) Combined snack bar/lounge may be provided as an alternative to separate snack bar and lounge spaces.

(2) Meeting/function room seating capacity should be based on usage by other than bowling patrons. Usage projection must be justified by demand and economic operations analysis serving local function requirements.

(3) Lobby/circulation/structure/partitions/janitor area - use 5% factor for centers of 24 lanes or less; 4% for 26 lanes or more.

sq.m. = square meter

NSF = Net Square Feet

GSF = Gross Square Feet

Minimum or Maximum NSF = Minimum or maximum space allowance to be provided for the particular function or activity.

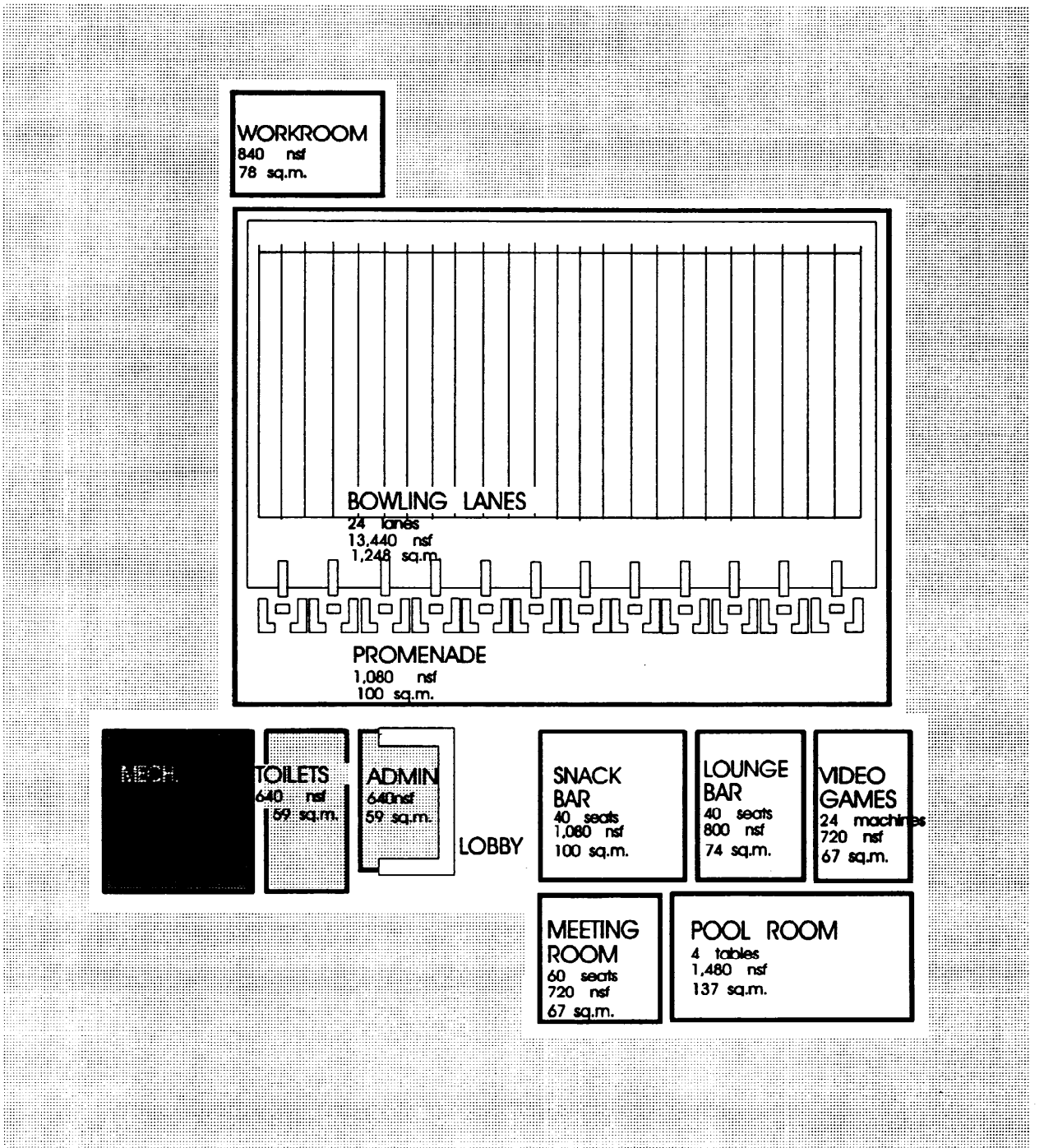
6. **ILLUSTRATIVE SPACE PROGRAMS.** Three space programs for small, medium and large Bowling Centers are presented to illustrate the application of the space allocation factors, and the range of spaces and capacities which may be included in a facility. The space programs are for illustrative purposes only.

7. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a medium-size Bowling Center. This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram is for illustrative purposes only.

BOWLING CENTER (Category Code 740 40)

Sample Space Programs

Functional Components/ Sub-Components	*Facility Size -- SMALL* Capacity	Net sq.m.	Total Area Net sq.m.	*Facility Size -- MIDDLE* Capacity	Net sq.m.	Total Area Net sq.m.	*Facility Size -- LARGE* Capacity	Net sq.m.	Total Area Net sq.m.
ACTIVITY AREAS									
BOWLING									
Bowling Lane (including lane, pinspotting, settee, service aisle)	12	624		24	1,250		32	1,660	
Workroom		78			78			78	
Promenade (including spectator seating, lockers)	12	100		24	200		32	267	
FOODSERVICE									
Snack Bar (including seating, serving counter, kitchen, storage)	20	50		40	100		60	151	
Lounge Bar (including seating, bar, storage)	20	37		40	74		60	111	
Function/Meeting Room				60	67		90	100	
GAMES									
Video Games Area	12	33		24	67		32	89	
Pool Room	2	69		4	137		6	206	
Subtotal Activity Areas			991			1,973			2,662
ACTIVITY SUPPORT AREAS									
Toilets		30			59			80	
Administration (including offices, pro shop, storage, control counter)		30			59			80	
Subtotal Activity Support Areas			60			118			160
BUILDING SUPPORT AREAS									
Lobby/Circulation/Structure/ Partitions/Janitor's Closet		53			105			141	
Mechanical/Electrical/ Communication Equip. Space		105			157			170	
Sutotal Building Support Areas			158			262			311
TOTAL GROSS AREA (sq.m.)			1,209			2,353			3,133
Total Gross Area per lane (sq.m.)	12		101	24		98	32		98



BOWLING CENTER - Medium Capacity

740 42 Fleet Recreation Center (sq.m./SF)

Project Review: Base MWR representatives, EFD, NAVFAC HQ, BUPERS (Pers-656D)
Design Criteria: (Military Handbook is not currently available)

1. **GENERAL.** See General Notes to 740 series category codes for general instructions regarding facility allowance planning procedures.

2. **DEFINITION.** The primary customer for the Fleet Recreation Center is the ship-based sailor (mostly E1-E6.). The mission of a Fleet Rec. Center is to support fleet readiness and enhance the morale of sailors through a professionally staffed, customer-oriented recreation program that serves the leisure needs of Fleet sailors. A typical Fleet Rec. Center is located within convenient walking distance (5-10 minutes) of the piers where Navy vessels are berthed, and serves the recreational needs of personnel. Activities accommodated in Fleet Rec. Centers include sports, parties, contests, intraship competitions, and other programs structured to meet the special needs of Fleet sailors. Some basic services such as snack bars, laundromats and telephone banks (individual telephone booths with seats, supervised by a cashier/control desk, and limited space for waiting) may be inched in a Fleet Rec. Center.

   The decision to provide one large size facility or divide the space allowance among several smaller facilities conveniently distributed along the length of the waterfront pier area, is at the discretion of the local Command

   Each location where a Navy fleet is based should be individually analyzed to understand its specific situation, and determine the mix of Fleet Rec. Center functions most appropriate to meet local needs. The space allowance should be based on the development of a justifiable program of functions, capacities and sizes, comparable to the Sample Space Programs contained in this criteria section.

3. **RELATED FACILITIES.** Consideration should be given to collocating Fleet Rec. Centers with related facilities in order to (i) take advantage of potential savings in space requirements and operating costs, and (ii) provide users with the increased convenience of a clustered recreation complex. These related facilities include

   - 740 40 Bowling Center
   - 740 43 Gymnasium
   - 740 45 Fitness Center
   - 740 53 Swimming Pool
   - Foodservice facilities such as Clubs
   - Other MWR indoor and outdoor recreational facilities.

4. **SPACE ALLOWANCE.** The maximum facility allowance for Fleet Rec. Centers is according to sizing criteria presented in Table 740 42A. The maximum gross area indicated in the table is the maximum total allowance per base, and may be used for a single large complex or multiple facilities.

TABLE 740 42A
SPACE ALLOWANCE FOR FLEET RECREATION CENTERS

Ship-based Population (rounded to the nearest thousand)	Max. Gross Area (total allowance per base) sq.m.	SF	Note
less than 2,000	0	0	(1), (2), (3)
3,000 to 5,000	465	5,000	(2), (3)
6,000 to 15,000	1,440	15,500	(2), (3)
16,000 and over	2,880	31,000	(2), (3), (4)

Notes for Table 740 42:

(1) For installations with a ship-based population of 2,000 or less, the base Gymnasium, Bowling Center and other MWR facilities may serve the fleet sailor's recreational needs in lieu of a Fleet Recreation Center.

(2) Population numbers should be consistent with projected base loading data. For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all the non-deployable population, plus two-thirds of the deployable population, to reflect time away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations.

(3) Round-off population up or down to the nearest thousand.

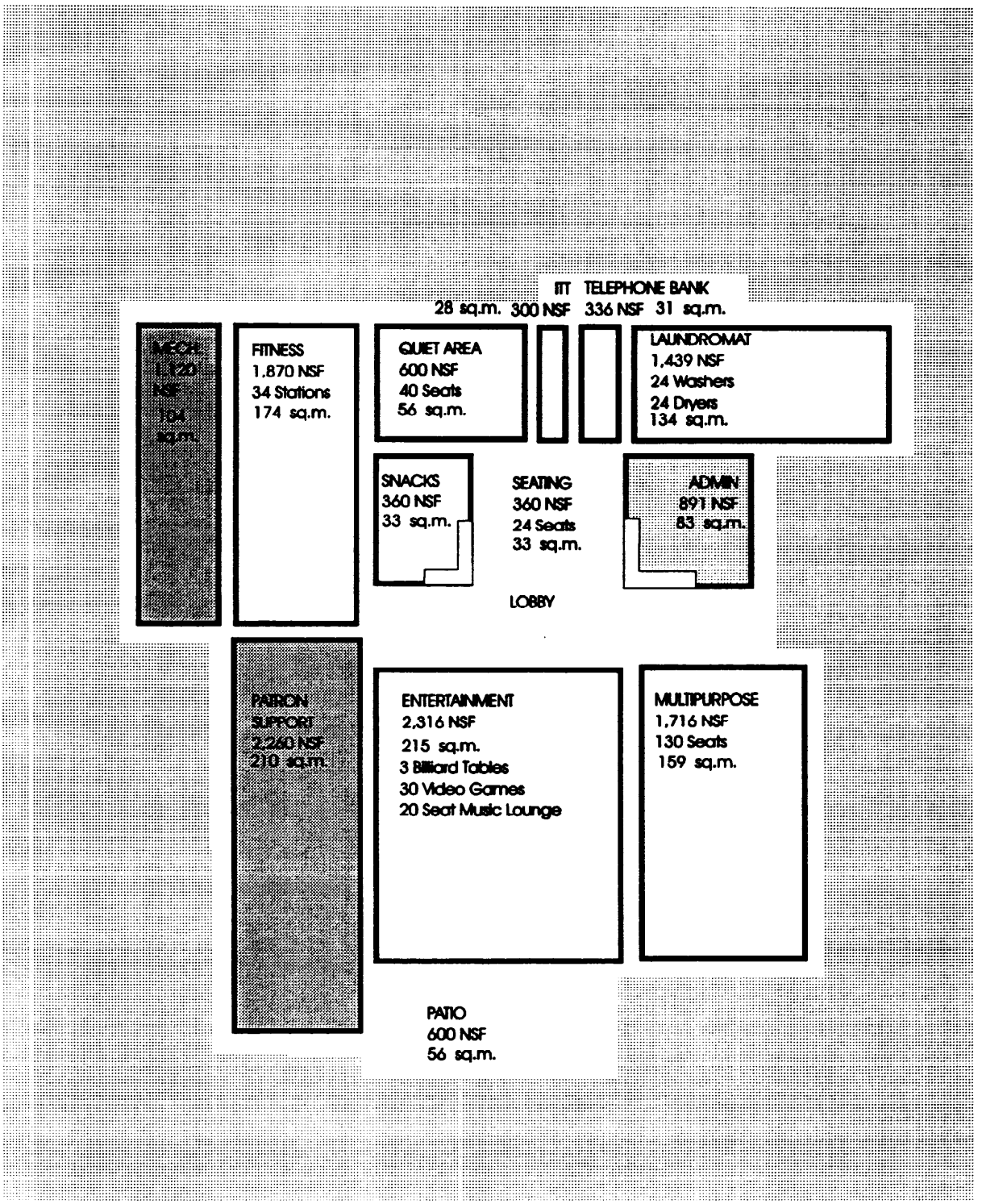
(4) For extra-large installations, the space allowance should be split up into a minimum of two facilities at separate sites conveniently located within proximity to shipbased population concentrations.

5. **ILLUSTRATIVE SPACE PROGRAMS.** Three space programs for small, medium and large Fleet Recreation Centers are presented to illustrate possible breakdowns of the overall space allowances into their primary functional components, with their respective sizes and capacities. These space programs are for illustrative purposes only.

6. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a large size Fleet Recreation Center. This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram is for illustrative purposes only.

Sample Space Programs

Functional Component / Sub Component	Space Allocation Standard		SMALL SIZE FACILITY Capacity	Net sq.m.	Total Net	MEDIUM SIZE FACILITY Capacity	Net sq.m.	Total Net	LARGE SIZE FACILITY Capacity	Net sq.m.	Total Net
ACTIVITY AREA					sq.m.			sq.m.			sq.m.
Fitness Area					0			132			187
Cardiovascular Training Area	5	Net sq.m. per station	0	0		3	15		6	30	
Circuit Training Area	5	Net sq.m. per station	0	0		6	30		10	50	
Free-weight Training Area	5	Net sq.m. per station	0	0		3	15		6	30	
Exercise Area	5	Net sq.m. per station	0	0		12	60		12	60	
Equipment Storage	10%	Net sq.m. per station		0			12			17	
Supervisor Station	9	Net sq.m. per station	0	0		0	0		0	0	
Multipurpose Area					0			72			143
Function Room	1	per seat	0	0		65	65		130	130	
Furniture Storage Area	10%	Net sq.m. function room		0			7			13	
Entertainment Area					126			143			200
Game Room											
Billiard Tables	40	Net sq.m. per table	2	80		2	80		3	120	
Video Games	2	Net sq.m. per game	18	36		24	48		30	60	
Music Lounge	1	Net sq.m. per seat	10	10		15	15		20	20	
Quiet Area					20			30			40
Reading Room	1	Net sq.m. per seat	10	10		15	15		20	20	
Computer Room	1	Net sq.m. per terminal	10	10		15	15		20	20	
Snack Bar					0			32			48
Seating Area	1	Net sq.m. per seat	0	0		16	16		24	24	
Food Preparation/Serving Area	100%	Net sq.m. seating area		0			16			24	
Satellite ITT Office	28	Net sq.m. per agent	0	0	0	0	0	0	1	28	28
Telephone Bank					14			21			28
Payphones	1	Net sq.m. per payphone	12	12		18	18		24	24	
Bill Changing	1	Net sq.m. per machine	2	2		3	3		4	4	
Laundromat					68			105			142
Washers	2	Net sq.m. per machine	12	24		18	36		24	48	
Dryers	2	Net sq.m. per machine	12	24		18	36		24	48	
Folding Tables	3	Net sq.m. per table	6	18		10	30		14	42	
Bill Changing	1	Net sq.m. per machine	2	2		3	3		4	4	
		SUB-TOTAL ACTIVITY AREA			228			535			816
ACTIVITY SUPPORT											
Toilets (male and female)					48			124			218
Water Closets/Urinals	3	Net sq.m. per fixture	6	18		8	24		10	30	
Lavatories	3	Net sq.m. per fixture	6	18		8	24		10	30	
Handicap Toilets	6	Net sq.m. per toilet	2	12		2	12		4	24	
Showers (male and female)	3	Net sq.m. per shower	0	0		8	24		12	36	
Lockers (male and female)	2	Net sq.m. per person	0	0		20	40		40	80	
Sauna (male and female)	9	Net sq.m. per sauna	0	0		0	0		2	18	
Administration					27			54			81
Control Desk/Sales	4	Net sq.m. per station	1	4		2	8		3	12	
Administrative Office	11	Net sq.m. per office	1	11		2	22		3	33	
Gear Issue	60%	total Net sq.m. Admin. Office		7			13			20	
Office Storage Area	50%	total Net sq.m. Admin. Office		6			11			17	
		SUB-TOTAL ACTIVITY SUPPORT			75			178			299
BUILDING SUPPORT					94			200			268
Entrance/Lobby/Circulation/ Housekeeping Supplies/Janitor's Closet/ Structure/Partitions	15-18%	total Net sq.m. for Activity Area and Activity Support		55			121			167	
Mechanical/Electrical/Communication Equipment Space	9-13%	total Net sq.m. for Activity Area and Activity Support		39			78			100	
TOTAL GROSS AREA (sq.m.)					397			912			1,383
OUTDOOR AREA											
Patio	1	Net sq.m. per seat	40	40	40	40	40	40	40	40	40



LAYOUT DIAGRAM -- FLEET RECREATION CENTER
Large Size Facility

740 43 GYMNASIUM (SQ.M./SF)

Project Review: EFD, NAVFAC HQ, BUPERS (Pers-656D)
Commandant of the Marine Corps (CMC) code LFL
Design Criteria: (Military Handbook is currently under development)

1. **GENERAL.** See introduction to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** Gymnasiums provide facilities and support services to meet the individual physical fitness, coordination, skills development, recreation and training needs of military personnel. The facilities may also serve dependents, retirees and authorized civilians. Activities which may be accommodated in a Gymnasium include: aerobics, athletic gear issue, badminton, basketball, boxing, calisthenics, cardiovascular training gymnastics, handball, jogging, martial arts, physical fitness training, racquetball, volleyball, wallyball, weight-train& wrestling, etc.

3. **RELATED FACILITIES.** Consideration should be given to collocating the Gymnasium with the following recreational facilities in order to (i) take advantage of potential savings in space requirements and operating costs, and (ii) provide users with the increased convenience of clustered facilities:

- 740 45 Fitness Center
- 740 50 Field House
- 740 53 Indoor Swimming Pool
- 740 84 Indoor Playing Courts
- 750 10 Outdoor Playing Courts
- 750 20 Playing Fields
- 750 30 Outdoor Swimming Pool.

4. **DEMAND.** The primary functional components of a Gymnasium - Basketball Court, Aerobics/Exercise Am, Cardiovascular Training Area, Weight Training Area, and Indoor Playing Court - are sized on the basis of the peak hour usage demand for the specific component at each installation, as follows:

a) Use projected base loading data to determine the population for each significant population category, as listed in Tables 740 43A through 43E.

b) Calculate peak hour demand for each functional component by multiplying the population for each category by participation factors found in Tables 740 43A through 43E. Add the demand for all population categories to derive Total Demand for each functional component.

c) Calculate the number of component units required by dividing the Total Demand by the maximum capacity per hour per component unit, as indicated in Tables 740 43A, C, D and E. Subtract the number of component units available at other MWR facilities on the installation, to determine the number required in the Gymnasium.

d) Multiply the number of units required for each functional component by the space allocation factors in Table 740 43. Add the net area for all components and add support area factors as directed in Table 740 43, to derive the Total Facility Allowance.

* For **Marine Corps Installations** use historical patron data to determine the participation factor.

Notes for Demand Calculations - Tables 740 43A through 43E:

(1) Population numbers should be cosistent with projected base loading data. Officers are O-1 through O-10 and enlisted are El through E-9. Civilians are authorized DoD employees. Retirees are all military retirees. within a 30-minute drive of the installation.

For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all the non-deployable population, plus two-thirds of the deployable population, to reflect time away on deploymemt. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations.

(2) Usage of facilities by spouses and dependents has been statistically incorporated in the participation factors used in the tables, These participation factors may be revised periodically by NAVFAC HQ and BUPERS, and the most current figures must be used in all demand calculations.

(3) For small installations with active duty populations of 100 or above, the calculated total number of indoor basketball courts should be rounded up to yield a minimum of one indoor basketball court.

(4) To calculate user capacity for aerobics/exercise areas at other MWR facilities at the installation, divide the net square area by 50 to derive the number of users.

TABLE 740 43A
BASKETBALL COURT DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0077	=	.....	users
(1),(2)	Officers	.....	x	.0045	=	+	users
(1),(2)	Retirees	.....	x	.0001	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0020	=	+	users
				Total Demand	=	.....	users
	divide by maximum capacity per basketball court per hour					÷ 32	
(3)	Total Number of Basketball Courts (round to the nearest whole unit)				=	.....	courts

TABLE 740 43B
AEROBICS/EXERCISE AREA DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0016	=	.....	users
(1),(2)	Officers	.....	x	.0019	=	+	users
(1),(2)	Retirees	.....	x	.0002	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0009	=	+	users
	Total Participant Demand (round to the nearest whole unit)				=	.....	users
(4)	subtract user capacity available at other MWR facilities on the installation (for example, at the Fitness or Recreation Centers)					-	users
	Total Participant Capacity required in Gymnasium				=	.....	users

TABLE 740 43C
CARDIOVASCULAR TRAINING STATION DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0172	=	.....	users
(1),(2)	Officers	.....	x	.0128	=	+	users
(1),(2)	Retirees	.....	x	.0027	=	+	usérs
(1),(2)	Authorized Civilians	.....	x	.0033	=	+	users
				Total Demand	=	.....	users
				divide by maximum capacity per station per hour		÷ 6	
				Total Number of Stations (round to the nearest whole unit)	=	.....	stations
				subtract number of stations available at other MWR facilities on the installation (for example, at the Fitness or Recreation Centers)		-	stations
				Total Number of Stations required in Gymnasium	=	.....	stations

TABLE 740 43D
WEIGHT TRAINING STATION DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0146	=	.....	users
(1),(2)	Officers	.....	x	.0146	=	+	users
(1),(2)	Retirees	.....	x	.0015	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0024	=	+	users
				Total Demand	=	.....	users
				divide by maximum capacity per station per hour		÷ 6	
				Total Number of Stations (round to the nearest whole unit)	=	.....	stations
				subtract number of stations available at other MWR facilities on the installation (for example, at the Fitness or Recreation Centers)		-	stations
				Total Number of Stations required in Gymnasium	=	.....	stations

TABLE 740 43E
INDOOR PLAYING COURT DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0021	=	.....	users
(1),(2)	Officers	.....	x	.0020	=	+	users
(1),(2)	Retirees	.....	x	.0005	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0007	=	+	users
				Total Demand	=	.....	users
				divide by maximum capacity per court per hour		÷ 6	
				Total Number of Courts (round to the nearest whole unit)	=	.....	courts
				subtract number of courts available at other MWR facilities on the installation (for example, at the Fitness Center or Indoor Playing Courts Facility)		-	courts
				Total Number of Courts required in Gymnasium	=	.....	courts

5. **SPACE ALLOWANCES.** Space allowances for Gymnasium facilities are determined according to the planning criteria presented in Table 740 43 below. The total allowance for a facility is the sum total of the space allowances for each functional component. The number of units of each component required to meet the demand is obtained from the calculations in Tables 740 43A, 740 43B, 740 43C, 740 43D and 740 43E.

TABLE 740 43
SPACE ALLOWANCE FOR GYMNASIUM

Note	Table	Functional Component	# Units	x	Space Allocation Factor	=	Total Net Area	Minimum Net Area sq.m.(SF)
		ACTIVITY AREAS						
	A	Basketball Court	.....	x	743sq.m.(8,000 NSF) per court	=	+	
(1)		Spectator Seating	.....	x	1 sq.m.(4 NSF) per seat	=	+	74(800)
		Equipment Storage/ Gear Issue Area			5% x (Net Area Court + Spectator Seating)	=	+	19(200)
	B	Aerobics/Exercise Area	.....	x	5sq.m.(50 NSF) per participant	=	+	70(750)
	C	Cardiovascular Training Area	.....	x	5sq.m.(50 NSF) per station	=	+	19(200)
	D	Weight Training Area	.....	x	5sq.m.(50 NSF) per station	=	+	(46500)
(2)		Instructor Station	.....	x	9sq.m.(100 NSF) per station	=	+	
	E	Indoor Playing Court	.....	x	74sq.m.(800 NSF) per court	=	+	
(3)		Classroom/Meeting Room	.....	x	1sq.m.(15 NSF) per seat	=	+	28(300)
					Subtotal Activity Areas		.....	
		ACTIVITY SUPPORT AREAS						
		Patron Support (including lockers, showers, toilets, sauna, whirlpool)			12% x Subtotal Activity Areas	=	.....	
		Administration/Fitness Assessment/Sales/ Laundry/Storage/Support			(4% x Subtotal Activity Areas) + 100 Net Area	=	+	28(300)
					Subtotal Activity Support Areas	=	.....	
		BUILDING SUPPORT AREAS						
		Lobby/Circulation/Structure/ Partitions			15% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	.....	
		Mechanical/Electrical/ Communication Equip. Space			5-10% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	+	
					TOTAL FACILITY ALLOWANCE	=	.....	GrossArea

Notes for Space Allowance Table:

(1) Spectator seating (minimum capacity 200 for a small facility, maximum capacity 600 for a large facility) should be provided in the basketball court. The seating capacity should be justified by the use of the court for activities drawing significant numbers of spectators. Portable or telescopic bleachers may be used.

(2) Space for one Instructor Station should be included in each separate Weight Training Area.

Continued Next Page:

(3) Classroom space (minimum 28 net sq.m. (300 NSF)) for a small facility, maximum 209 net sq.m. (2,250 NSF) for a large facility) for instruction and meetings should be included in a Gymnasium. Room sizes should be based on the capacities most frequently needed, and may range as follows: small (15-20 persons); medium (30-45 persons); large (50-60 persons).

sq.m. = square meter

NSF = Net square Feet

GSF = Gross Square Feet

Minimum NSF = Minimum space allowance to be provided for the particular function or activity.

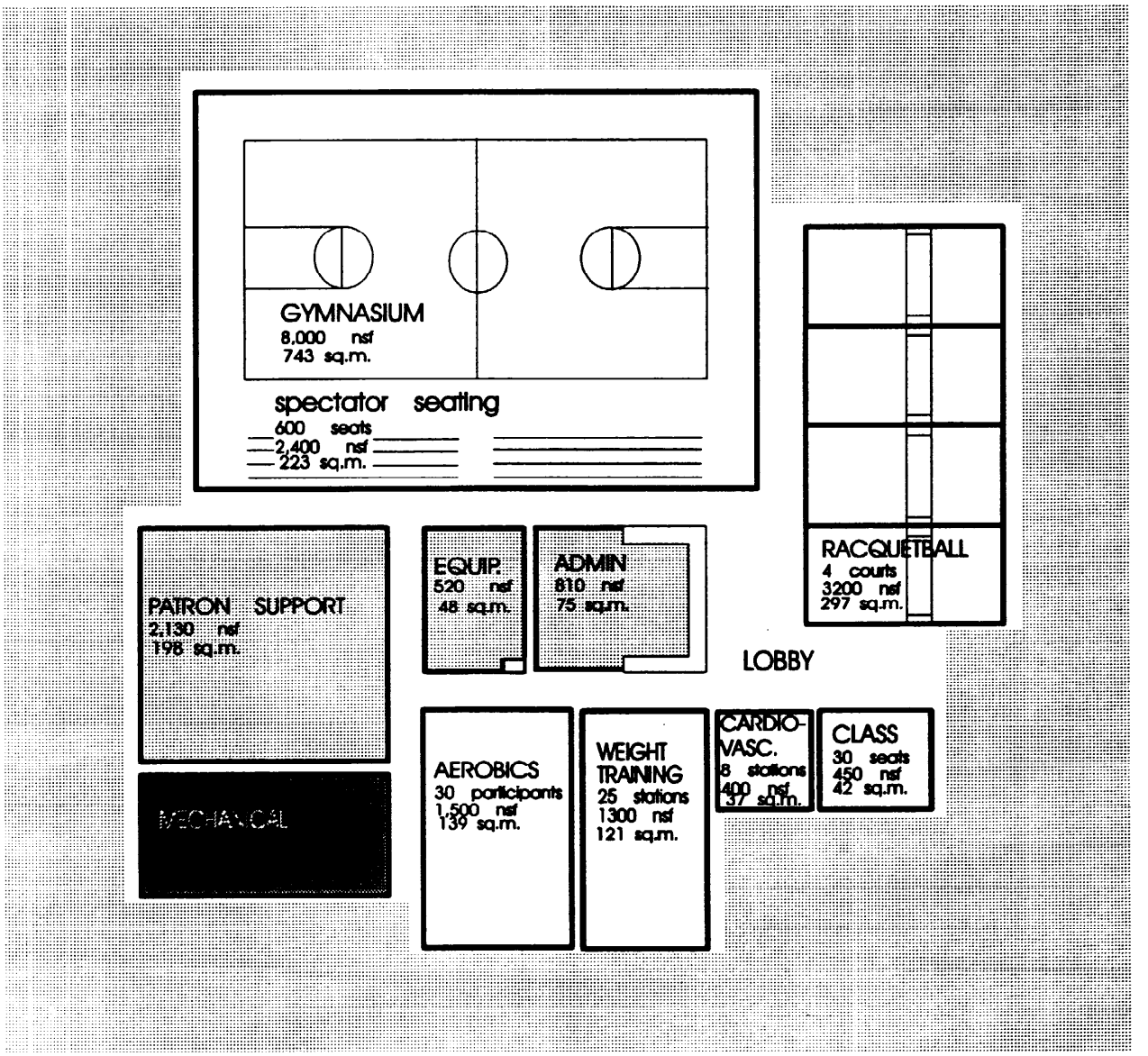
6. **ILLUSTRATIVE SPACE PROGRAMS.** Three space programs for small, medium and large Gymnasiums are presented to illustrate the application of the space allocation factors, and the range of spaces and capacities which may be included in a facility. These space programs are for illustrative purposes only.

7. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a medium-size Gymnasium facility. This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram is for illustrative purposes only.

GYMNASIUM (Category Code 740 43)

Sample Space Program

Functional Components/ Sub-Components	Space Allocation Factor		Notes	Facility Size -- SMALL Capacity	Net sq.m.	Total Net sq.m.	Facility Size -- MEDIUM Capacity	Net sq.m.	Total Net sq.m.	Facility Size -- LARGE Capacity	Net sq.m.	Total Net sq.m.
ACTIVITY AREAS												
Basketball Court	743	Net sq.m. per court		1	743		1	743		2	1,486	
Spectator Seating	0.40	Net sq.m. per seat		200	80		600	240		1,200	included w/ courts area	
Equipment Storage/ Gear Issue Area	5%	of Net sq.m. Court + Spectator Seating	Min 19 Net sq.m.		41			49			74	
Aerobics/Exercise Area	5	Net sq.m. per participant	Min 70 Net sq.m.	15	75		30	150		50	250	
Cardiovascular Training Area	5	Net sq.m. per machine	Min 19 Net sq.m.	4	20		8	40		16	80	
Weight Training Area												
Free Weights Area	5	Net sq.m. per station	Min 19 Net sq.m.	4	20		6	30		10	50	
Circuit Training Area	5	Net sq.m. per station	Min 28 Net sq.m.	12	60		18	90		24	120	
Instructor Station	9	Net sq.m. per station		1	9		1	9		1	9	
Racquetball Court	74	Net sq.m. per court		2	148		4	296		6	444	
Classroom/Meeting Room	1	Net sq.m. per seat		15	20		30	30		45	50	
Subtotal Activity Areas						1,216			1,677			2,563
ACTIVITY SUPPORT AREAS												
Patron Support (including lockers, showers, toilets, sauna, whirlpool)	12%	of Net sq.m. total Activity Areas			150			200			310	
Administration/Fitness Assessment/Sales/ Laundry/Storage/Support	4%	of Net sq.m. total Activity Areas + 9 Net sq.m.	Min 28 Net sq.m.		60			80			110	
Subtotal Activity Support Areas						210			280			420
BUILDING SUPPORT AREAS												
Lobby/Circulation/Structure/ Partitions/Janitor's Closet	15%	of Net sq.m. total Activity Areas +			210			290			450	
Mechanical/Electrical/ Communication Equip. Space	5-10%	of Net sq.m. total Activity Areas + Activity Support			140			150			150	
Subtotal Building Support Areas						350			440			600
TOTAL GROSS AREA (sq.m.)						1,776			2,397			3,583



GYMNASIUM - Medium Capacity

740 45 FITNESS CENTER (SQ.M./SF)

Project Review: EFD, NAVFAC HQ, BUPERS (Pers-656D)
Commandant of the Marine Corps (CMC) code LFL
Design Criteria: *(Military Handbook is currently under development)*

1. **GENERAL.** See introduction to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** Fitness Centers provide facilities and support services to meet the individual physical fitness needs of military personnel. The facilities may also serve dependents, retirees and authorized civilians. Activities which may be accommodated in a Fitness Center include: aerobics, athletic gear issue, calisthenics, cardiovascular training, fitness assessment and testing, gymnastics, handball, martial arts, physical fitness training, racquetball, squash, wallyball, weight-training, wrestling, etc. Fitness Centers may charge membership or usage fees, and provide qualified instructors to assist users.

3. **RELATED FACILITIES.** Consideration should be given to collocating the Fitness Center with the following recreational facilities in order to (i) take advantage of potential savings in space requirements and operating costs, and (ii) provide users with the increased convenience of clustered facilities:

- 740 43 Gymnasium
- 740 50 Field House
- 740 53 Indoor Swimming Pool
- 740 84 Indoor Playing Courts
- 750 10 Outdoor Playing Courts
- 750 20 Playing Fields

4. **DEMAND.** The primary functional components of a Fitness Center - Aerobics/Exercise Area, Cardiovascular Training Area, Weight Training Area, and Indoor Playing Court - are sized on the basis of the peak hour usage demand for the specific component at each installation, as follows:

a) Use projected base loading data to determine the population for each significant user population category, as listed in Tables 740 45A through 45D.

b) Calculate peak hour demand for each functional component by multiplying the population for each category by participation factors found in Tables 740 45A through 45D. Add the demand for all population categories to derive Total Demand for each functional component.

c) Calculate the number of component units required by dividing the Total Demand by the maximum capacity per hour per component unit, as indicated in Tables 740 45B, C and D. Subtract the number of component units available at other MWR facilities on the installation, to determine the number required in the Fitness center.

d) Multiply the number of units required for each functional component by the space allocation factors in Table 740 45. Add the net area for all components and add support area factors as directed in Table 740 45, to derive the Total Facility Allowance.

Notes for Demand Calculations - Tables 740 45A through 45D:

(1) Population numbers should be consistent with projected base loading data. Officers are O-1 through O-10 and enlisted are E-1 through E-9. Civilians are authorized DoD employees. Retirees are all military retirees within a 30-minute drive of the installation.

For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all of the non-deployable population, plus two-thirds of the deployable population, to reflect time away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations.

(2) Usage of facilities by spouses and dependents has been statistically incorporated in the participation factors used in the table These participation factors may be revised periodically by NAVFAC HQ and BUPERS, and the most current figures must be used in all demand calculations.

(3) To calculate user capacity for aerobics/exercise areas at other MWR facilities at the installation, divide the net area by 50 to derive the number of users.

TABLE 740 45A
AEROBICS/EXERCISE AREA DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0016	=	.....	users
(1),(2)	Officers	.....	x	.0019	=	+	users
(1),(2)	Retirees	.....	x	.0002	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0009	=	+	users
	Total Participant Demand (round to the nearest whole unit)				=	.....	users
(3)	subtract user capacity available at other MWR facilities on the installation (for example, at the Gymnasium or Recreation Centers)					-	users
	Total Participant Capacity required in Fitness Center				=	.....	users

TABLE 740 45B
CARDIOVASCULAR TRAINING STATION DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0172	=	.....	users
(1),(2)	Officers	.....	x	.0128	=	+	users
(1),(2)	Retirees	.....	x	.0027	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0033	=	+	users
				Total Demand	=	.....	users
	divide by maximum capacity per station per hour					÷ 6	
	Total Number of Stations (round to the nearest whole unit)				=	.....	stations
	subtract number of stations available at other MWR facilities on the installation (for example, at the Gymnasium or Recreation Centers)					-	stations
	Total Number of Stations required in Fitness Center				=	.....	stations

TABLE 740 45C
WEIGHT TRAINING STATION DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0146	=	.....	users
(1),(2)	Officers	.....	x	.0146	=	+	users
(1),(2)	Retirees	.....	x	.0015	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0024	=	+	users
				Total Demand	=	.....	users
				divide by maximum capacity per station per hour		÷ 6	
				Total Number of Stations (round to the nearest whole unit)	=	.....	stations
				subtract number of stations available at other MWR facilities on the installation (for example, at the Gymnasium or Recreation Centers)		-	stations
				Total Number of Stations required in Fitness Center	=	.....	stations

TABLE 740 45D
INDOOR PLAYING COURT DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0021	=	.....	users
(1),(2)	Officers	.....	x	.0020	=	+	users
(1),(2)	Retirees	.....	x	.0005	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0007	=	+	users
				Total Demand	=	.....	users
				divide by maximum capacity per court per hour		÷ 6	
				Total Number of Courts (round to the nearest whole unit)	=	.....	courts
				subtract number of courts available at other MWR facilities on the installation (for example, at the Gymnasium or Indoor Playing Courts Facility)		-	courts
				Total Number of Courts required in Fitness Center	=	.....	courts

5 . **SPACE ALLOWANCES**. Space allowances for Fitness Center facilities are determined according to the planning criteria presented in Table 740 45 below. The total allowance for a facility is the sum total of the space allowances for each functional component. The number of units of each component required to meet the demand is obtained from the calculations in Tables 740 45A, 740 45B, 740 45C and 740 45D.

TABLE 740 45
SPACE ALLOWANCE FOR FITNESS CENTER

Note	Table	Functional Component	# Units	x	Space Allocation Factor	=	Total Net Area	Minimum Net Area sq.m.(SF)
		ACTIVITY AREAS						
	A	Aerobics/Exercise Area	.....	x	5sq.m.(50 NSF) per participant	=	+	70(750)
	B	Cardiovascular Training Area	.....	x	5sq.m.(50 NSF) per station	=	+	19(200)
	C	Weight Training Area	.....	x	5sq.m.(50 NSF) per station	=	+	46(500)
(1)		Instructor Station	.....	x	9sq.m.(100 NSF) per station	=	+	
	D	Indoor Playing Court	.....	x	74(800 NSF) per court	=	+	
					Subtotal Activity Areas		.....	
		ACTIVITY SUPPORT AREAS						
		Patron Support (including lockers, showers, toilets, sauna, whirlpool)			18% x Subtotal Activity Areas	=	.....	
		Administration/Fitness Assessment/Sales/ Laundry/Storage/Support			(5% x Subtotal Activity Areas) + 9sq.m.(100 NSF)	=	+	28(300)
					Subtotal Activity Support Areas	=	.....	
		BUILDING SUPPORT AREAS						
		Lobby/Circulation/Structure/ Partitions			25% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	.....	
		Mechanical/Electrical/ Communication Equip. Space			5-10% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	+	
					TOTAL FACILITY ALLOWANCE	=	.....	Gross Area

Notes for space allowance table:

(1) Space for one Instructor Station should be included in each separate Weight Training Area.

sq.m. = square meter
NSF = Net Square Feet
GSF = Gross Square Feet
Minimum NSF = Minimum space allowance to be provided for the particular function or activity.

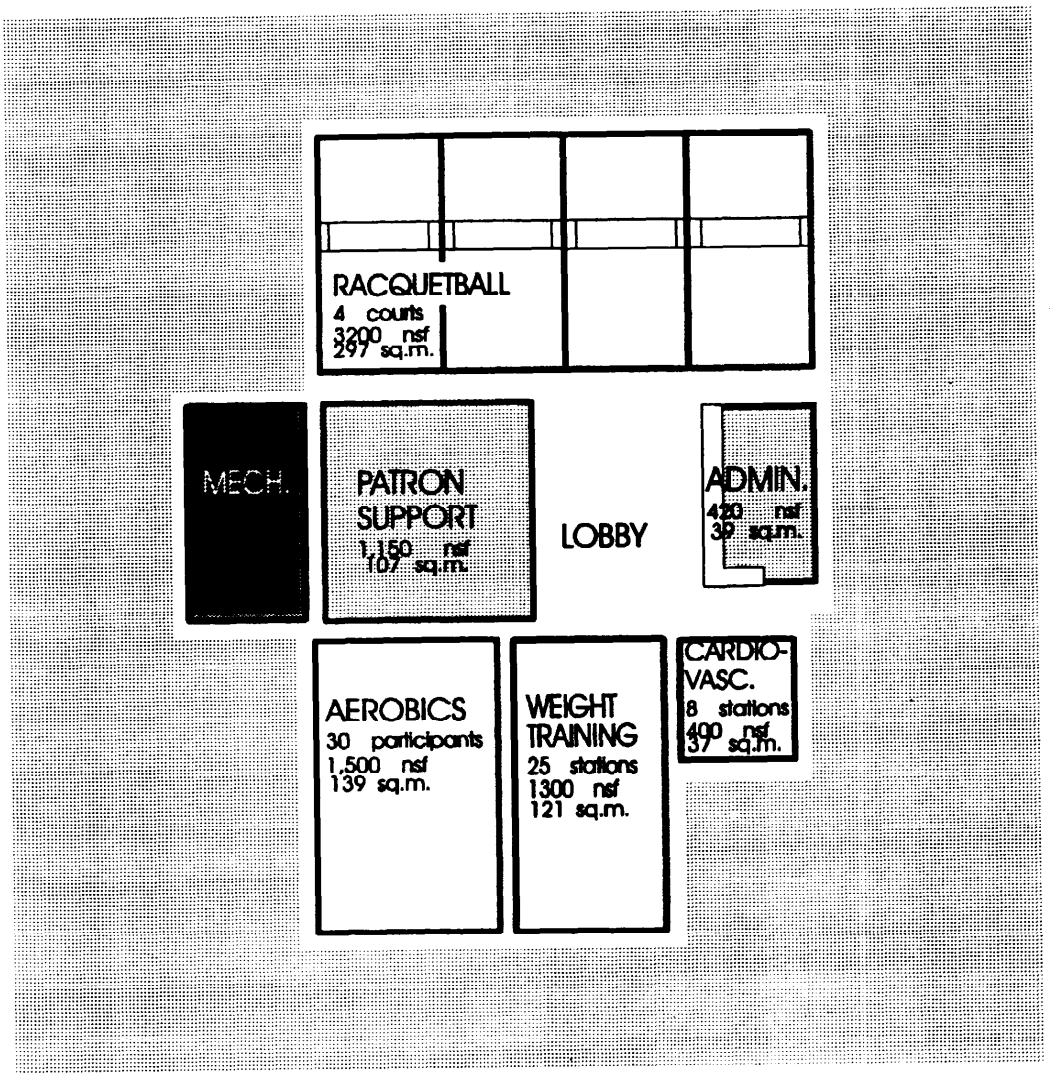
6. **ILLUSTRATIVE SPACE PROGRAMS.** Three space programs for small, medium and large Fitness Centers are presented to illustrate the application of the space allocation factors, and the range of spaces and capacities which may be included in a facility. These space programs are for illustrative purposes only.

7. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a medium-size Fitness Center facility. 'This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram is for illustrative purposes only.

FITNESS CENTER (Category Code 740 45)

Sample Space Program

Functional Components/ Sub-Components	Facility Size -- SMALL Capacity	Net sq.m.	Total Net sq.m.	Facility Size -- MEDIUM Capacity	Net sq.m.	Total Net sq.m.	Facility Size -- LARGE Capacity	Net sq.m.	Total Net sq.m.
ACTIVITY AREAS									
Aerobics/Exercise Area	15	75		30	150		50	250	
Cardiovascular Training Area	4	20		8	40		16	80	
Weight Training Area									
Free Weights Area	4	20		6	30		10	50	
Circuit Training Area	12	60		18	90		24	120	
Instructor Station	1	9		1	9		1	9	
Racquetball Court	2	148		4	296		6	444	
Subtotal Activity Areas			332			615			953
ACTIVITY SUPPORT AREAS									
Patron Support (including lockers, showers, toilets, sauna, whirlpool)		60			110			170	
Administration/Fitness Assessment/Sales/ Laundry/Storage/Support		28			40			60	
Subtotal Activity Support Areas			88			150			230
BUILDING SUPPORT AREAS									
Lobby/Circulation/Structure/ Partitions/Janitor's Closet		110			190			300	
Mechanical/Electrical/ Communication Equip. Space		40			80			120	
Subtotal Building Support Areas			150			270			420
TOTAL GROSS AREA (sq.m.)			570			1,035			1,603



FITNESS CENTER - Medium Capacity

740 46 ROLLER/ICE SKATING RINK (sq.m./SF)

This facility serves as a roller/ice skating rink requiring a hard surface floor with potential for multipurpose use. The facility may include administrative space, maintenance, equipment storage, snack bar with kitchen space, locker and spectator areas. Minimum rink size should be 929 sq.m. (10,000 SF) with additional space as required for support functions based on military population as shown in Table 740 46.

TABLE 740-46
Space Criteria For Roller/Ice Skating Rinks

Military Strength (1)	**Gross Area** sq.m.	SF
Up to 2,000	929 (2)	10,000 (2)
2,001 to 20,000	1,390 (2)	15,000 (3)
20,000 and up	1,860 (2)	20,000 (3)

Gross area is exclusive of mechanical room space.

(1) Military strength is defined as military population plus 50% of the dependent personnel.

(2) Plus additional space for support functions.

(3) Includes space for support functions.

740 47 RECREATION INFORMATION, TICKETS AND TOURS OFFICE (sq.m./SF)

Project Review: Base MWR representatives, EFD, NAVFAC HQ, BUPERS (Pcrs-656D)
Design Criteria: *(Military Handbook is not currently available)*

1. **GENERAL.** See General Notes to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** The mission of the Recreation Information, Tickets and Tours (ITT) Office is to serve the military community's leisure needs by providing information on what to see and do locally, offering tours to nearby attractions, and selling tickets for musical and theatrical performances, concerts, sporting and other special events.

   ITT facilities can vary according to local needs, and may range from ticket selling booths and information counters to travel agency type accommodation with display and office desk/seating/waiting area configurations.

3. **RELATED FACILITIES.** ITT Offices are most commonly collocated with Contracted Leisure Travel Agencies, since these two programs frequently complement each other. ITT operations may also benefit from collocation with high traffic uses such as Base Exchanges.

4. **SPACE ALLOWANCE.** The space allowance for ITT Offices is presented below in Table 740 47B.

   The number and appeal of local attractions and recreational opportunities will have a direct impact on the volume of ticket sales and information requests handled by an ITT Office. This volume is the primary determinant of the number of staff required to serve the market at individual bases. Based on analysis of existing operations, the staffing ratio indicated in Table 740 47A is recommended.

TABLE 740 47A
RECOMMENDED STAFFING FOR ITT OFFICE

Active-Duty Installation Population	Full-Time Staff	Part-Time Staff	Note
250 or less	0	2	(1)
251-1,000	1	1	(1)
1,001-5,000	1	2	(1)
5,001-10,000	3	3	(1)
more than 10,000	3	4	(1)

Note for Staffing Table:

(1) Population numbers should be consistent with projected base loading data. For facility planning purposes at installation with deployable forces, the active-duty demand population is comprised of all of the non-deployable population, plus two-thirds of the deployable population, to reflect time away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations.

TABLE 740 47B
SPACE ALLOWANCE FOR ITT OFFICE

# Staff	Min. Gross Area (rounded up to the next FTE)		Max. Gross Area	
	sq.m.	SF	sq.m.	SF
1	19	200	42	450
2	28	300	67	720
3	46	500	92	990
4	78	840	112	1,210
5	102	1,100	131	1,410

Notes for Space Allowance Table:

FTE = Full Time Equivalent, in situations where staffing is made up of full- and part-time employees.

A good location is critical for running a successful ITT operation - offices should be located in convenient, high visibility, high visibility locations. Adequate parking should be available near the office.

Ticket booths may be located separately from other ITT facilities. On large bases requiring multiple booths, such booths may be clustered in one location or occupy several sites. When siting ticket booths, space for lines to form should be taken into account. Booth locations should allow for long lines to spill over into adjacent parking lots on those occasions when tickets for events drawing large audiences go on sale.

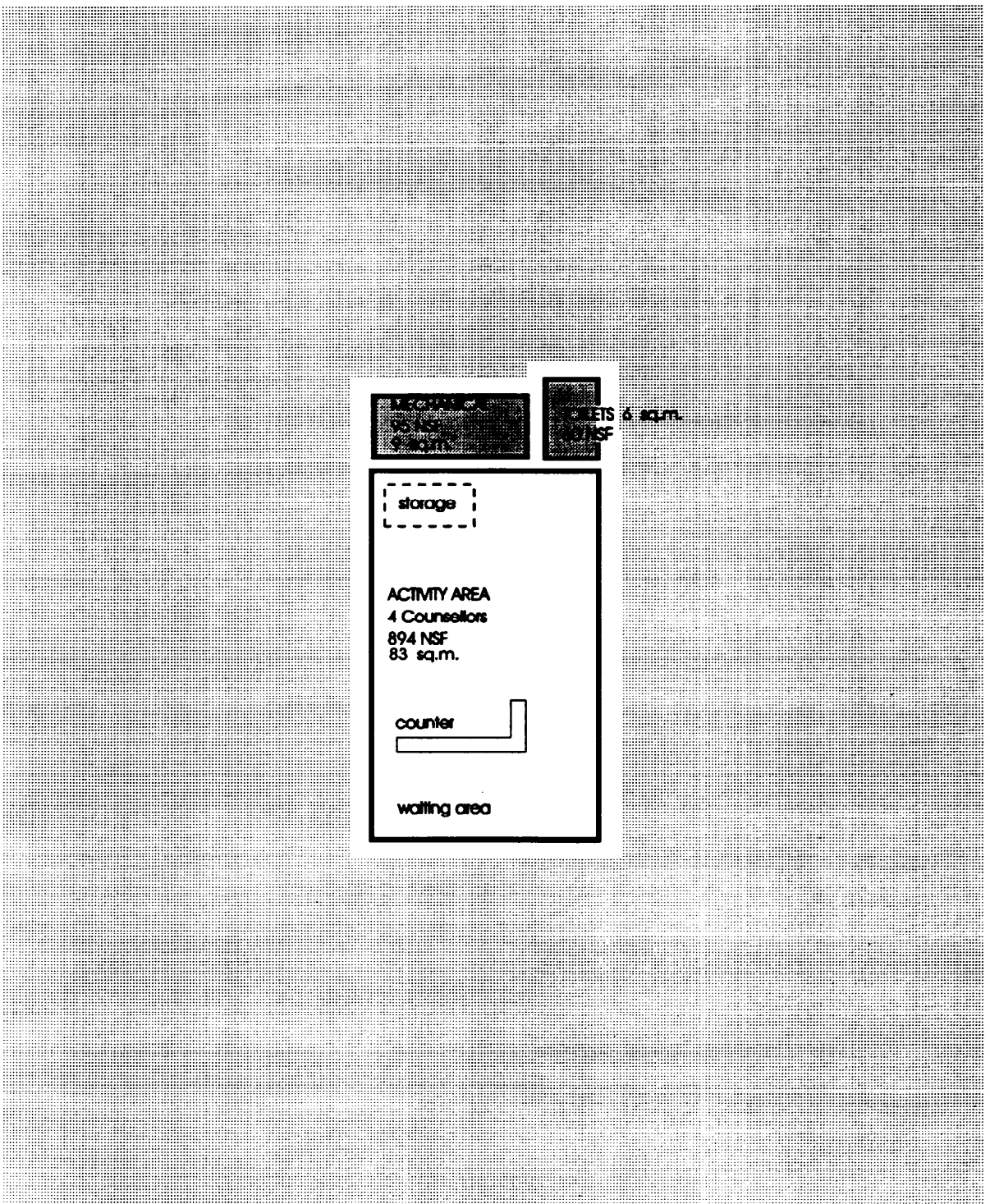
5. **ILLUSTRATIVE SPACE PROGRAMS.** Four sample space programs for small, medium, large and extra-large ITT Offices are presented to illustrate possible breakdowns of the overall space allowances into their primary functional components, with their respective sizes and capacities. These space programs are for illustrative purposes only.

6. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for an extra-large size ITT Office. This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram is for illustrative purposes only.

RECREATION INFORMATION, TICKET AND TOURS OFFICE (Category Code 740 47)

Sample Space Programs

Functional Component/ Sub-Component	Space Allocation Standard		SMALL SIZE FACILITY Capacity	Net	Sub-Total Net sq.m.	MEDIUM SIZE FACILITY Capacity	Net	Sub-Total Net sq.m.	LARGE SIZE FACILITY Capacity	Net	Sub-Total Net sq.m.	EXTRA LARGE SIZE FACILITY Capacity	Net	Sub-Total Net sq.m.
				sq.m.			sq.m.			sq.m.			sq.m.	
ACTIVITY AREA					25			45			65			81
Information Counter/Ticket Booth	3	Net sq.m. per station	1	3		1	3		2	6		2	6	
Display Rack	3	Net sq.m. per 6' module	2	6		3	9		4	12		4	12	
Waiting Area	1	Net sq.m. per seat	2	2		4	4		4	4		6	6	
Counsellor Office	11	Net sq.m. per office	1	11		2	22		3	33		4	44	
Office Storage	30%	total Net sq.m. office		3			7			10			13	
SUB-TOTAL ACTIVITY AREA					25			45			65			81
ACTIVITY SUPPORT					6			6			6			6
Toilets (male and female)	6	Net sq.m. per toilet	1	6		1	6		1	6		1	6	
SUB-TOTAL ACTIVITY SUPPORT					6			6			6			6
BUILDING SUPPORT					10			15			20			23
Entrance/Circulation/ Housekeeping Supplies/Janitor's Closet Structure/Paritions	15-19%	total Net sq.m. for Activity Area and Activity Support		6			9			12			14	
Mechanical/Electrical/Communicatio Equipment Space	9-13%	total Net sq.m. for Activity Area and Activity Support		4			6			8			9	
TOTAL FACILITY ALLOWANCE (Gross sq.m.)					41			66			91			110
Gross sq.m. per each FTE Staff					41			33			30			27



LAYOUT DIAGRAM -- ITT OFFICE
Extra Large Size Facility

740 48 CONTRACTED LEISURE TRAVEL AGENCY (sq.m./SF)

Project Review: Base MWR representatives, EFD, NAVFAC HQ, BUPERS (Pers-656D)
Design Criteria: *(Military Handbook is not currently available)*

1. GENERAL. See General Notes to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. DEFINITION. The mission of an on-base Contracted Leisure Travel Agency is to serve the military community's unofficial travel service needs. This is accomplished by providing services like those obtained from a commercial travel agency in the private sector - information on land/sea/air travel, and accommodation and car rental options, reservations and ticketing services, and assistance with individual tour and travel arrangements.

3. RELATED FACILITIES. Contracted Leisure Travel Agencies are most commonly collocated with Recreation Information, Tickets and Tours (ITT) Offices, since these two programs complement each other. Such travel agency operations may also benefit from collocation with high traffic uses such as Base Exchanges.

4. SPACE ALLOWANCE. The maximum space allowances for Contracted Leisure Travel Agency facilities are presented below in Table 740 48A. Recommended space allowances for such facilities are 22 net square meter (240 NSF) for a single agent, and 14 net square meter (150 NSF) for each additional agent.

Travel industry statistics indicate that average productivity per travel agent is $500,000 per year. Unless a one-person agency can generate $500,000 or more in leisure travel sales, bases should consider alternative methods of providing this type of service. However, while the staffing for a small travel agency operation may be one Ml-time equivalent (FTE) position, the minimum size of facility should be sufficient to accommodate stations for at least two agents.

TABLE 740 48A
SPACE ALLOWANCE FOR CONTRACTED LEISURE TRAVEL AGENCY

Note	Total Sales (rounded to the nearest one hundred thousand)	# Travel Agents Allowance (FTE)	Min. Space Allowance (Gross Area)	Max. Space Gross Area)
(1)$500,000 to $1,200,000	1-2	36	390	65	700
$1,300,000 to $1,800,000	3	50	540	93	1,000
$1,900,000 to $2,400,000	4	64	690	111	1,200
$2,500,000 to $3,000,000	5	78	840	139	1,500
$3,100,000 to $3,600,000	6	92	990	158	1,700
$3,700,000 to $4,200,000	7	106	1,140	177	1,900
$4,300,000 to $4,800,000	8	120	1,290	195	2,100

Notes for Space Allowance Table:

(1) While the staffing for a small travel agency operation may be one full-time equivalent (FTE) position, the minimum size of facility should be sufficient to accommodate stations for at least two agents. Furthermore, wherever possible, it is recommended that space for likely future sales growth - sufficient square area to accommodate at least one additional agent - be included in the sizing of new small travel agency facilities.

A good location is critical for running a successful travel agency operation offices should be located in convenient, high traffic, high visibility locations. Adequate parking should be available near the office.

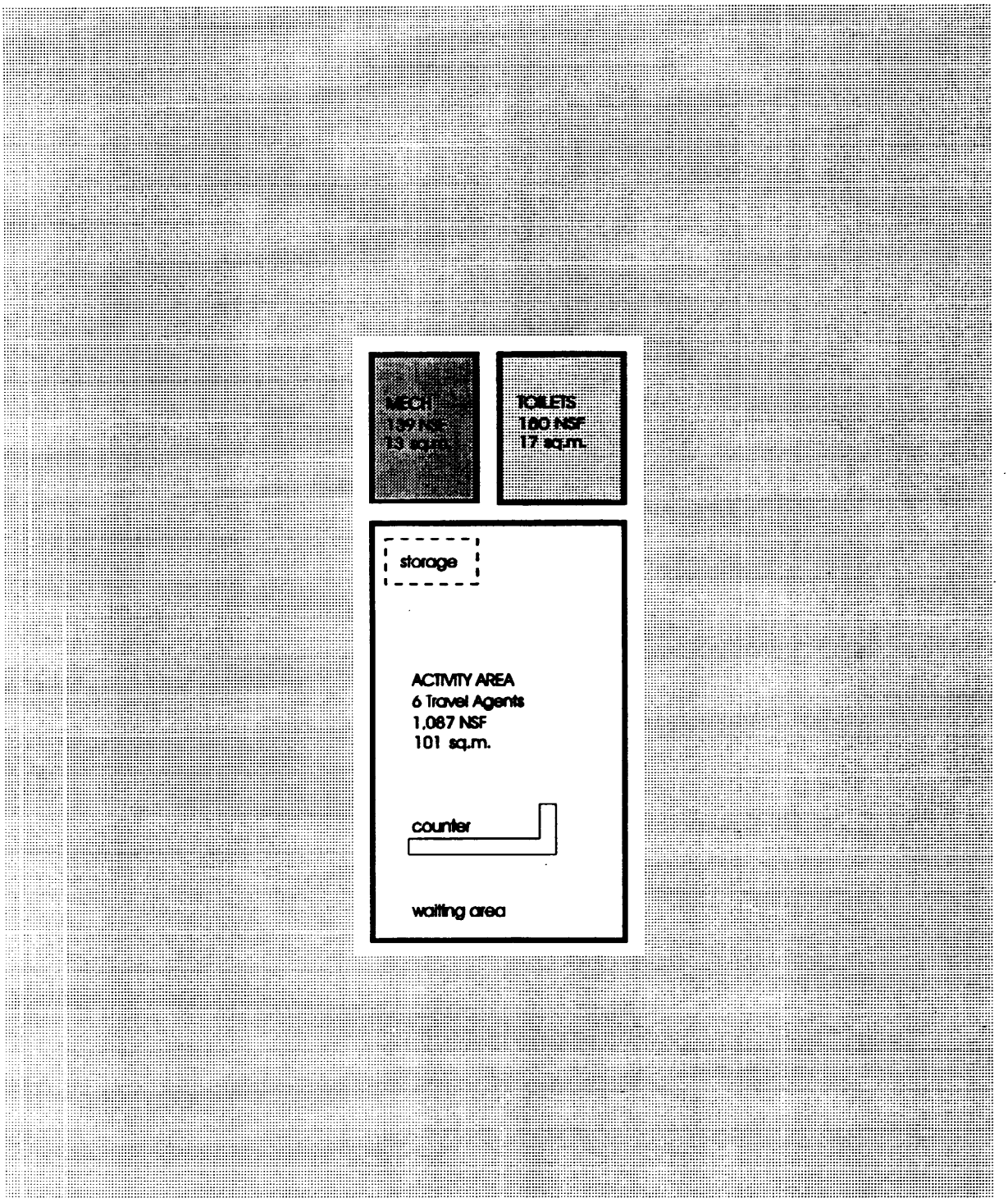
5. **ILLUSTRATIVE SPACE PROGRAMS.** Four sample space programs for small, medium, large and extra-large Contracted Leisure Travel Agencies are presented to illustrate possible breakdowns of the overall space allowances into their primary functional components, with their respective sizes and capacities. These space programs are for illustrative purposes only.

6. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a large size Contracted Leisure Travel Agency. This diagram is an example of the composition of such a facility in terms of its functional components their respective sizes and adjacencies. The layout diagram is for illustrative purposes only.

CONTRACTED LEISURE TRAVEL AGENCY (Category Code 740 48)

Sample Space Programs

Functional Component/ Sub-Component	Space Allocation Standard		SMALL SIZE FACILITY Capacity	Net	Sub-Total Net sq.m.	MEDIUM SIZE FACILITY Capacity	Net	Sub-Total Net sq.m.	LARGE SIZE FACILITY Capacity	Net	Sub-Total Net sq.m.	EXTRA LARGE SIZE FACILITY Capacity	Net	Sub-Total Net sq.m.
				sq.m.			sq.m.			sq.m.			sq.m.	
ACTIVITY AREA					43			70			96			126
Travel Agent Station	8	Net sq.m. per station	2	16		4	32		6	48		8	64	
Printing Station	5	Net sq.m. per station	1	5		1	5		1	5		1	5	
Copy Machine	5	Net sq.m. per machine	1	5		1	5		1	5		1	5	
Information Counter	3	Net sq.m. per station	1	3		1	3		1	3		2	6	
Display Rack	3	Net sq.m. per 2m modul	2	6		3	9		4	12		5	15	
Waiting Area	1	Net sq.m. per seat	3	3		6	6		9	9		12	12	
Office Storage	30%	Net sq.m. agent stations		5			10			14			19	
SUB-TOTAL ACTIVITY AREA					43			70			96			126
ACTIVITY SUPPORT					6			12			18			24
Toilets (male and female)	6	Net sq.m. per toilet	1	6		2	12		3	18		4	24	
SUB-TOTAL ACTIVITY SUPPORT					6			12			18			24
BUILDING SUPPORT					16			24			32			39
Entrance/Circulation/ Housekeeping Supplies/Janitor's Closet Structure/Paritions	15-19%	total Net sq.m. for Activity Area and Activity Support		9			15			19			24	
Mechanical/Electrical/Communication Equipment Space	9-13%	total Net sq.m. for Activity Area and Activity Support		6			10			13			15	
TOTAL GROSS AREA (sq.m.)					64			106			146			189
Gross sq.m. per Travel Agent					32			27			24			24



LAYOUT DIAGRAM -- CONTRACTED LEISURE TRAVEL AGENCY
Large Size

740 50 FIELD HOUSES (sq.m./SF)

Field houses are large facilities combining gymnasiums, courts, swimming pools, exercise facilities and administrative and storage areas to support the activities. They are recommended for **large installations only and require special study and design.**

Space allowances for field houses are given in Table 740-50. Space for an indoor swimming pool is included in the allowances; therefore, if a field house is provided, facilities under Category Code 740 53 (Indoor Swimming Pool) are not authorized.

Environmental Adjustment Factors. Field house requirements shall be **based on historical utilization data of the various athletic activities to be consolidated** in the field house. The **justification for a field house must include the complete delineation of all existing and planned athletic facilities which serve the same functions** as those to be *included in the field house (such as gymnasiums, indoor swimming pool, indoor playing courts and the like). For each of these facilities, the following information must be provided: size, condition, location, utilization, hours of operation and expected change in demand when new field house is constructed. No field house should be planned for new installations or where justification data is not available.

TABLE 740-50
Space Allowances for Field Houses

Military Strength	Gross Area sq.m.	Gross Area SF
Up to 7,000	None	None
7,001 to 10,000	4,650	50,000
10,001 to 15,000	5,760	62,000
Over 15,000	(1)	

(1) For each subsequent increment of 15,000 military strength an additional field house of 5,760 sq.m. (62,000 SF) may be provided.

740 52 GUN, SKEET AND/OR TRAP BUILDING (sq.m./SF)

This facility is for support of the respective ranges and contains operator's office, storage, sales area, gun maintenance shop, toilets and lounge. Space allowances are given in Table 740-52 and may be used in one facility or divided between facilities. See Category Code 750 52 for land requirements.

TABLE 740-52
Space Allowances for Gun, Skeet and/or Trap Building

Military Population (1)	Gross Area sq.m.	Gross Area SF
Up to 100	None	None
101 to 10,000	367	3,950
10,001 to 15,000	399	4,300
15,001 to 20,000	423	4,550
20,001 to 25,000	446	4,800
25,001 to 30,000	474	5,100
30,001 to 40,000	492	5,300
Over 40,000	511	5,500

(1) Military population consist of military strength assigned to installations.

740 53 SWIMMING POOL - INDOOR (SQ.M./SF)

(including poolside deck and bathhouse)

Project Review: Base MWR representatives, EFD, NAVFAC HQ, BUPERS (Pers-656D)
Design Criteria: *(Military Handbook is not currently available; see NAVMILPERSCOMINST 1710.6A)*

1. **GENERAL.** See General Notes to 740 series category codes for General Instructions regarding facility allowance planning procedures.

   The planning criteria presented below for Category Code 740 53 are also applicable to Category Code 750 30. Outdoor Swimming Pool -- Installation.

2. **DEFINITION.** The primary purpose of Swimming Pools is to support physical readiness programs as well as instructional, informal and intramural activities, and to Serve the recreational needs of active-duty military personnel and their spouses and children, retirees and DoD authorized civilians. With the exception of extra-small and small bases, each installation must provide either an all-hands indoor or outdoor pool, or access to aquatic resources in the local community to meet patron recreational demands. All on-base aquatics facilities must be handicap accessible.

   The local Command has discretion over the decision to provide indoor or outdoor Swimming Pools. However, in general, large installations requiring more than one Swimming Pool to meet patron demand, may develop only one indoor pool. Additional indoor pools may be developed on the basis of facility planning criteria specified for Combat Training Pool/Tank under category code 179 55.

   In addition to the swimming pool, special features such as diving wells, water slides and wading pools (see relevant criteria and NAVMILPERSCOMINST 1710.6A) and zero-depth entry areas may be incorporated in the facility if there is sufficient local justification.

   At smaller installations, the potential for shared use of a single pool for both recreational and training needs should be examined.

3. **RELATED FACILITIES.** Consideration should be given to collocating the Swimming Pool with related recreational facilities in order to (i) take advantage of potential savings in space requirements and operating costs, and (ii) provide users with the increased convenience of clustered facilities. These related recreational facilities include:

   - 740 43 Gymnasium
   - 740 45 Fitness Center
   - 740 84 Indoor Playing Courts
   - Other MWR recreational and foodservice facilities such as Clubs and Recreation Centers.

4. **DEMAND.** Swimming Pool facilities are sized on the basis of the peak hour demand at each installation, as follows:

   a) Use projected base loading data to determine the population for each significant population category, as listed in Table 740 53A.

   b) Calculate peak hour demand by multiplying the population for each category by participation factors found in Tables 740 53A. Add the demand for all population categories to derive Total Demand for each functional component. Adjust the calculated Total Demand as indicated in Table 740 53A for installations with alternative on-base recreational swimming facilities such as lakes or beaches.

   c) The determination of the length of the pool is a local Command decision which should be based primarily on patron demand and programmatic considerations. A 25-meter length pool is sufficient to satisfy most fitness and recreational swimming needs. The advantage of a 50-meter length is that the pool may be divided up into

2 or 3 areas and utilized simultaneously for different programs. For example, given sufficient demand, a 50-meter length pool divided into three separate areas may be used simultaneously for recreational swimming, lap swimming for fitness training, and an instructional class in life-saving techniques.

d) Calculate the number of lanes required by dividing the Total Demand by the maximum capacity per hour per lane, indicated in Tables 740 53B or 740 53C, depending on whether the local Command opts for a 25 meter length or 50 meter length Swimming Pool. In general, the development of Swimming Pools with fewer than 6 lanes and more than 10 lanes is not recommended.

e) Where a beach area is available, a beach bathhouse of 325 sq.m. (3,000 SF) may be provided. If the beach is developed in lieu of one of the swimming pools authorized, the beach bathhouse may be sized as for the swimming pool bathhouse.

Notes for Demand Calculation - Table 740 53A:

(1) Population numbers should be consistent with projected base loading data. Officers are O-1 through O-10 and enlisted are E-1 through E-9. Civilians are authorized DoD employees. Retirees are all military retirees within a 30-minute drive of the installation.

For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all the non-deployable popalation, plus two-thirds of the deployable population, to reflect time away on deployment, However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations.

(2) The participation factors used in the table may be revised periodically by NAVFAC HQ and BUPERS, and the most current figures must be used in all demand calculations.

(3) Dependent population data may be obtained from the base MWR or Housing Offices.

TABLE 740 53A
SWIMMING FACILITY DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1), (2)	Enlisted	.....	x	.0043	=	.....	users
(1), (2)	Officers	.....	x	.0045	=	add	users
(1), (2)	Retirees	.....	x	.0025	=	add	users
(1), (2)	Authorized Civilians	.....	x	.0015	=	add	users
(1), (2), (3)	Dependents	.....	x	.0093	=	add	users
		Total Demand (rounded to the nearest whole unit)			=	.....	users
	adjustment for installations with alternative on-base swimming facilities (such as developed beaches or lakes)					subtract 30	users
		Total Demand (rounded to the nearest whole unit)			=	.....	users

TABLE 740 53B
SWIMMING POOL CAPACITY CALCULATION – 25 METER LENGTH

Total Demand (rounded to the nearest whole unit)	=	.....	users
Divide by maximum capacity per hour per lane (for a 25 meter length Swimming Pool)		divide by 4	users
Total number of lanes for a 25 meter length Swimming Pool	=	.....	lanes

TABLE 740 53C
SWIMMING POOL CAPACITY CALCULATION -- 50 METER LENGTH

Total Demand (rounded to the nearest whole unit)	=	.....	users
Divide by maximum capacity per hour per lane (for a 50 meter length Swimming Pool)		divide by 6	users
Total number of lanes for a 50 meter length Swimming Pool	=	.....	lanes

5 . **SPACE ALLOWANCE.** In addition to determining the length of the pool and the number of lanes, a Swimming Pool facility requires an adequately sized bathhouse and poolside deck area. Space allowance criteria for these support facilities are presented in Table 740 53D. Refer to NAVMILPERSCOMINST 1710.6A for critical dimensional criteria for swimming pools and related facilities.

TABLE 740 53D
SPACE ALLOWANCES FOR SWIMMING POOLS

Note	Table	Functional Component	# Units	X	Space Allocation Factor	=	Total Net Area	Min. Net Area sq.m.(SF)
		ACTIVITY AREA						
(1), (2)	740 53B	Swimming Pool -- 25 meter length	.....	X	63sq.m.(674 NSF) per lane	=	.....	
(1), (2)	740 53C	Swimming Pool -- 50 meter length	.....	X	125sq.m.(1,348 NSF) per lane	=	.....	
		Poolside Deck Area						
		for Indoor Pool			100% total Net Area lanes	=	.....	
		for Outdoor Pool			300% total Net Area lanes	=	.....	
		ACTIVITY SUPPORT						
		Bathhouse						
		Lockers, Showers, Toilets			33.33% total Net Area lanes	=	.....	
		Control Desk	.....	X	4sq.m.(45 NSF) per station	=	.....	4(45)
		Administrative Office	.....	X	11sq.m.(120 NSF) per office	=	.....	11(120)
		Lifeguard Office	.....	X	4sq.m.(40 NSF) per station	=	.....	7(80)
		Storage (equip., supplies, etc.)	.....	X	2sq.m.(20 NSF) per lane	=	.....	9(100)
		Subtotal Activity Support Areas				=	.....	
		BUILDING SUPPORT						
		Entrance/Circulation/Housekeeping Supplies/Janitor's Closet/ Structure/Partitions			10-15% X subtotal Net Area Activity Support Areas	=	.....	
		Mechanical/Electrical/Communication Equipment Space			5-10% X subtotal Net Area Activity Support Areas	=	.....	
		Pool Plant Room (pump, filter, etc.)			20% total Net Area lanes	=	.....	
		Chemical Storage Room(s) [separate rooms for different chemicals, as per safety requirements]			6sq.m.(60 NSF) per room	=	.....	6(60)
		TOTAL FACILITY ALLOWANCE FOR SUPPORT FACILITIES (Gross Area)				=	.....	

Notes for Space Allowance - Table 740 53D:

(1) The determination of the length of the pool is a local Command decision which should be based primarily on patron demand and programmatic considerations.

(2) Minimum lane width of 2 meters (7') is recommended, with an additional 0.5 meter (1'6") outside lanes on both sides of the swimming pool.

sq.m. = square meter

NSF = Net Square Feet
GSF = Gross Square Feet
Minimum or Maximum NSF = Minimum or maximum space allowance to be provided for the particular function or activity.

6. **ILLUSTRATIVE SPACE PROGRAMS.** Two space programs for a 6-lane, 25-meter and an 8-lane, 50-meter Swimming Pool facility are presented to illustrate possible breakdowns of the overall space allowances into their primary functional components, with their respective sizes and capacities. The space programs are for illustrative purposes only.

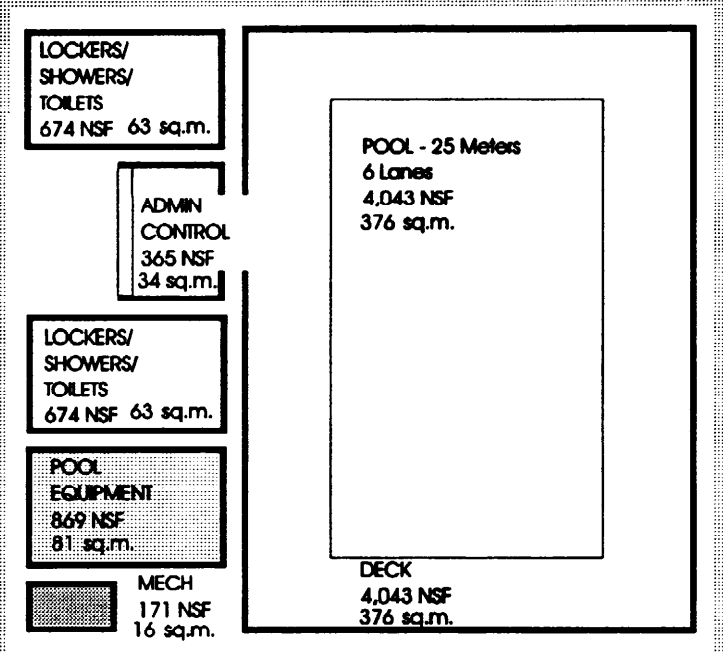
7. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a 6-lane, 25-meter length Indoor Swimming Pool facility. This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram is for illustrative purposes only.

SWIMMING POOL (Category Code 740 53/750 30)

Sample Space Programs

Functional Component/ Sub-Component	Space Allocation Standard		25 METER POOL Capacity	Net sq.m.	Sub Total Net sq.m.	50 METER POOL Capacity	Net sq.m.	Sub Total Net sq.m.
INDOOR ACTIVITY AREA								
Swimming Pool -- 25 meter length	63	Net sq.m. per lane	6	378	378			
Swimming Pool -- 50 meter length	125	Net sq.m. per lane				8	1,000	1,000
Deck Area	100%	total Net sq.m. lanes		378	378		1,000	1,000
Subtotal Area of Footprint for pool and deck					756			2,000
ACTIVITY SUPPORT								
Bathhouse (lockers, showers, toilets)	33.33%	total Net sq.m. lanes		126			333	
Control Desk	4	Net sq.m. per station	1	4		1	4	
Administrative Office	11	Net sq.m. per office	1	11		1	11	
Lifeguard Room	4	Net sq.m. per station	2	8		3	12	
Storage (equipment, supplies, etc.)	2	Net sq.m. per lane	6	12		8	16	
					161			376
BUILDING SUPPORT								
Entrance/Circulation/Housekeeping Supplies/Janitor's Closet/ Structure/Partitions	10-15%	total Net sq.m. Activity Support		24	24		38	38
Mechanical/Electrical/Communication Equipment Space	5-10%	total Net sq.m. Activity Support		16	16		19	19
Pool Plant Room (pump, filter, etc.)	20%	total Net sq.m. lanes		76	76		200	200
Chemical Storage Room	6	Net sq.m. per room	1	6	6	1	6	6
TOTAL FACILITY ALLOWANCE FOR SUPPORT FACILITIES (Gross sq.m.)					283			639

	25 METER POOL	50 METER POOL
Maximum pool capacity @ 2 net sq.m. (pool and deck area) per person for recreational use	**38 persons**	**100 persons**
Maximum pool capacity @ 4 swimmers per lane in 25-meter pool or 6 swimmers per lane in 50-meter pool for lap swimming	**24 persons**	**48 persons**



LAYOUT DIAGRAM -- INDOOR SWIMMING POOL
25 Meters

740 54 Recreation Center (sq.m./SF)

Project Review: Base MWR representatives, EFD, NAVFAC HQ, BUPERS (Pers-656D)
Design Criteria: *(Military Handbook is not currently available)*

1. **GENERAL.** See General Notes to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** A Recreation Center is designed to serve primarily younger (ages 18-24) enlisted personnel (mostly E1-E6), particularly those living in Bachelor Enlisted Quarters. Rec. Centers offer patrons programmed activities staffed with trained personnel. Activities to be accommodated in the Rec. Center include: "hanging out", informal group activities, tournaments and competitions, special events, theme activities for holidays, music practice and "jam" sessions, talent shows, movie marathons, game show nights, demonstrations, classes, lectures board games, cards, television, trivia contests and special programs for women. Some basic support facilities such as a kitchen and a telephone bank (with private booths and a waiting area) may be included for the convenience of patrons, particularly in locations where such services may not otherwise be available.

   Each base where a Rec Center is located should be individually analyzed to understand its specific situation, an determine the mix of Rec. Center functions most appropriate to meet local needs. The space allowance should be based on the development of a justifiable program of functions, capacities and sizes, comparable to the Sample Space Programs contained in this criteria section.

3. **RELATED FACILITIES.** Rec. Centers should be located within convenient walking distance of Bachelor Enlisted Quarters/dormitory facilities.

   Consideration should also be given to collocating the Rec. Center with related facilities in order to (i) take advantage of potential savings in capital and operating costs (for example, consolidation of administrative and support spaces, site development and staffing), (ii) provide users with the increased convenience of clustered facilities, and (iii) take advantage of synergies between facilities. Such related facilities include:

   - 740 28 Amusement Center
   - 740 40 Bowling Center
   - 740 43 Gymnasium
   - 740 64 Enlisted Club

4. **SPACE ALLOWANCE.** Recreation Center facilities are sized on the basis of the El-E6 population at each installation. The maximum facility allowance for Rec. Centers is according to sizing criteria presented in Table 740 54A.

Notes for Table 740 54A:

(1) For installations with an E1-E6 population of 1,000 or less, the base Community Center or other MWR facilities should be used to accommodate Recreation Center functions.

(2) Population numbers should be consistent with projected base loading data. For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all the non-deployable population, plus two-thirds of the deployable population, to reflect time away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations. Round-off population up or down to the nearest tbousand.

Location is an important factor in the utilization of Rec. Centers. Since their primary users are younger enlisted personnel, many of whom may not have access to personal vehicles, Rec. Centers should be conveniently located within a 5-10 minute walking radius of the majority of BEQ's (Bachelor Enlisted Quarters).

The local Command has the option of providing the total space allowance as one Rec. Center or distributing the area among several smaller facilities. The latter approach may be appropriate on larger bases with multiple concentrations of E1-E6 residential populations.

At installations with smaller populations, Rec. Center functions may be accommodated in a Community Center which serves both younger single sailors and older personnel with families. Facility planning criteria far Community Centers are addressed separately under Category Code 714 32.

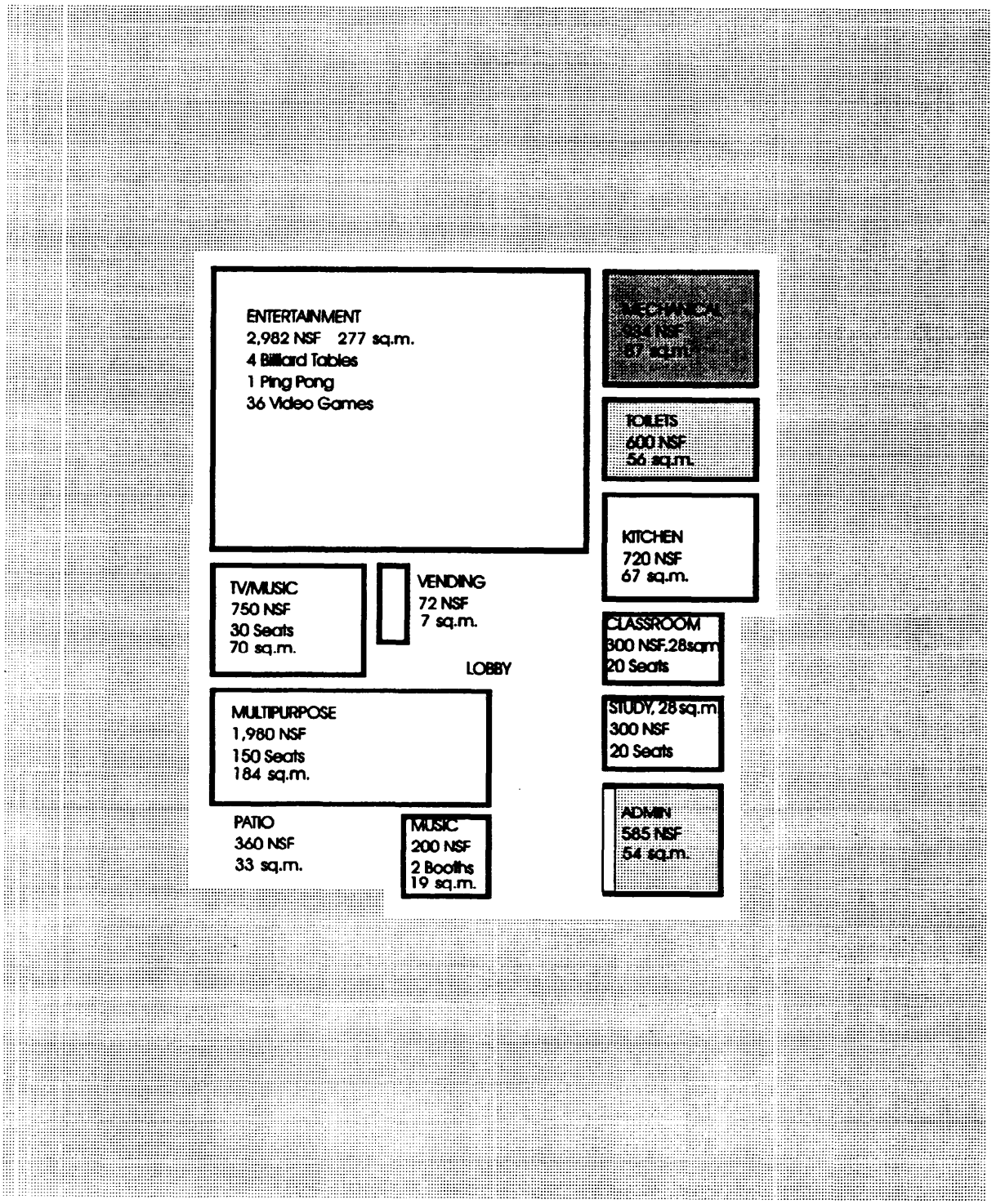
5. **ILLUSTRATIVE SPACE PROGRAMS.** Space programs for small, medium and large Recreation Centers are presented to illustrate possible breakdowns of the overall space allowances into their primary functional components, with their respective sizes and capacities. These space programs are for illustrative purposes only.

6. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a medium size Recreation Center facility. This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram is for illustrative purposes only.

RECREATION CENTER (Category Code 740 54)

Sample Space Programs

Functional Component / Sub-Component	Space Allocation Standard		SMALL SIZE Capacity	SMALL SIZE Net sq.m.	SMALL SIZE Sub-Total Net sq.m.	MEDIUM SIZE Capacity	MEDIUM SIZE Net sq.m.	MEDIUM SIZE Sub-Total Net Area	LARGE SIZE Capacity	LARGE SIZE Net sq.m.	LARGE SIZE Sub-Total Net sq.m.
ACTIVITY AREA											
Multipurpose Area					83			165			275
Function Room	1	Net sq.m. per seat	75	75		150	150		250	250	
Furniture Storage Area	10%	Net sq.m. function room		8			15			25	
Entertainment Area					39			78			126
TV/Music Lounge	2	Net sq.m. per seat	15	30		30	60		45	90	
Music Room	9	Net sq.m. per room	1	9		2	18		4	36	
Game Room					164			268			408
Billiard Tables	40	Net sq.m. per table	2	80		4	160		6	240	
Ping Pong Tables	36	Net sq.m. per table	1	36		1	36		2	72	
Video Games	2	Net sq.m. per video game	24	48		36	72		48	96	
Quiet/Study Room	1	Net sq.m. per seat	10	10	10	20	20	20	30	30	30
Classroom	1	Net sq.m. per seat	15	15	15	20	20	20	30	30	30
Kitchen					24			48			72
Seating Area	1	Net sq.m. per seat	12	12		24	24		36	36	
Food Preparation/Storage Area	100%	Net sq.m. seating area		12			24			36	
SUB-TOTAL ACTIVITY AREA					335			599			941
ACTIVITY SUPPORT											
Toilets (male and female)					48			60			60
Water Closets/Urinals	3	Net sq.m. per fixture	6	18		8	24		8	24	
Lavatories	3	Net sq.m. per fixture	6	18		8	24		8	24	
Handicap Toilets	6	Net sq.m. per toilet	2	12		2	12		2	12	
Vending Machines	2	Net sq.m. per machine	2	4	4	4	8	8	4	8	8
Administration					36			53			71
Control Desk/ITT Counter	4	Net sq.m. per station	2	8		3	12		4	16	
Administrative Office	11	Net sq.m. per office	2	22		3	33		4	44	
Office Storage Area	25%	total Net sq.m. office		6			8			11	
SUB-TOTAL ACTIVITY SUPPORT					88			121			139
BUILDING SUPPORT					135			202			259
Entrance/Lobby/Circulation/ Housekeeping Supplies/Janitor's Closet/ Structure/Partitions	15-19%	total Net sq.m. for Activity Area and Activity Support		80			122			162	
Mechanical/Electrical/Communication Equipment Space	9-13%	total Net sq.m. for Activity Area and Activity Support		55			79			97	
TOTAL GROSS AREA (sq.m.)					**557**			**922**			**1,339**
Outdoor Patio	1	Net sq.m. per seat	12	12	12	24	24	24	36	36	36



LAYOUT DIAGRAM -- RECREATION CENTER
Medium Site Facility

740 55 YOUTH CENTER (SQ.M./SF)

Project Review: EFD, NAVFAC HQ, BUPERS (Pers-656D)
Commandant of the Marine Corps (CMC) code LFL
Design Criteria: *(Military Handbook is currently under development)*

1. **GENERAL.** See introduction to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** Youth Centers provide age-appropriate recreation activities that promote the psychological, social, and physical well-being of military and other eligible dependent youth ages 6 to 17 years. Programs accommodated may include: youth sports and physical fitness, social recreation, recreational skills development, personal development, teen activities, before and after school programs, day camp, special events and trips.

3. **RELATED FACILITIES.** The location of Youth Centers should be determined primarily for proximity to the family housing areas served - preferably accessible by the youth within fifteen minutes walk or bicycle ride. Collocation of Youth Centers with other MWR facilities is recommended, in particular with youth playing fields, outdoor playing courts, and playgrounds. Consideration should be given to potential savings in Youth Center space requirements for specific Activity Areas, if other MWR facilities provide the same functions conveniently accessible and available for use by the youth.

4. **DEMAND.** The primary functional components of a Youth Center - Multipurpose Gymnasium Court, Social Recreation Spaces including lounges, snack bar and games areas, Programmed Activities Classrooms and Before/After School Program Home Base - are sized on the basis of the peak period usage demand far the special component at each installation, as follows:

   a) Determine the total youth population of the anticipated service area of the proposed facility, based on school enrollment data. Youth population is subdivided into two significant groups: Elementary (ages 6-12), and Senior (ages 13-17). If the total eligible youth population is less than 300, accommodate youth programs in a Recreation Building/Community Center, Category Code 740 54.

   b) Calculate peak period demand by multiplying the population of each significant category by standard participation factors for each component, found in Tables 740 55A through 55G. Add the demand for all population categories to derive Total Demand for each functional component. Apply factors as directed in the Tables to determine the numbers of units required.

   c) Multiply the number of units required for each functional component by space allocation factors in Table 740 55. Add net area for all components and add support area factors as directed in Table 740 55, to derive the Total Facility Allowance.

5. **SPACE ALLOWANCES.** Space allowances for Youth Centers are determined according to the planning criteria presented in Table 740 55 below. The total allowance for a facility is the sum total of the space allocations for each functional component. The number of units of each component required to meet the demand is obtained from the calculations in Tables 740 55A, 740 55B, 740 55C, 740 55D, 740 55E, 740 55F, and 740 55G.

TABLE 740 55A
YOUTH CENTER MULTIPURPOSE GYMNASIUM DEMAND CALCULATION

Note	Population Category	Population (school enrollment in service area)	x	Participation Factor	=	Peak Period Demand	
(1),(2)	Elementary	.....	x	.048	=	.....	users
(1),(2)	Senior	.....	x	.200	=	+	users
				Total Demand	=	.....	users

For total demand of 75-175 users, provide one half-court unit
For total demand of 176 users or higher, provide one full-court unit

TABLE 740 55B
YOUTH CENTER LOUNGES DEMAND CALCULATION

Note	Population Category	Population (school enrollment in service area)	x	Participation Factor	=	Peak Period Demand	
(1),(2)	Elementary	.....	x	.007	=	.....	seats
(1),(2)	Senior	.....	x	.025	=	+	seats
		Total Demand (round to the nearest whole unit)			=	.....	seats

TABLE 740 55C
YOUTH CENTER SNACK BAR DEMAND CALCULATION

Note	Population Category	Population (school enrollment in service area)	x	Participation Factor	=	Peak Period Demand	
(1),(2)	Elementary	.....	x	.003	=	.....	seats
(1),(2)	Senior	.....	x	.011	=	+	seats
		Total Demand (round to the nearest whole unit)			=	.....	seats

TABLE 740 55D
YOUTH CENTER VIDEO GAMES DEMAND CALCULATION

Note	Population Category	Population (school enrollment in service area)	x	Participation Factor	=	Peak Period Demand	
(1),(2)	Elementary	.....	x	.005	=	.....	machines
(1),(2)	Senior	.....	x	.005	=	+	machines
		Total Demand (round to the nearest whole unit)			=	.....	machines

YOUTH CENTER POOL/BILLIARDS DEMAND CALCULATION

Note	Population Category	Population (school enrollment in service area)	x	Participation Factor	=	Peak Period Demand	
(1),(2)	Elementary	.....	x	.0003	=	.....	tables
(1),(2)	Senior	.....	x	.0015	=	+	tables
		Total Demand (round to the nearest whole unit)			=	.....	tables

TABLE 740 55F
YOUTH CENTER CLASSROOMS DEMAND CALCULATION

Note	Population Category	Population (school enrollment in service area)	x	Participation Factor	=	Peak Period Demand	
(1),(2)	Elementary	.....	x	.025	=	.....	users
(1),(2)	Senior	.....	x	.039	=	+	users
		Total Demand (round to the nearest whole unit)			=	.....	users

TABLE 740 55G
YOUTH CENTER BEFORE/AFTER SCHOOL PROGRAM HOME BASE DEMAND CALCULATION

Note	Population Category	Population (school enrollment in service area)	x	Participation Factor	=	Peak Period Demand	
(1),(2)	Elementary	.....	x	.080	=	.....	users
				Total Demand	=	.....	users
	multiply for user demand accommodated in home base at one time					x .33	
(3)		Total Home Base Capacity (round to the nearest whole unit)			=	.....	users

Notes for Demand Calculations - Tables 740 55A through 55G:

(1) The participation factors used in the tables are statistically adjusted to reflect differential effective usage patterns by the different population groups. These participation factors may be revised periodically by NAVFAC HQ and BUPERS, and the most current figures must be used in all demand calculations.

(2) If more than one Youth Center is located at an installation and each serves a defined population area, demand should be calculated separately for each facility, based on its projected service area.

(3) Although only one-third of program user population is accommodated in home base at one time, the number of lockers provided should equal the total projected before/after school user demand.

TABLE 740 55
SPACE ALLOWANCE FOR YOUTH CENTERS

Note	Table	Functional Component	# Units	x	Space Allocation Factor	=	Total Net Area	Minimum Net Area sq.m.(SF)
		ACTIVITY AREAS						
	A	Multipurpose Gymnasium	.....	x	353sq.m.(3800NSF) per half crt	=	+	
(1)		(incl. stage, storage)	.....	x	622sq.m.(6700NSF) per full crt	=	+	
		Social Recreation						
(2)	B	Lounges	.....	x	2sq.m.(20 NSF) per seat	=	+	
	C	Snack Bar (incl. seating, kitchen, storage)	.....	x	2sq.m.(25 NSF) per seat	=	+	37(400)
		Games Area						
	D	Video Games	.....	x	3sq.m.(33 NSF) per machine	=	+	
	E	Pool/Billiards	.....	x	28sq.m.(300 NSF) per table	=	+	
		Ping-pong	.....	x	33sq.m.(360 NSF) per table	=	+	
		Programmed Activities						
	F	Classrooms (incl. storage)	.....	x	2sq.m.(25 NSF) per user	=	+	46(500)
		Before/After School Program						
(3)	G	Home Base (incl. lockers)	.....	x	1sq.m.(15 NSF) per user	=	+	37(400)
					Subtotal Activity Areas		.....	
		ACTIVITY SUPPORT AREAS						
		Toilets			4% x Subtotal Activity Areas	=	.....	
		Administration/Equipment Issue/Laundry/Storage/ Support			6% x Subtotal Activity Areas	=	+	
					Subtotal Activity Support Areas	=	.....	
		BUILDING SUPPORT AREAS						
		Lobby/Circulation/Structure/ Partitions			20% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	.....	
		Mechanical/Electrical/ Communication Equip. Space			5-10% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	+	
(4),(5),(6)					TOTAL FACILITY ALLOWANCE	=	.....	Gross Area

Notes for Space Allowance Table:

(1) Gymnasium equipment storage - minimum 19 net square meter (200 NSF), included in Space Allowance Factor for court units.

(2) Lounges may include several spaces - television room, quiet room, teen lounge, etc. Separate space for teen lounge is recommended.

(3) One home base is to be provided in each Youth Center.

(4) Covered outdoor space (such as an entrance canopy or sheltered patio) is counted at 50% of its area, and must be included within the total gross area allowance for the facility.

(5) Minimum size for Youth Center - if total eligible population is less than 300, accommodate youth programs is Recreation Center/Community Center, Category Code 746 54 / 714 32.

(6) Maximum size for Youth Center - if total facility exceeds 2,140 square meters (23,000 GSF), provide multiple facilities whose combined size equals the total allowance.

sq.m. = square meter

NSF = Net Square Feet

GSF = Gross Square Feet

Minimum NSF = Minimum space allowance to be provided for the particular function or activity.

6. **ILLUSTRATIVE SPACE PROGRAMS.** Three space programs for small, medium and large Youth Centers are presented to illustrate the application of the space allocation factors, and the range of spaces and capacities which may be included in a facility. These space programs are provided for illustrative purposes only.

7. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a medium-size Youth Center. This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram is provided for illustrative purposes only.

YOUTH CENTER (Category Code 740 55)

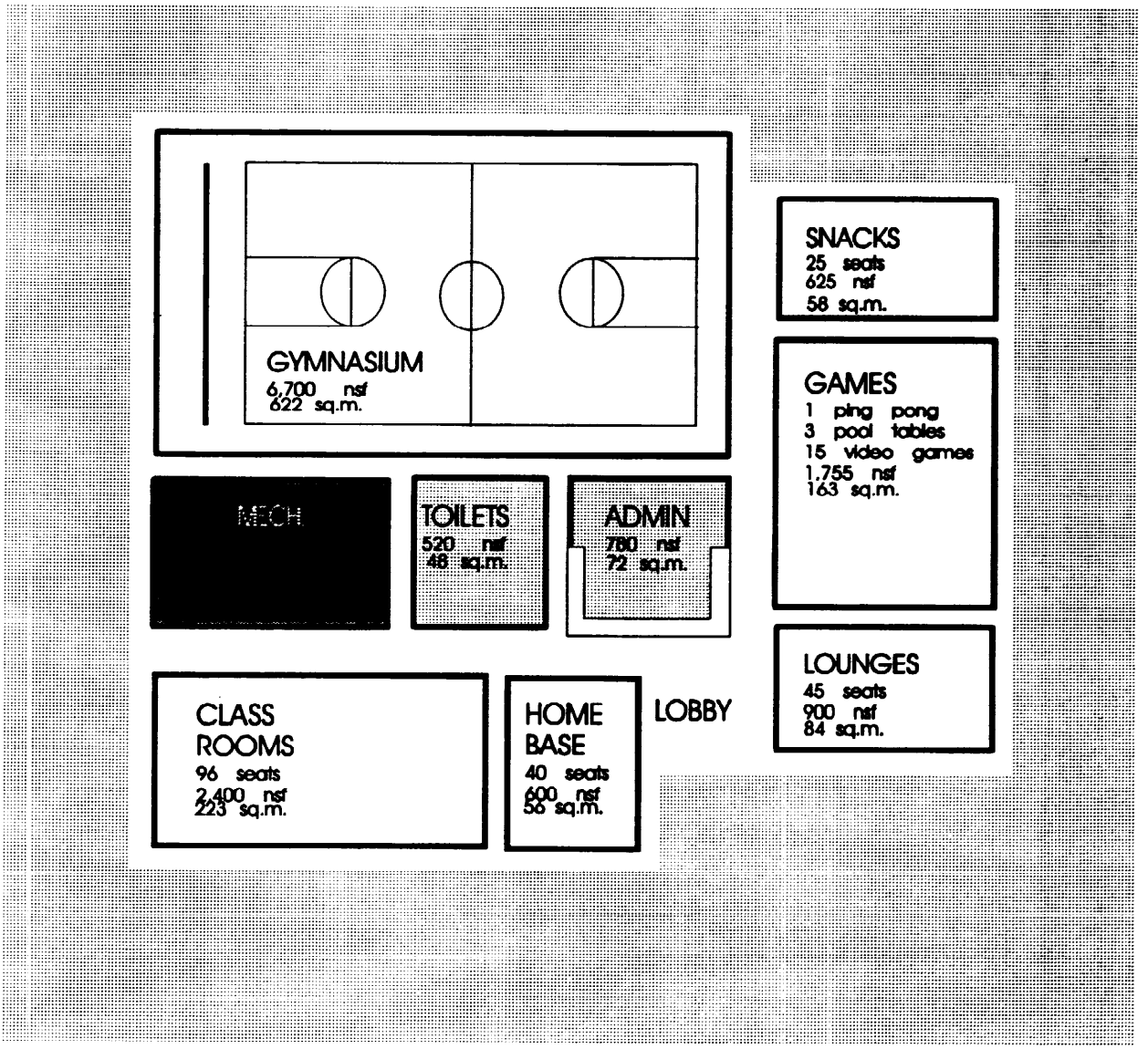
Sample Space Programs

Functional Components/ Sub-Components	Facility Size -- SMALL Capacity	Net sq.m.	Total Net sq.m.	Facility Size -- MEDIUM Capacity	Net sq.m.	Total Net sq.m	Facility Size -- LARGE Capacity	Net sq.m.	Total Net sq.m.
ACTIVITY AREAS									
MULTIPURPOSE GYMNASIUM									
Court (including stage/platform, storage)	1	353		1	622		1	622	
SOCIAL RECREATION									
Snack Bar (including seating, kitchen, storage)	16	32		25	50		36	72	
Games Area:									
Video Games	8	24		15	45		22	66	
Pool Tables	2	56		3	84		4	112	
Ping-pong	1	33		1	33		2	66	
Lounges	25	50		45	90		65	130	
PROGRAMMED ACTIVITIES									
Classrooms (including storage)	60	120		96	192		140	280	
BEFORE/AFTER SCHOOL PROGRAM									
Home Base	27	30		40	40		60	60	
Subtotal Activity Areas			698			1,156			1,408
ACTIVITY SUPPORT AREAS									
Toilets		30			50			60	
Administration/Equip. Issue/ Laundry/Storage/Support		40			70			80	
Subtotal Activity Support Areas			70			120			140
BUILDING SUPPORT AREAS									
Lobby/Circulation/Structure/ Partitions/Janitor's Closet		150			260			310	
Mechanical/Electrical/ Communication Equip. Space		80			110			120	
Subtotal Building Support Areas			230			370			430
TOTAL GROSS AREA (sq.m.)			998			1,646			1,978

OUTDOOR ACTIVITY AREAS

Basketball Court/Hard Surface Games

Playground



YOUTH CENTER - Medium Capacity

740 56 THEATER (sq.m./SF)

Space allowances for theaters will be determined by the following method:

Step 1: Determine basic authorized number and seating capacity from Table 740-56A.

Step 2: Determine Environmental Adjustment Factor from Table 740-56B and adjust the value obtained from Step 1 accordingly.

Step 3: Determine gross area requirements from Table 740-56C.

All facilities, except the general purpose facility, will be provided with a stage.

TABLE 740-56A
Authorized Numbers and Seating Capacities for Theaters

Military Population (1)	Number	Capacity Seat	Dressing Rooms
Up to 300	Note (2)		
301 to 1,000		General Purpose	without
1,001 to 2,000		350	With
2,001 to 3,000	1	500	With
3,001 to 7,000		1,000	With
7,001 to 10,000	1	1,000	With
	plus 1	500	Without
10,001 to 15,000	1	1,000	With
	plus 2	@ 500	Without
15,001 to 20,000	1	1,000	With
	plus 3	@ 500	Without
20,001 to 25,000		1,000	With
	plus 1	1,000	Without
	plus 2	@ 500	Without
Over 25,000	Note (3)		

(1) Military population is military strength plus 50% of dependents.
(2) Accommodate in Code 740 54 (Recreation Center) for small activities.
(3) Requirements will be based on individual engineering studies.

Environmental Adjustment Factors. The maximum allowances obtained from Table 740-56A must be adjusted to reflect available community support and other recreational facilities available on installation. Table 740-56B gives the environmental variables and the individual EAFs for each variable. The product of these individual EAF's is the final EAF to be used. An example of EAF use follows Table 740-56B.

TABLE 740-56B
Environmental Adjustment Factors for Theaters

Condition	Civilian Community Facilities (1)	Other Recreational Facilities (2)	Current Installation Theater (3)
Normal	0.70	0.70	1.00
Poor	1.00	1.00	0.50

(1) **Civilian Community Facilities**

Normal - At least one civilian theater or drive-in within 60 minutes driving time of installation and local TV or CATV reception.

Poor - No civilian theater or drive-in within 60 minutes driving time or no local TV or CATV.

(2) **Other Recreational Facilities (On-installation)**

Normal - Three or more of the following five facilities are either available or construction funds have been appropriate: 1) a club or open mess; 2) bowling alley; 3) hobby shop; 4) gymnasium; 5) playing courts and fields.

Poor - Two or less of the five facilities are available and no construction funds have been appropriated for them.

(3) **Current Installation Theatre** (Attendance)

Assuming films are shown nightly and changed once a week.

Normal - Two shows in a week are more than two-thirds full.

Poor - Two shows in a week are less than half-full or one show is less than two-thirds full.

Figures must be verified from monthly utilization reports.

EXAMPLE: Assume the military strength is 6,000. There are several theaters close by and the TV reception is good. The installation has only open messes and a gymnasium that currently doubles as a theater. Current attendance is less than one-third full for two shows.

1. **Maximum seating allowance** from Table 740-56A is: 1,000 seats

2. **Environmental Adjustment Factors:**
   - (a) Civilian community - **normal:** select 0.70
   - (b) Other recreational facilities - **poor** since only two of the five types are available: select 1.00
   - (c) Current attendance - **poor:** select 0.50

   Therefore EAF is (0.70) x (1.00) x (0.5) = 0.35

3. Adjusted seating capacity is: 1,000 x 0.35 = **350 seats (Use Table 740 56 for Gross Allowance)**

TABLE 740-56C
Space Allowances for Theaters

Capacity Seats	**Gross Area**			
	With Dressing Rooms		Without Dressing Rooms	
	sq.m.	SF	sq.m.	SF
General Purpose	325	3,500	325	3,500
350	604	6,500	539	5,800
500	1,010	10,900	892	9,600
1,000	1,600	17,200	1,440	15,500

740 60 Series

OPEN MESS - CAT CODE REFERENCE TABLE 740 60

	NAVY		MARINE CORP	
RANK	GRADE	USE CODE	GRADE	USE CODE
Commissioned Officers	COMM	740 60	COMM	740 60
Consolidated Officers/Enlisted	Comm/E1-E9	740 67	Comm/E1-E9	740 67
Enlisted Club	E1-E3 or E1-E6	740 63	E1-ES	740 63
Enlisted, Open	E1-E9	740 64	E1-E9	740 64
Staff NCO			E6-E9	740 66
Petty officers, open	E4-E9	740 66		
1st, 2nd, 3rd Class Petty	E4-E6	740 69		
Chief Petty Officers	E7-E9	740 70		

CLUBS (Future)
(FOOD / BEVERAGE / ENTERTAINMENT FACILITIES)

The 740-60 Series will be restructured and updated at a later time to reflect current market conditions and to maximize resources for operations. Bureau of Naval Personnel (BUPERS) will direct this effort.

For New Club Construction see CC 740 67

740 60 COMMISSIONED OFFICERS' MESS, OPEN (sq.m./SF)

Design Criteria: MIL-HDBK - 1037

Space Allowances are given in Table 740-60A.

Environment Adjustment Factors. The space allowances must be adjusted depending on distance between the installation and nearest metropolitan center with a population of 100,000 or more. After obtaining space allowance from Table 740-60A, enter Table 740-60B to obtain appropriate EAF multiplier.

TABLE 740-60A
Space Allowances for Commissioned Officers' Mess, Open

Officer Population (1)	**Gross Area** sq.m.	SF	Officer Population (1)	**Gross Area** sq.m.	SF
Up to 50	(2)	(2)	3,001 to 4,000	3,950	42,500
51 to 150	409	4,400	4,001 to 5,000	4,510	48,500
151 to 250	743	8,000	5,001 to 6,000	5,010	53,900
251 to 400	1,110	12,000	6,001 to 7,000	5,530	59,500
401 to 750	1,490	16,000	7,001 to 8,000	5,990	64,500
751 to 1,000	2,040	22,000	8,001 to 9,000	6,320	68,000
1,001 to 2,000	2,580	27,800	9,001 to 10,000	6,750	72,700
2,001 to 3,000	3,340	36,000			

(1) Officer population consists of active duty officers plus 50% of officers spouses and 50% of retired officers supported by the installation.

(2) Provide 4 sq.m. (44 SF) per person in other facilities

TABLE 740-60B
Environmental Adjustment Factors for Commissioned Officers' Mess, Open

Distance to Metropolitan Center with Population of 100,000 or more	**EAF**
More than 48 kilometers (30 miles)	1.00
Less than 48 kilometers (30 miles) but more than 24(15)	0.95
Less than 24 kilometers (15 miles)	0.90

740 63 ENLISTED CLUB (sq.m./SF)

Grades E1-E3, E4-E6 and USMC E4, E5

Design Criteria: MIL-HDBK - 1037

For enlisted club, grades E1 through E3

This is a recreational facility operated and controlled by the Navy Resale Systems Office. It is planned primarily far enlisted grades E1 through E3. Use Table 740-63 to calculate space requirements.

For a combined club facility, grades E1 through E6

As an alternative, the Command may eliminate Category Code 740 69 and provide a combined club facility for enlisted grades E1 through E3 and petty officer grades E4 through E6 (Marine Corps noncommissioned grades E4 and E5). Use Category Code 740 63 for a combined club. To calculate the total requirements, add the allowances for grades E1 through E3 from Table 740-63 and the allowances for grades E4 through E6 from Table 740-66A and apply the EAF from Table 740-66B.

TABLE 740-63
Space Allowances for Enlisted Clubs

Enlisted Strength (1)	**Gross Area** sq.m.	SF	Enlisted Strength (1)	**Gross Area** sq.m.	SF
Up to 500	(2)	(2)	15,001 to 20,000	6,500	70,000
501 to 1,000	929	10,000	20,001 to 25,000	7,430	80,000
1,001 to 3,000	1,770	19,000	25,001 to 30,000	8,360	90,000
3,001 to 5,000	2,790	30,000	30,001 to 40,000	10,200	110,000
5,001 to 7,000	3,720	40,000	40,001 to 50,000	12,100	130,000
7,001 to 10,000	4,650	50,000	50,001 to 60,000	13,900	150,000
10,001 to 15,000	5,570	60,000			

(1) Grades E1 through E3 (USN or USMC)

(2) Provide 1 sq.m. (12 square feet) per person in Code 740 54 facilities (Recreation Center for small activities).

740 64 ENLISTED MESS, OPEN (sq.m./SF)

Design Criteria: MIL-HDBK - 1037

This code is to be used in cases where one **consolidated open mess facility is planned to accommodate all enlisted grades (E1 through E9).**

To determine space requirements, combine allowances for Category Codes 740 63 and 740 66 (Enlisted Club and Petty Officers' Mess, Open).

740 66 PETTY OFFICERS' MESS, OPEN/STAFF NONCOMMISSIONED OFFICERS' (SNCO) CLUB (sq.m./SF)

Design Criteria: MIL-HDBK - 1037

For Navy Installations this code provides facilities for all petty officers in grades E4 through E9. If justified by the number of users, an installation may plan for two separate open messes:
One for grades E4 through E6 (use Code 740 69).
One for grades E7 through E9 (use Code 740 70).

For Marine Corps Installations this code provides facilities for staff noncommissioned officers in grades E6 through E9.

* The planning factors are the same for all groups and are given in Table 740-66A.

Environmental Adjustment Factors. The space allowances must be adjusted depending on distance between the installation and nearest metropolitan center with a population of 100,000 or more. After obtaining space allowance from Table 740-66A, obtain appropriate EAF multiplier from Table 740-66B.

TABLE 740-66A
Space Allowances for PO Mess, Open/SNCO Club

PO/SNCO Population (1)	**Gross Area** sq.m.	SF	PO/SNCO Population (1)	**Gross Area** sq.m.	SF
Up to 50	(2)	(2)	8,001 to 10,000	6,320	68,000
51 to 150	409	4,400	10,001 to 12,000	7,260	78,100
151 to 250	603	6,500	12,001 to 14,000	8,160	87,800
251 to 400	743	8,000	14,001 to 16,000	9,180	98,800
401 to 750	1,300	14,000	16,001 to 18,000	9,790	105,400
751 to 1,250	1,560	16,800	18,001 to 20,000	10,500	113,100
1,251 to 2,000	2,040	22,000	20,001 to 22,000	11,220	120,800
2,001 to 3,000	2,580	27,800	22,001 to 24,000	11,970	128,800
3,001 to 4,000	3,340	36,000	24,001 to 26,000	12,660	136,300
4,001 to 5,000	3,900	42,000	26,001 to 28,000	13,170	141,800
5,001 to 6,000	4,550	49,000	28,001 to 30,000	13,840	149,000
6,001 to 8,000	5,500	59,200			

(1) **NAVY** - EITHER E4 - E9 (for Code 740 66)
OR E4 - E6 (for Code 740 69) and E7 - E9 (for Code 740 70)
USMC - E6 - E9 for Code 740 66

Population is the active duty NCO's in the respective group plus 50% of their spouses and 50% of retired military personnel in that group.

(2) Provide 4 sq.m. (44 SF) per person in other facilities.

TABLE 740 66B
Environmental Adjustment Factors for PO Mess, Open/SNCO Club

Distance to Metropolitan Center with Population of 100,000 or more	**EAF**
More than 48 kilometers (30 miles)	1.00
Less than 48 kilometers (30 miles) but more than 24(15)	0.95
Less than 24 kilometers (15 miles)	0.90

740 67 CONSOLIDATED OFFICER/ENLISTED PERSONNEL MESS, OPEN

(This category code will become a primary facility in future revisions as: Food / Beverage / Entertainment / Facilities - Clubs) New projects will be reviewed by BUPERS

This code is used to plan the space requirements for a single facility to accommodate on-base facilities, surrounding competitive environment and size of the supporting population. The facility may include one or more of the following components: **Full Table Service Restaurant, Quick Service (over the counter) Restaurant, Banquet/Catering Room(s), Cafeteria, Beverage Lounge(s) with or without Entertainment** The space allowances for each component will be calculated based on projected annual revenues applied to the per-square-meter (per-square-foot) revenue criteria. Contact Bupers for additional information.

740 69 FIRST, SECOND, AND THIRD CLASS PETTY OFFICERS MESS, OPEN/NONCOMMISSIONED OFFICERS (NCO) CLUB (sq.m./SF)

Design Criteria: MIL-HDBK - 1037

For Navy Installations this code provides facilities for petty officers in grades E4 - E6.

For Marine Corps Installations: NCO clubs are not constructed.

See Code 740 66 for criteria. **EAF's apply - use Table 740 66B.**

740 70 CHIEF PETTY OFFICERS' MESS, OPEN (sq.m./SF)

GRADES E7 - E9

Design Criteria: MIL-HDBK - 1037

This code provides facilities for Navy Chief Petty Officers in grades E7 through E9.

See Code 740 66 for criteria. **EAF's apply - use Table 740-66B.**

740 71 CLASS VI PACKAGE STORE (sq.m./SF)

This facility provides for retail sales to authorized customers and the transfer (wholesale) of alcoholic beverages to clubs and open messes. See Table 740-71 for space allowances.

TABLE 740-71
Space Allowances for Package Stores

CONUS/Annual Case Sales (1) (2)	Overseas/Authorized Customers (3)	**Gross Area** sq.m.	SF
2,000	500	84	900
5,000	1,000	181	1,950
10,000	1,500	274	2,950
15,000	2,000	362	3,900
20,000	3,000	548	5,900
30,000	4,000	725	7,800
40,000	6,000	929	10,000

(1) Includes Alaska and Hawaii.
(2) Annual total case sales both retail and transferred to clubs and open messes.
(3) Authorized customers shall be as defined by Chief of Naval Personnel.

740 74 CHILD DEVELOPMENT CENTER (sq.m./SF)

Project Review: EFD - NAVFAC HQ. 20 - Bureau of Naval Personnel (BUPERS) code N-656D
Commandant of the Marine Corps (CMC) code LFL
Design Criteria: Mil-Hdbk-1037/2, Navy OPNAVINST 1700.9____Latest) "Child Development Programs"
Marine Corps. MCO 1710.30____Latest) "Child Development Services (USMC)

CHILD DEVELOPMENT CENTERS may be established as required to provide child care/development for children ages **6-weeks to 6 years old** for full-day, part-day, and hourly care. The maximum capacity for a center is 305 children When a need exists for more than **305 children,** consideration should be given to establishing additional centers. Space allowances for child development centers are shown in **Table 740-74.**

Space allowances provide for **infant, pre-toddler, toddler, and pre-school age activity rooms/spaces, infant crib space, isolation area with toilet, lobby/reception, food service/kitchen, staff training/lounge/curriculum development spaces, offices, laundry, toilets, janitor closet(s), and storage.**

Entrance canopies may be provided for pickup and discharge of passengers in inclement weather regions.

Outdoor shade structure(s) may be provided in high temperature areas.

Outdoor storage shed (playgrounds) may be provided according to Table 740-74A.

TABLE 740-74A
Space Allowances for Outdoor Storage

Size	Number Of Children	Gross Area sq.m.	Gross Area SF
Small	100 & below	14	150
Medium	200 & below	23	250
Large	305 & below	33	350

Outdoor play areas are based on **9 sq.m. (100 SF) per child up to 100 children.** When **greater than 100 children, add 5 sq.m. (50 SF) per additional child.** Play areas shall be located immediately adjacent to the CDC.

Capacity shall be determined by actual count of **Military Dependents** through age 6 receiving installation support who will be using the facility. Actual count must be determined by questionnaire, survey, documented historical data or similar process. **Dependents of Civilian Employees** through age 6 may be included as per DOD Instruction 6060.2 "Child Development Programs" of March 3, 1989. Justification remains the responsibility of the sponsoring command with requirements based on local needs. Adjust these figures for any projected increase/decrease in military/civilian employee population or mission changes.

New activities having no historical back-up: Determine the total number of married military families receiving direct installation support and multiply by 15 percent, plus the number of children of single parent military families receiving direct installation support. When including dependents of civilian employees, determine the total number of civilian employees and multiply by 2.5 percent.

Table 740-74
Space allowances for Child Development Centers

Number of Children	Building Gross Square Feet
0 - 24	**None Authorized**
25 - 305	**1000 GSF plus 65 GSF for each child.**

Total Area = Building GSF + 5-10% Equipment Space(s) (1) + Outdoor Storage Space(2)

Notes:

(1) Add an additional 5-10% (dependent on local conditions) of the building gross square footage for mechanical, electrical, and communication equipment space(s).

(2) In addition, add the gross area for the outdoor storage space..

740 75 NAVY FLYING CLUB FACILITY (sq.m./SF)

Reference: Federal Aviation Regulation (Part 141)

The Navy Flying Club is a recreational flying activity located on or near military installations used by authorized personnel and approved by the Department concerned. The space allowances shown in the Table below for aero clubs are intended to provide hangar space to be used to maintain aircraft and for aircraft storage during inclement weather to provide ramp space for outdoor aircraft tie-down area, and to provide multipurpose space for administrative, training, classrooms, operations scheduling, safety meetings, and flight planning. Space requirements are based on the number of aircraft operated by the club.

Each Navy Flying Club facility must have adequate area for refueling operations, ie. fuel truck or permanent tanks that meet all local, state, and federal regulations pertaining to that operation.

TABLE 740-75
Space Allowances for Aero Clubs

Number of Aircraft	**Gross Area Hangar Space** sq.m.	SF	**Gross Area + Multi-Purpose Space** sq.m.	SF	**Gross Area + Ramp Space** (Approx. 14m x 20m(45ft x 20ft))
1	84	900	46	500	For each aircraft operated
2 to 5	214	2,300	93	1,000	Multiply by 125 sq.m.(1350 SF) to
6 to 10	353	3,800	111	1,200	obtain the required Ramp Space.
11 to 15	492	5,300	139	1,500	
16 to 20	632	6,800	158	1,700	
For each additional 5 add	139	1,500	35	375	(# Aircraft) x 125 sq.m.(1350 SF) = Ramp Area

740 76 LIBRARY (sq.m./SF)

Main Libraries. This facility is for recreational reading and study. Space allowances are given in Table 740-76A. The allowances may be increased to 10% where the facility is also designated as a command reference center. If bookmobiles are operated from the main library, an additional 28 sq.m. (300 SF) per bookmobile will be required for book storage, trucks, and work space for bookmobile staffs.

Branch Libraries. Based on individual justification, branch libraries may be provided in support of an educational services office or for each increment of 3,000 military strength over 10,000. Each branch library shall not exceed 372 sq.m. (4,000 gross SF) area. Where practical, the individual incremental allowances may be combined in one branch library.

For BFR purposes: The total allowance is the main library plus the branch libraries.

TABLE 740-76A
Space Allowances for Main Libraries

Military Population (1)	**Gross Area**		Military Population (1)	**Gross Area**	
	sq.m.	SF		sq.m.	SF
Up to 500	232	2,500 (2)	20,001 to 26,000	2,790	30,000
501 to 1,500	418	4,500	26,001 to 32,000	3,340	36,000
1,501 to 2,500	581	6,250	32,001 to 40,000	4,090	44,000
2,501 to 4,000	743	8,000	40,001 to 50,000	5,020	54,000
4,001 to 6,000	975	10,500	50,001 to 60,000	5,950	64,000
6,001 to 8,000	1,110	12,000	60,001 to 70,000	6,760	72,800
8,001 to 12,000	1,670	18,000	70,001 to 80,000	7,530	81,000
12,001 to 16,000	1,860	20,000	80,001 to 90,000	8,360	90,000
16,001 to 20,000	2,230	24,000	90,001 to 100,000	9,110	98,000

(1) Military population is active duty military plus 40% of dependents.

(2) Accommodate in other facilities.

740 77 COMMUNITY STORAGE (READY ISSUE/SHOP STORE/MISC.)

(sq.m./SF) (Not applicable to Marine Corps activities)

Storage facilities for miscellaneous equipment and/or goods related to community support will be provided only where it can be individually justified. There are no criteria for this type of facility. General information on normal stacking heights, square meter per measurement metric ton (SF per measurement ton) requirements and other parameters are provided in Category Code 440 series.

740 78 RECREATION PAVILION (sq.m./SF)

The purpose of this facility is to support recreation areas such as parks, playgrounds, picnic areas, beaches, etc. This facility may include lounge, toilets, storage areas, snack bars, and/or concession stand for limited and related items as required. Space allowances may be utilized in varying numbers and sizes of pavilions. See Table 740-78 for space allowances.

TABLE 740-78
Space Allowances for Recreation Pavilions

Military Population (1)	**Gross Area** sq.m.	SF	Military Population (1)	**Gross Area** sq.m.	SF
Up to 1,000	74	800	30,001 to 40,000	678	7,300
1,001 to 3,000	125	1,350	40,001 to 50,000	790	8,500
3,001 to 7,000	242	2,640	50,001 to 60,000	892	9,600
7,001 to 10,000	297	3,200	60,001 to 70,000	985	10,600
10,001 to 15,000	372	4,000	70,001 to 80,000	1,070	11,500
15,001 to 20,000	455	4,900	80,001 to 90,000	1,150	12,400
20,001 to 25,000	520	5,600	90,001 to 100,000	1,240	13,300
25,001 to 30,000	585	6,300			

(1) Military population consists of active duty military plus 60% of dependent population and 25% of retirees supported by the installation.

740 79 RIDING STABLES (sq.m./SF)

Provides space for single stalls, box or double stalls, treatment stalls, quarantine areas, quarters for one operator, hay storage area, grain room, tack lockers, sweat pad and blanket drying area, office, and toilets. See Table 740-79 for space allowances.

TABLE 740-79
Space Allowances for Riding Stables

Military Population (1)	**Gross Area** sq.m.	SF	Military Population (1)	**Gross Area** sq.m.	SF
Up to 100	None	None			
101 to 1,000	195	2,100	25,001 to 30,000	1,190	12,800
1,001 to 3,000	232	2,500	30,001 to 40,000	1,650	17,800
3,001 to 5,000	334	3,600	40,001 to 50,000	1,730	18,600
5,001 to 7,000	437	4,700	50,001 to 60,000	1,900	20,400
7,001 to 10,000	548	5,900	60,001 to 70,001	2,120	22,800
10,001 to 15,000	715	7,700	70,001 to 80,000	2,310	24,900
15,001 to 20,000	892	9,600	80,001 to 90,000	2,510	27,000
20,001 to 25,000	1,050	11,250	90,001 to 100,000	2,690	29,000

(1) Military population consists of military strength plus 25% of dependent population.

740 80 GOLF CLUBHOUSE (SQ.M./SF)

Project Review: EFD, NAVFAC HQ, BUPERS (Pers-656D)
Commandant of the Marine Corps (CMC) code LFL
Design Criteria: *(Military Handbook is not currently available)*

1. **GENERAL.** See introduction to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** Golf Clubhouses provide facilities and services in support of golf course operations, to meet the recreation needs of military personnel. The facilities may also serve dependents, retirees and authorized civilians. Activities which may be accommodated in Golf Clubhouses include: bar/lounge service, snack bar food and beverage service, pro shop sales, equipment rental and storage (including possibly for cross-country skiing and other winter sports), golf facility administration, and grounds keeping and maintenance.

3. **RELATED FACILITIES.** Consideration should be given to collocating the Golf Clubhouse with the following recreational facilities in order to (i) take advantage of potential savings in space requirements and operating costs, and (ii) provide users with the increased convenience of clustered facilities:

- 740 53 Indoor Swimming Pool
- 740 84 Indoor Playing Courts
- 750 10 Outdoor Playing Courts
- 750 30 Outdoor Swimming Pool
- 750 40 Golf Course
- 750 56 Golf Driving Range.

4. **DEMAND.** The primary functional components of a Golf Clubhouse - Foodservice and Golf Equipment Areas - are sized based on the number of holes of the golf course and other user demand factors, as follows:

a) Use Table 740 80A to determine the seating demand for each foodservice area. Calculate the number of snack bar and lounge or combined snack bar/lounge seats required to serve golfing patrons, based on the number of golf course holes. Additional capacity may be required to serve non-golfing patrons in snack bar, lounge, and function room spaces, as directed in Notes (1) and (2) to Table 740 80A. Add golfing and non-golfing patron demand to determine number of seats required for each functional component.

b) Multiply the number of seats required for each functional component by the space allocation factors in Table 740 80B.

c) Demand for golf equipment facilities - pro shop, golf bag and cart storage - is directly related to the number of golf course holes. Multiply the number of 9-hole units by the space allocation factors in Table 740 80B.

d) Add the net area (NSF) for all components and add support area factors as directed in Table 740 80B, to derive the Total Facility Allowance for the Golf Clubhouse.

e) Demand for golf course support facilities - golf car storage and maintenance building - is directly related to the number of golf course holes and golf cars. Multiply the number of units for each functional component by the space allocation factors in Table 740 80C to determine the space allowances.

TABLE 740 80A
GOLF CLUBHOUSE FOODSERVICE SEATING CAPACITIES

Note	Number of Golf Course Holes	Snack Bar	Lounge	Combined Snack Bar/Lounge	Function Room
(1),(2)	9-18	20	10	25	–
(1),(2)	27-36	40	20	50	–
(1),(2)	45-54	60	30	75	–

Notes for Foodservice Seating Capacities:

(1) The figures for seating capacities accommodate only golfing patron demand. Additional snack bar, lounge, and combined snack bar/lounge capacity for non-golfing patrons must be justified by demand analysis and economic operations projections based on local conditions. For example, if the golf course is situated near other installation facilities with significant numbers of workers, there may be a substantial number of non-golfing patrons at lunchtime. In the absence of specific local installation data, assume that non-golfing patron demand requires a 100% increase in snack bar seating and 50% increase in lounge seating from that required to meet the demand of golfing patrons alone.

(2) The capacity of a function room should be based on the size of special events and large group functions for which there is a local requirement, justified by demand analysis and economic operations projections.

5. **SPACE ALLOWANCES.** Space allowances for Golf Clubhouse facilities are determined according to the planning criteria presented in Tables 740 80B and 740 80C, below. The total allowance for a facility is the sum total of the space allowances for each functional component. Seating capacity requirements for foodservice components are obtained from Table 740 80A.

Notes for Space Allowance Tables 748 80B and 748 80C:

(1) A combined snack bar/lounge may be provided as an alternative to separate snack bar and lounge areas.

(2) Minimum 19 sq.m. (280 NSF) for golf bag and art storage allows for 60 club sets (both patron-owned and rental), with bags and carts.

(3) Covered outdoor space (such as an entrance canopy or sheltered patio) is counted at 50% of its area, and mast be inclined within the total gross area allowance for the facility.

(4) For safety reasons, the golf car storage facility should be a separate structure, or designed for safety separation if accommodated in the same structure.

(5) For safety reasons, the maintenance building should be a separate structure. Space for pesticide/fertilizer storage should be designed for safety separation if accommodated in the same structure.

sq.m. = square meter

NSF = Net Square Feet

GSF = Gross Square Feet

Minimum NSF = Minimum space allowance to be provided for the particular function or activity.

TABLE 740 80B
SPACE ALLOWANCES FOR GOLF CLUBHOUSES

Note	Table	Functional Component	# Units	x	Space Allocation Factor	=	Total Net Area	Minimum Net Area sq.m.(SF)
		ACTIVITY AREAS						
		Foodservice						
	A	Snack Bar (including seating, kitchen, storage)	.....	x	3sq.m.(27 NSF) per seat	=	.....	
	A	Lounge (including seating, bar, storage)	.....	x	2sq.m.(20 NSF) per seat	=	+	
(1)	A	Combined Snack Bar/ Lounge (including seating, kitchen, bar, storage)	.....	x	2sq.m.(25 NSF) per seat	=	+	
	A	Function Room (including seating, service kitchen)	.....	x	2sq.m.(17 NSF) per seat	=	+	
		Golf Equipment						
		Pro Shop (including sales area, stockroom)	.....	x	46sq.m.(500 NSF) per 9 holes	=	+	49(530)
(2)		Golf Bag and Cart Storage/Rental	.....	x	14sq.m.(150 NSF) per 9 holes	=	+	19(200)
					Subtotal Activity Areas	=	.....	
		ACTIVITY SUPPORT AREAS						
		Patron Support (including lockers, showers, toilets)			20% x Subtotal Activity Areas	=	.....	
		Administration/Storage/ Support			5% x Subtotal Activity Areas	=	+	11(120)
					Subtotal Activity Support Areas	=	.....	
		BUILDING SUPPORT AREAS						
		Lobby/Circulation/Structure/ Partitions			25% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	+	
		Mechanical/Electrical/ Communication Equip. Space			5-10% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	+	
(3)					TOTAL FACILITY ALLOWANCE	=	.....	Gross Area

TABLE 740 80C
SPACE ALLOWANCES FOR GOLF COURSE SUPPORT FACILITIES

Note	Table	Functional Component	# Units	x	Space Allocation Factor		Total Net Area	Minimum Net Area sq.m.(SF)
(4)		Golf Car Storage	.....	x	6sq.m.(65 NSF) per car	=	.....	
(5)		Maintenance Building	.....	x	232sq.m.(2,500 NSF) per 9 holes	=	.....	348(3,750)

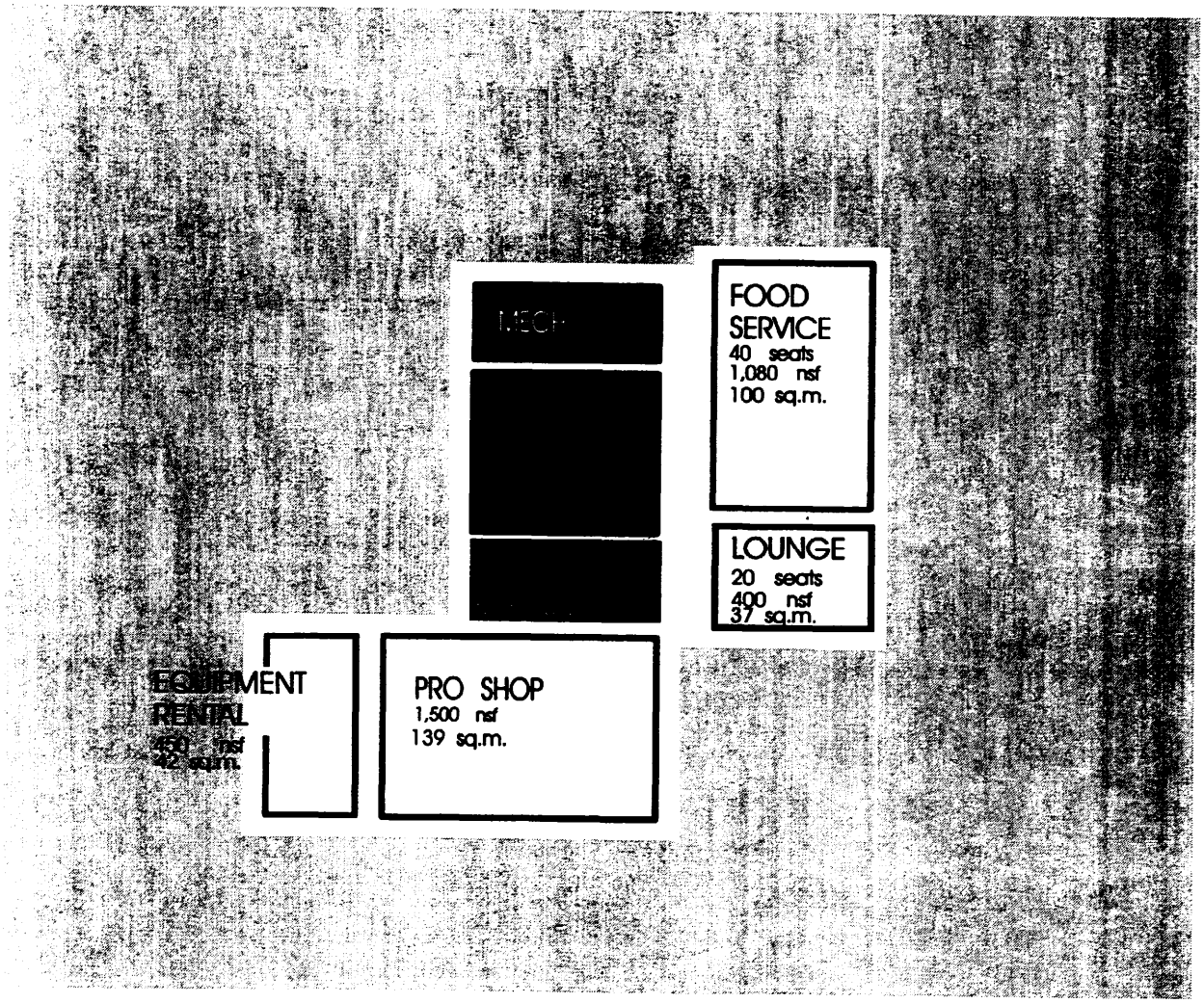
5. **ILLUSTRATIVE SPACE PROGRAMS.** Three space programs for small, medium and large Golf Clubhouses are presented to illustrate the application of the space allocation factors, and the range of spaces and capacities which may be included in a facility. These space programs are for illustrative purposes only.

6. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a medium-size Golf Clubhouse facility. This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram is for illustrative purposes only.

GOLF CLUBHOUSE (Category Code 740 80)

Sample Space Programs

Functional Components/ Sub-Components	Facility Size -- SMALL Capacity	Net sq.m.	Total Net sq.m.	Facility Size -- MEDIUM Capacity	Net sq.m.	Total Net sq.m.	Facility Size -- LARGE Capacity	Net sq.m.	Total Net sq.m.
ACTIVITY AREAS									
FOOD AND BEVERAGES									
Foodservice (including seating, kitchen, storage)	20	60		40	120		60	180	
Lounge Bar (including seating, bar, storage)	10	30		20	60		30	90	
Function Room (including seating, service kitchen)							45	90	
GOLF EQUIPMENT									
Pro Shop (including sales area, stockroom)		92			138			184	
Golf Bag and Cart Storage/ Rental	120	28		180	41		240	55	
Subtotal Activity Areas			210			359			599
ACTIVITY SUPPORT AREAS									
Patron Support (including lockers, showers, toilets)		40			70			120	
Administration/Storage/ Support		11			20			30	
Subtotal Activity Support Areas			51			90			150
BUILDING SUPPORT AREAS									
Lobby/Circulation/Structure/ Partitions/Janitor's Closet		70			90			150	
Mechanical/Electrical/ Communication Equip. Space		30			40			10	
Subtotal Building Support Areas			100			130			160
TOTAL GROSS AREA (sq.m.)			361			579			909
Golf Car Storage	30	180	180	60	360	360	100	600	600
Maintenance Building	18 holes	464	464	27 holes	696	696	36 holes	928	928



GOLF CLUBHOUSE - Medium Capacity

740 81 MWR RENTAL CABIN (sq.m./SF)

Project Review: Base MWR representatives, EFD, NAVFAC HQ, BUPERS (Pers-656D)
Design Criteria: (Military Handbook is not currently available)

1. **GENERAL.** See General Notes to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** MWR Rental Cabins are permanent "stand-alone" or multiplex structures. Such Rental Cabins are typically developed to provide accommodation in locations which offer outdoor recreation opportunities such as boating, canoeing, fishing, hunting, hiking, skiing, and swimming. Given their typical settings, Rental Cabins are generally rustic in nature, with limited amenities, and used solely for recreational purposes. Mobile homes, trailers, RV sites and campers are not included under this category code, although such facilities may share sites and support facilities with Rental Cabins.

   In addition to sleeping areas, each Rental Cabin may include a living/dining space, kitchenette, b&room and storage area. An open or covered outdoor seating terrace may also be provided in locations with mild, warm or hot climates.

   Each cluster of cabins should also be provided with a janitor's closet and a small storage area for linen, and housekeeping supplies and equipment. This type of support space may be attached to one of the cabins.

3. **RELATED FACILITIES.** Locations suitable for the development of MWR Rental Cabins may also include RV sites, camping sites and support facilities to provide patrons with a range of options for accommodation. Support facilities may include recreation centers with lounges, games areas (including pool tables, video games and ping-pong tables) and snack bars, administration offices and supply stores.

   Where such locations are on waterfronts, other facilities providing support for recreational activities, such as marinas, and boat repair and storage yards, may share sites with Rental Cabins.

4. **SPACE ALLOWANCE.** Space allowances for Rental Cabins need to address the following two issues:

   Total Number of Rental Cabins

   The total number of Rental Cabins planned for a site should be based on the following considerations:

   - Capacity of of the site to accommodate the development of cabins in a manner which is both economical and environmentally appropriate. Critical site planning considerations include vehicular access and parking, utilities, privacy, views, and preservation of flora and fauna. For example, the development of a sufficient number of Rental Cabins in a location with steep, densely wooded slopes would need to weigh the costs of infrastructure provision and the clearing of areas with its impact on vegetation and wildlife.

   - Return-on-investment analysis based on projected demand, revenues, capital investment, and operating and maintenance costs. This type of analysis will determine the financial feasibility of the proposed project and the number of cabins required to ensure a viable outcome.

Sizes of Individual Rental Cabins

The size of individual cabins is based on the capacity per cabin, determined primarily on the number of bed spaces to be accommodated. The number of bed spaces per cabin should be based on the pattern of the projected demand for accommodation. In most cases, it is likely that demand data analysis will indicate a need for some combination of Rental Cabins with 4-, 6- and 8-bed capacities. The maximum space allowance for the different sizes of Rental Cabins is presented in Table 740 81A below.

TABLE 740 81A
SPACE ALLOWANCE FOR MWR RENTAL CABINS

Capacity	Maximum Space Allowance (Gross Area)	
	sq.m.	SF
4 beds	84	900
6 beds	121	1,300
8 beds	158	1,700

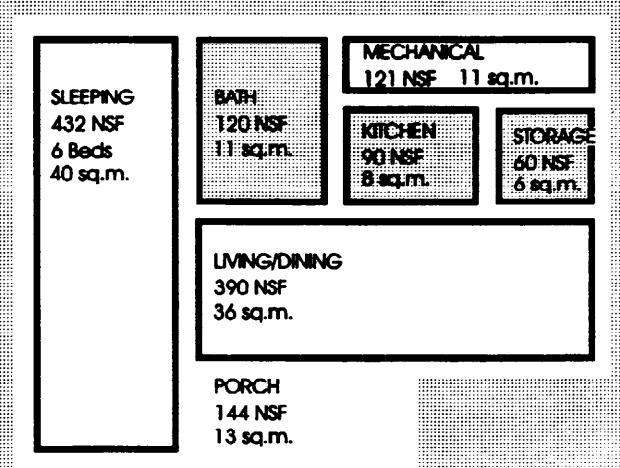
5. **ILLUSTRATIVE SPACE PROGRAMS.** Space programs for 4-, 6- and 8-bed MWR Rental Cabins are presented to illustrate the possible breakdown of the overall space allowances into functional components, with their respective sizes and capacities. These space programs are for illustrative purposes only.

6. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a 6-bed MWR Rental Cabin, illustrating the relative sizes and adjacencies of component areas. A second diagram illustrates some site planning principles for organizing a group of MWR Rental Cabins. The layout diagram is for illustrative purposes only.

MWR RENTAL CABINS (Category Code 740 81)

Sample Space Program for Typical Units

Functional Component/ Sub-Component	Space Allocation Standard		4-BED CABIN Capacity	4-BED CABIN Net sq.m.	4-BED CABIN Sub-Total Net sq.m.	6-BED CABIN Capacity	6-BED CABIN Net sq.m.	6-BED CABIN Sub-Total Net sq.m.	8-BED CABIN Capacity	8-BED CABIN Net sq.m.	8-BED CABIN Sub-Total Net sq.m.
ACTIVITY AREA					66			102			132
Sleeping Area	7	Net sq.m. per bed	4	28		6	42		8	56	
Bathroom	6	Net sq.m. per bathroom	1	6		2	12		2	12	
Living/Dining Area	6	Net sq.m. per bed	4	24		6	36		8	48	
Kitchenette	1	Net sq.m. per bed	4	4		6	6		8	8	
Storage	1	Net sq.m. per bed	4	4		6	6		8	8	
BUILDING SUPPORT											
Mechanical/Electrical/Communication Equipment Space	10%	total Net sq.m. for facility		7	7		11	11		15	15
Structure/Partitions	5%	total Net sq.m. for facility		4	4		6	6		7	7
TOTAL Gross Area (sq.m.)					77			119			154
OUTDOOR AREA											
Porch	2	**Net sq.m. per person**	4	8	8	6	12	12	8	16	16



LAYOUT DIAGRAM -- MWR RENTAL CABIN
6 Bed Capacity

740 82 PUBLIC TELEPHONE FACILITY (sq.m./SF)

This code is for public telephone facilities at **Marine Corps recruit training** installations.

740 84 INDOOR PLAYING COURTS (SQ.M./SF)

Project Review: EFD, NAVFAC HQ, BUPERS (Pers-656D)
Commandant of the Marine Corps (CMC) code LFL
Design Criteria: *(Military Handbook is currently underr development)*

1. **GENERAL.** See introduction to 740 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** Indoor Playing Courts provide facilities and support services to meet the individual physical fitness and recreation needs of military personnel. The facilities may also serve dependents, retirees and authorized civilians. Activities which may be accommodated in Indoor Playing Courts include: athletic gear issue, handball, racquetball and wallyball.

3. **RELATED FACILITIES.** Consideration should be given to collocating the Indoor Playing Courts with the following recreational facilities in order to (i) take advantage of potential savings in space requirements and operating costs, and (ii) provide users with the increased convenience of clustered facilities:

   - 740 43 Gymnasium
   - 740 45 Fitness Center
   - 740 50 Field House
   - 750 10 Outdoor Playing Courts
   - 750 20 Playing Fields.

4. **DEMAND.** The number of Indoor Playing Courts and size of facility provided at each installation is determined on the basis of the peak hour usage, as follows:

   a) Use projected base loading data to determine the population for each significant user population category, as listed in Table 740 84A.

   b) Calculate peak hour demand by multiplying the population for each category by participation factors found in Table 740 84A. Add the demand for all categories to derive Total Demand.

   c) Calculate the number of Indoor Playing Courts required by dividing the Total Demand by the maximum capacity per hour per court, as indicated in Table 740 84A. Subtract the number of MWR indoor courts available elsewhere at the installation, to determine the number of courts required in an Indoor Playing Courts Facility.

   d) Multiply the number of courts required by the space allocation factor in Table 740 84. Add the net area for the courts and the support area factors as directed in Table 740 84, to derive the Total Facility Allowance.

TABLE 740 84A
INDOOR PLAYING COURTS DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0021	=	.....	users
(1),(2)	Officers	.....	x	.0020	=	+	users
(1),(2)	Retirees	.....	x	.0005	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0007	=	+	users
				Total Demand	=	.....	users
				divide by maximum capacity per court per hour		÷ 6	
				Total Number of Courts (round to the nearest whole unit)	=	.....	courts
				subtract number of courts available at other MWR facilities on the installation (for example, at the Gymnasium or Fitness Center)		-	courts
				Total Number of Courts required in Indoor Playing Courts Facility	=	.....	courts

Notes for Indoor Playing Courts Demand Calculatiom:

(1) **Population numbers should be consistent with projected base loading data. Officers are O-1 through O-10 and enlisted are E-1 through E-9. Civilians are authorized DoD employees. Retirees are all military retirees within a 30-minute drive of the installation.**

For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all the nondeployable population, plus two-thirds of the deployable population, to reflect time away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations.

(2) **Usage of facilities by spouses and dependents has been statistically incorporated in the participation factors. These participation factors may be revised periodically by NAVFAC HQ and BUPERS, and the most current figures must be used in all demand calculations.**

5. **SPACE ALLOWANCES.** Space allowances for Indoor Playing Courts facilities are determined according to the planning criteria presented in Table 740 84 below. The total allowance for a facility is the sum total of the space allowances for each functional component. The number of indoor playing courts required to meet the demand is obtained from the calculations in Table 740 84A.

TABLE 740 84
SPACE ALLOWANCE FOR INDOOR PLAYING COURTS

Note	Table	Functional Component	# Units	x	Space Allocation Factor	=	Total Net Area	Minimum Net Area sq.m.(SF)
		ACTIVITY AREAS						
	A	Racquetball Court	.....	x	74sq.m.(800 NSF) per court	=	+	
					Subtotal Activity Areas		.....	
		ACTIVITY SUPPORT AREAS						
		Patron Support (including lockers, showers, toilets, sauna, whirlpool)			10% x Subtotal Activity Areas	=	.....	
		Administration/Storage/Support			5% x Subtotal Activity Areas	=	+	19(200)
					Subtotal Activity Support Areas	=	.....	
		BUILDING SUPPORT AREAS						
		Lobby/Circulation/Structure/ Partitions			20% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	.....	
		Mechanical/Electrical/ Communication Equip. Space			5-10% x (Subtotal Activity Areas + Subtotal Activity Support Areas)	=	+	
(1)					TOTAL FACILITY ALLOWANCE	=	.....	Gross Area

Notes for Space Allowance Table:

(1) Covered outdoor space (such as an entrance canopy or sheltered patio) is counted at 50% of its area, and must be included within the total gross square footage allowance for the facility.

sq.m. = square meter
NSF = Net Square Feet
GSF = Gross Square Feet
Minimum NSF = Minimum space allowance to be provided for the particular function or activity.

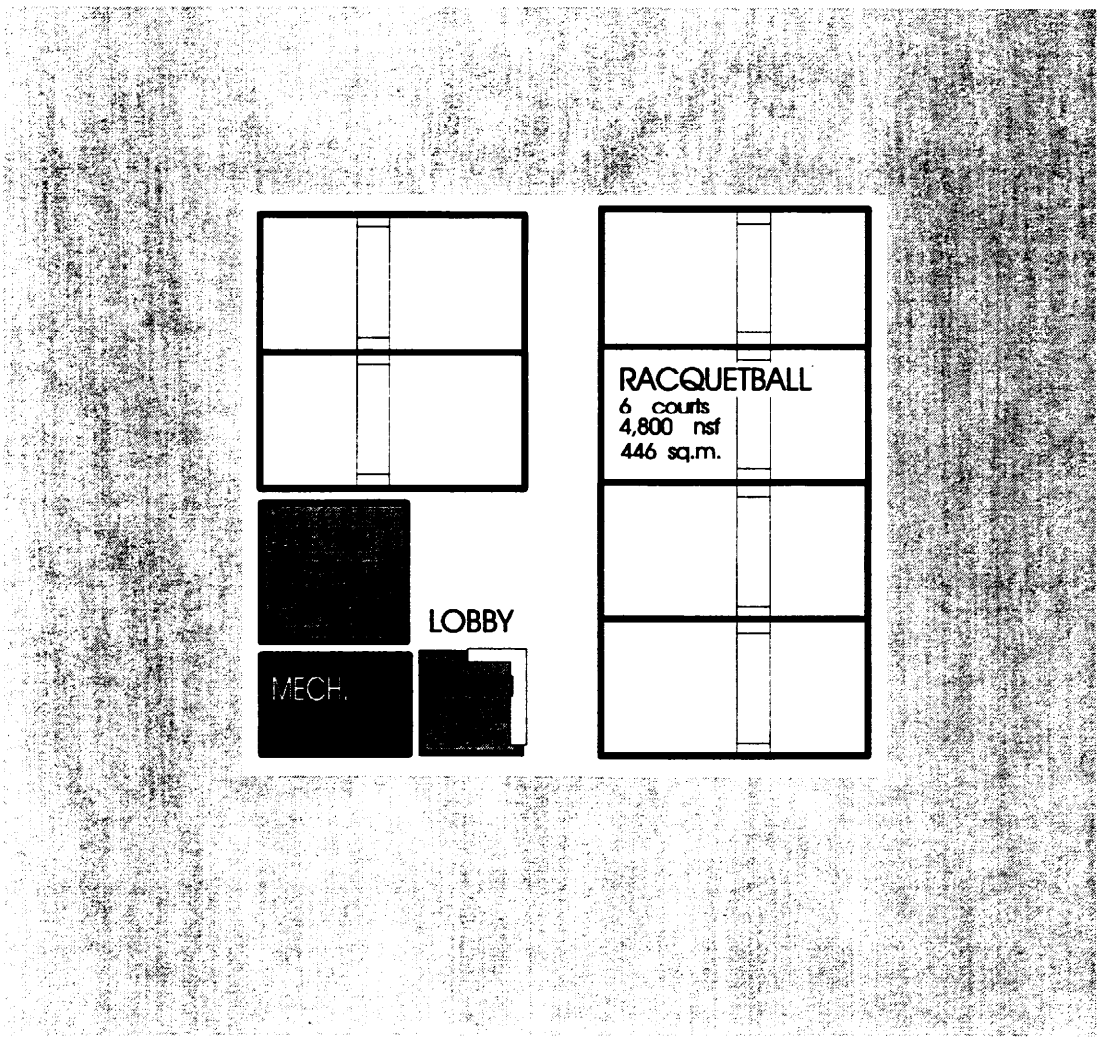
6. **ILLUSTRATIVE SPACE PROGRAMS.** A space program for a medium-size Indoor Playing Courts Facility is presented to illustrate the application of the space allocation factors, and the range of spaces and capacities which may be included in a facility. This space program is for illustrative purposes only.

7. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a medium-size Indoor Playing Courts Facility. This diagram is an example of the composition of such a facility in terms of its functional components, their respective sizes and adjacencies. The layout diagram for illustrative purposes only.

INDOOR COURTS COMPLEX (740 84)

Sample Space Program

Functional Components/ Sub-Components	Facility Size -- MEDIUM		
	Capacity	Net sq.m.	Total Net sq.m.
ACTIVITY AREAS			
Racquetball Court	6	444	
Subtotal Activity Areas			444
ACTIVITY SUPPORT AREAS			
Patron Support (including lockers, showers, toilets)		44	
Administration/ Storage/Support		20	
Subtotal Activity Support Areas			64
BUILDING SUPPORT AREAS			
Lobby/Circulation/Structure/ Partitions/Janitor's Closet		100	
Mechanical/Electrical/ Communication Equip. Space		50	
Subtotal Building Support Areas			150
TOTAL GROSS AREA (sq.m.)			**658**



INDOOR COURTS COMPLEX - Medium Capacity

740 85 EXCHANGE CENTRAL WAREHOUSE (sq.m./SF)

NOTE: The establishment of an exchange central warehouse must be coordinated through Navy Resale and Services Support Office or CMC.

This type warehouse may be provided for bulk back-up storage (exchange stock and operating supplies) to support all exchange operations within a geographical area as determined by NAVRESSO or Marine Corps Exchange Services.

This central warehouse allowance does not void the need for the installation exchange warehouse, Code 740-86, preferably located contiguous to the exchange main retail store. Space allowances for central warehouses shall not exceed those computed under the following procedures:

1. The basic space allowance for a central warehouse building will accommodate receiving and marking activities, storage, offices, restrooms, etc. (excluding distribution and shipping departments, exterior docks, platforms, ramps, etc.). The basic space allowances will be determined by first computing the warehouse monthly inventory dollar average for the highest six months of the year (central warehouse only); next identifying the percentage of increase in the Department Store Inventory Price Index (Store Total) since 1967; then reducing the inventory dollar average by that percentage; and then dividing this adjusted dollar amount by the applicable "average dollars per square meter (foot) factor selected from Column (3) of Table 740-85A. Selection of this factor (divider) from the Table will be based on the clear vertical space of the existing or planned warehouse building(s) involved (Column 1). If the developed basic space requirement is to be satisfied within one structure and this structure provides a clear vertical space of 4 meters (14 feet) or more, the basic space requirement will be reduced by applying the efficiency adjustment factor obtained from Table 740-85B.

Department Store Inventory Price Index can be obtained from any regional office of the U.S. Department of Labor, Bureau of Labor Statistics or Navy Resale System Office. The base year for the index of 1941 was 100. Since 1967 was the base date of these space criteria, Department Store Inventory Price Index has to be adjusted to show increase from that year to present. Index for 1967 was 216.0. **Adjustment is made by the following calculation:**

Example (for January 1979): Department store Inventory Price Index = 364.4

$$\frac{\text{Present Index}}{\text{1967 Index}} \times 100 = \frac{364.4}{216.0} \times 100 = 168.70 = \text{Adjusted Index.}$$

2. In addition to the basic space allowance, an allowance for the distribution and shipping departments may be authorized. This additional allowance will be computed by adding 9 sq.m. (100 square feet) for each location exchange to be served by the central warehouse.

3. In addition to the space allowances provided by 1 and 2, above, space may be provided for covered and/or raised loading platforms. Space allowances for these will not exceed 20% of the total space authorized by 1 and 2, above. An example of computation is given following Table 740-85B.

TABLE 740-85A
Central Warehouse Inventory Value - Dollars Per Gross Area

Column: 1 Clear Vertical Space		2 Maximum Stacking Height		3 Average Dollars Per **Gross Area**	
meters	Ft	meters	Ft-inch	$/sq.m.	$/GSF
5.5	18	4.6	15-0	252.40	23.45
5.2	17	4.3	14-0	237.88	22.10
4.9	16	4.0	13-0	223.89	20.80
4.6	15	3.7	12-0	216.35	20.10
4.3	14	3.7	12-0	216.35	20.10
4.0	13	3.5	11-6	209.36	19.45
3.7	12	3.2	10-6	194.29	18.05
3.4	11	2.9	9-6	178.68	16.60
3.0	10	2.6	8-6	160.38	14.90
2.7	9	2.3	7-6	141.55	13.15

TABLE 740-85B
Central Warehouse Efficiency Adjustment Factor

Gross Area sq.m.	SF	Reduce by	**Gross Area** sq.m.	SF	Reduce by
1,860 to 2,790	20,000 to 30,000	1.0%	6,501 to 7,430	70,001 to 80,000	3.5%
2,791 to 3,720	30,001 to 40,000	1.5%	7,431 to 8,360	80,001 to 90,000	4.0%
3,721 to 4,650	40,001 to 50,000	2.0%	8,361 to 9,290	90,001 to 100,000	4.5%
4,651 to 5,570	50,001 to 60,000	2.5%	Over 9,290	over 100,000	5.0%
5,571 to 6,500	60,001 to 70,000	3.0%			

Example: Assume that the planned central warehouse will have an average monthly dollar inventory of $1,800,000 (based on the highest 6 months of the year), the proposed warehouse will be in one building with a clear vertical space of 5 meters (15 feet) and that 27 exchange retail branches are to be served.

Step 1: Divide the average monthly dollar inventory of $1,800,000 by the adjusted percent change in the current Department Store Inventory Price Index since 1967 (adjusted index, January 1979- 168.70).

$$\frac{\$1,800,000}{168.70} \times 100 = \$1,066,983$$

Step 2: Determine basic space allowance by dividing the average monthly dollar inventory by the average dollars per square meter (SF) factor for 5 meters (15 ft.) vertical clear space (from Table 740-85A, column 3).

$$\frac{1{,}066{,}983}{216.35\ \$/\text{sq.m.}} = 4{,}932\ \text{sq.m.} \qquad \frac{1{,}066{,}983}{20.10\ \$/\text{SF}} = 53{,}084\ \text{SF}$$

Step 3: Reduce basic space allowance obtained in Step 1 by applying efficiency adjustment factor for 4,932 sq.m. (53,084 gross SF) warehouse (from Table 740-85B).

4,932 sq.m. - (4,932 x 0.025) = 4,932 sq.m. - 123 sq.m. = 4,809 sq.m.
53,084 SF - (53,084 x 0.025) = 53,084 SF - 1,327 SF = 51,757 SF

Step 4: Add allowance for distribution and shipping department (9 sq.m.(100 SF) for each branch retail exchange Served).

4,809 sq.m. + (9 sq.m. x 27) = 4,809 sq.m. + 243 sq.m. = 5,052
51,757 SF + (100 SF x 27) = 51,757 SF + 2,700 SF = 54,457
This is the total space allowance for central warehousing building.

Step 5: Determine maximum additional space allowance for covered and/or raised loading platforms (200% of total building allowance).

(5052 sq.m. x 0.20) = 1,010 sq.m.
(54,457 SF x 0.20) = 10,891 SF

740 86 EXCHANGE INSTALLATION WAREHOUSE (sq.m./SF)

The total storage space that may be provided in installation exchange warehouses to accommodate back-up storage for exchange retail activities on an installation will not exceed, in CONUS, 33% and in Alaska, Hawaii and overseas, 50% of the space authorized for the main retail store on the installation. Wherever practicable, the installation exchange warehouses shall be located contiguous to the exchange main retail store in order to reduce the cost of moving stock from the warehouse to the main store sales area.

740 87 MARINA SUPPORT BUILDING (sq.m./SF)

This facility provides space for office, equipment check-out, repair, and storage. It does not include docks, marina slips, and walkways which are listed under Code 750 60. This is a special facility which is required only at outdoor recreation areas which have waterfront facilities available for boating activities. See Table 740-87 for space allowances.

TABLE 740-87
Space Allowances for Marina Support Building

Military Population (1)	**Gross Area** sq.m.	SF	Military Population (1)	**Gross Area** Sq.m.	SF
up to 100	None	None	25,001 to 30,000	2,040	22,000
101 to 1,000	325	3,500	30,001 to 40,000	2,190	23,600
1,001 to 3,000	539	5,800	40,001 to 50,000	2,360	25,400
3,001 to 5,000	785	8,450	50,001 to 60,000	2,510	27,000
5,001 to 7,000	975	10,500	60,001 to 70,000	2,630	28,300
7,001 to 10,000	1,180	12,650	70,001 to 80,000	2,740	29,500
10,001 to 15,000	1,450	15,600	80,001 to 90,000	2,840	30,600
15,001 to 20,000	1,740	18,700	90,001 to 100,000	2,940	31,600
20,001 to 25,000	1,930	20,800			

(1) Military population consists of military strength plus 15% of dependent population.

740 88 EDUCATIONAL SERVICES OFFICE (sq.m./SF)

The space allowances shown in Table 740-88 are intended to provide facilities for the advancement of the academic, technical, and vocational education of military personnel of all grades and ranks in order to enhance their potential to the service. These facilities shall make joint use of existing classrooms or other suitable facilities to the maximum extent possible. In cases where joint use is impractical and separate educational facilities are requested, detailed supporting justification is required. When justified by installation requirements, a supporting branch library may be provided in accordance with criteria for Code 740 76.

TABLE 740-88
Space Allowances for Educational Services Offices

Military Strength	Gross Area					
	Basic		OJT (1)		CAC (2)	
	sq.m.	SF	sq.m.	SF	sq.m.	SF
up to 250		(3)	None	None	None	None
251 to 1,000	383	4,125	28	300	46	500
1,001 to 3,000	808	8,700	46	500	46	500
3,001 to 5,000	1,250	13,500	65	700	46	500
5,001 to 7,000	1,500	16,100	84	900	46	500
7,001 to 10,000	1,840	19,800	111	1,200	46	500
10,001 to 15,000	2,440	26,300	158	1,700	46	500
15,001 to 20,000	2,950	31,800	204	2,200	46	500
20,001 to 25,000	3,370	36,300	251	2,700	46	500
25,001 to 30,000	3,760	40,500	297	3,200	46	500
30,001 to 40,000	4,460	48,000	344	3,700	46	500
40,001 to 50,000	5,110	55,000	390	4,200	46	500
50,001 to 60,000	5,570	60,000	437	4,700	46	500

(1) On-The-Job Training program management personnel space. This added space is authorized only in newly constructed facilities.

(2) Career Advisory and Counseling section. This added space is authorized only in newly constructed facilities. If more than one counselor is required, add 7 square meter (80 square feet) per counselor.

(3) Accommodate in other facilities.

Environmental Adjustment Factors. For general planning purposes, the maximum authorized space allowance is 50% of the value obtained from Table 740-88. Any requirements above this must be justified in detail.

740 89 BATHHOUSE (sq.m./SF)
(Included in CC 740 53 SWIMMING POOL - INDOOR sizing standards)

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750 COMMUNITY FACILITIES - MORALE, WELFARE AND RECREATION (EXTERIOR)

GENERAL NOTES

The General Notes and General Instructions at the introduction to the 740 Series (pages 740-2 through 740-l 0) also apply to the revised criteria for the following facilities:

Category Code Description

750 10 OUTDOOR PLAYING COURTS
750 20 PLAYING FIELDS
750 40 GOLF COURSE
750 58 RECREATIONAL CAMPGROUND

USING THE CRITERIA

1. SIZE TO ACCOMMODATE DEMAND

The revised criteria provide a new approach to determine allowances for Morale, Welfare and Recreational (MWR) facilities. Facility allowances are sized to accommodate the projected demand for the anticipated functions. This sizing involves a three-step procedure:

A. Estimate Projected Demand

Calculate the peak-hour demand for each functional component of the facility using the demand calculation tables. Then apply any special adjustment factors in the criteria.

B. Determine Capacity Requirements

Derive the number of required functional units (for example, playing courts or training stations) by multiplying the demand by the capacity factors in the criteria.

C. Calculate Space Allowances

Apply the space allocation factors to determine the square meter (footage) required for each functional component. Add the areas for all components, plus support area factors indicated in the criteria, to determine the total facility allowance. For each step in this planning process, follow the calculations and instructions provided in the criteria for each facility type. In addition to the criteria stated in, attention should be given to relevant planning information in the Base Master Plan, and existing Design Manuals, Military Handbooks or Instructions for the specific facility type.

The involvement of MWR representation in the planning process is strongly recommended in order to ensure a match between program needs, and the types and sizes of spaces to be provided.

2. DEMAND FACTORS DERIVED FROM SMART COMPASS

A. Participation Factors for Each Population Category

Demand calculation involves application of Participation Factors provided in the criteria for each significant user population category - officers, enlisted personnel, retired military, and authorized civilians. These factors have been statistically derived to represent system-wide standards for **peak-hour participation** by each group, using data from the Smart Compass "Leisure Needs Survey" and other user surveys.

B. SMART COMPASS "Leisure Needs Survey"

The Smart Compass **"Leisure Needs Survey"** is a needs assessment of Morale, Welfare and Recreation (MWR) programs administered by the **Bureau of Naval Personnel** (BUPERS).

The **Leisure Needs Survey (LNS)** was implemented in 1985 to capture valid and reliable "installation specific" community leisure needs assessment information and comprehensive data for local management to use for short and long range Morale, Welfare and Recreation (MWR) program planning. Each Navy base with an MWR program is surveyed at least once every three years. The survey was scientifically developed by a team of experts made up of university professors with specialties in leisure studies and research statistics. The Navy regularly brings in subject matter experts from universities and the MWR profession to review and validate the results and update the survey process.

The LNS measures MWR user intentions and trends of active duty Navy, spouses, retirees and authorized civilian patrons of MWR services. The survey contains demographics of patrons, leisure time activity preferences, evaluation of services and facilities, and barriers to participation. The random sampling process in use was carefully developed to ensure that the sampling enables us to generalize from a small representative group to a larger one. The LNS is an accepted, reliable and validated survey tool used by many local commands to modify MWR programs and to justify the construction of MWR facilities.

For questions concerning **Smart Compass** contact the **Bureau of Naval Personnel, Code Pers-651. Summaries of the local Leisure Needs Survey results are available in the MWR office on each Navy base.**

For **Marine Corps Installations** results of the **MWR Construction Program Patron Survey** will be used to provide Marine Corps specific patron desires. Construction Program Patron Survey data is available from the **Commandant of the Marine Corps (MW)**

C. Survey Data Already Incorporated in Factors

The Participation Factors already incorporate the demand implications of the Smart Compass data Users of these criteria do not need to use any Smart Compass data in applying the demand calculation tables, **except as specified in the Bowling Center and Golf Course criteria.**

The Participation Factors may be revised periodically by NAVFAC HQ, BUPERS, and the Commandant of the Marine Corps (MWR). The most current figures must be used in all demand calculations.

3. SPACE ALLOWANCE FLEXIBILITY

A. Modular Space Allowances

For many of these criteria, usage demand, capacity requirements and space allowances are calculated separately for component function-areas of the facility, and then totalled to derive overall facility space allowances. This procedure is designed to respond to local variations in the set of activities and spaces provided, and the relative demand for different activities depending on the needs of the installation population. This approach can also accommodate diverse existing facility situations, when considering additions or complementary new facilities.

B. Space Programs versus Facility Allowances

These criteria are used to determine the total space allowance for a facility. Even though area calculations for functional components of the facility are used in deriving the overall allowance, this does not fix the space sizes of the component program areas of the facility. Local installation decisions, in the space programming and design process, should determine the appropriate allocation of areas for each function-space within the total facility allowance.

C. Local Variation

Local demand for program activities may depend on a variety of factors, in addition to the overall installation population, including:

(a) Proportion and relative participation of different user groups among the population.

(b) Specific program of activities provided.

(c) Competing on-base and off-base facilities providing similar programs.

(d) Geographic distribution and accessibility of the user populations.

(e) Local climate conditions and operating seasons.

(f) Overseas situations and local customs.

4. POPULATION BASIS FOR DEMAND CALCULATIONS

A. Use Base Loading Data

Population figures used in the demand calculations should be consistent with projected base loading data. Officers are O-1 through O-10. Enlisted are E-1 through E-9. Authorized Civilians are authorized DoD employees.

B. Deployable Forces

For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all the non-deployable population, plus two-thirds of the deployable population, to reflect time away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations.

c. Dependent Demand Incorporated in Factors

Demand for facility use by dependent spouses and youth is already statistically incorporated in the Participation Factors provided in the criteria, as derived from system-wide utilization data

D. Authorized Retirees

Retirees are all military retirees residing within a 30-minute drive of the installation. In the absence of other available installation data on authorized retiree population, the installation should use the DoD Statistical Report on the Military Retirement System (published by DoD, Office of the Actuary, RCS No. DDM (A) 1375), and apply the data for zip codes within a 30-minute drive of the installation.

E. Reservists

For demand calculations, reservist population should be included with the active duty military populations. Numbers of reservists should be counted according to the percentage factors indicated in Item 4, Reservists, of NAVFAC P-80, Section 740, General Notes, Installation Military Strength.

5. RECREATIONAL PLANNING CONTEXT

Planning for MWR facilities should involve consideration of the individual facility in relationship to a comprehensive recreational program and facilities plan for the installation. Consider the following factors, in addition to those relationships specifically indicated in the criteria for each facility:

- If other MWR facilities serving the same user population provide the same program activities, reduce the allowed capacity of the proposed facility by the capacity provided elsewhere at the installation.

- Consider collocating the facility with other recreational facilities providing complementary programs, to provide the users with the increased convenience and at&activeness of clustered activities, and to take advantage of potential savings in support space requirements and operating costs.

- Size and locate an individual facility appropriately to the target population and geographical area its particular function is designed to serve. Convenient access for users should be considered in balance with the need far efficient facility operation and avoidance of duplicate facilities.

750 10 OUTDOOR PLAYING COURTS (EA)

Project Review: EFD, NAVFAC HQ, BUPERS (Pers-656D)
Commandant of the Marine Corps (CMC) code LFL
Design Criteria: Military Handbook (MIL-HDBK-1037/3) - Outdoor Sports and Recreation Facilities

1. **GENERAL.** See introduction to 750 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** Outdoor Playing Courts provide facilities and support services to meet the individual physical fitness and recreation needs of military personnel. The facilities may also serve dependents, retirees and authorized civilians. Activities which may be accommodated in Outdoor Playing Courts include: basketball, tennis, volleyball.

3. **RELATED FACILITIES.** Consideration should be given to collocating the Outdoor Playing Courts with the following recreational facilities in order to (i) take advantage of potential savings in space requirements and operating costs, and (ii) provide users with the increased convenience of clustered facilities:

- 740 43 Gymnasium
- 740 45 Fitness Center
- 740 50 Field House
- 740 84 Indoor Playing Courts
- 750 20 Playing Fields.

4. **DEMAND AND ALLOWANCES.** The number of Outdoor Playing Courts provided at each installation is determined on the basis of the peak hour usage, as follows:

a) Use projected base loading data to determine the population for each significant user population category, as listed in Tables 750 10A through 10C.

b) Calculate peak hour demand for each type of Outdoor Playing Court by multiplying the population for each category by participation factors found in Tables 750 10A through 10C. Add the demand for all population categories to derive Total Demand for each court type.

c) Derive the Total Number of Courts required by dividing the Total Demand by the maximum capacity per average peak hour per court, as indicated in Tables 750 10A through 10C.

d) Lighted courts may be provided as an alternative to the above unlighted courts. Calculate the Number of Lighted Courts by multiplying the Total Number of Courts of each type, as derived above, by the adjustment factors indicated in Tables 750 10A through 10C.

Notes for Demand Calculations - Tables 750 10A through 10C:

(1) Population numbers should be consistent with projected base loading data. Officers are O-1 through O-10 and enlisted are El through E-9. Civilians are authorized DoD employees. Retirees are all military retirees within a 30-minute drive of the installation.

For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all of the non-deployable population, plus two-thirds of the deployable population, to reflect time away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installations.

(2) Usage of facilities by spouses and dependeats has been considered in the participation factors used in the tables. These participation factors may be revised periodically by NAVFAC HQ and BUPERS, and the most current figures must be used in all demand calculations.

(3) Lighted courts may be provided as an alternativc to unlighted courts, in proportion of their relative total numbers as calculated in the Tables.

TABLE 750 10A
OUTDOOR BASKETBALL COURT DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0052	=	.....	users
(1),(2)	Officers	.....	x	.0024	=	+	users
(1),(2)	Retirees	.....	x	.0001	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0011	=	+	users
				Total Demand		=	users
	divide by maximum capacity per basketball court per average peak hour					÷ 6	
	Total Number of Outdoor Basketball Courts (round to the nearest whole unit)				=	.....	courts
	multiply by 0.6 to obtain the number of lighted courts					x 0.6	
(3)	Total Number of Lighted Courts (round to the nearest whole unit)				=	.....	courts

TABLE 750 10B
OUTDOOR TENNIS COURT DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0010	=	.....	users
(1),(2)	Officers	.....	x	.0023	=	+	users
(1),(2)	Retirees	.....	x	.0005	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0007	=	+	users
				Total Demand	=	.....	users
	divide by maximum capacity per tennis court per average peak hour					÷ 2	
	Total Number of Outdoor Tennis Courts (round to the nearest whole unit)				=	.....	courts
	multiply by 0.67 to obtain the number of lighted courts					x 0.67	
(3)	Total Number of Lighted Courts (round to the nearest whole unit)				=	.....	courts

TABLE 750 10C
OUTDOOR VOLLEYBALL COURT DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0033	=	.....	users
(1),(2)	Officers	.....	x	.0027	=	+	users
(1),(2)	Retirees	.....	x	.0000	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0005	=	+	users
				Total Demand	=	.....	users
	divide by maximum capacity per volleyball court per average peak hour					÷ 6	
	Total Number of Outdoor Volleyball Courts (round to the nearest whole unit)				=	.....	courts
	multiply by 0.6 to obtain the number of lighted courts					x 0.6	
(3)	Total Number of Lighted Courts (round to the nearest whole unit)				=	.....	courts

750 20 PLAYING FIELDS (EA)

Project Review: EFD, NAVFAC HQ, BUPERS (Pers-656D)
Commandant of the Marine Corps (CMC) code LFL
Design Criteria: Military Handbook (MIL-HDBK-1037/3) - Qutdoor Sports and Recreation Facilities

1. **GENERAL.** See introduction to 750 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** Playing Fields provide facilities and support services to meet the individual physical fitness, coordination, skills development, training and recreation needs of military personnel. The facilities may also serve dependents, retirees and authorized civilians. Activities which may be accommodated in Playing Fields include: baseball, football, soccer, softball, track and field, etc.

3. **RELATED FACILITIES.** Consideration should be given to collocating the Playing Fields with the following recreational facilities in order to (i) take advantage of potential savings in space requirements and operating costs, and (ii) provide users with the increased convenience of clustered facilities:

- 740 43 Gymnasium
- 740 45 Fitness Center
- 740 50 Field House
- 740 53 Indoor Swimming Pool
- 750 10 Outdoor Playing Courts.

4. **DEMAND AND ALLOWANCES.** The number of Playing Fields provided at each installation is determined on the basis of the peak hour usage, as follows:

a) Use projected base loading data to determine the population for each significant user population category, as listed in Tables 750 20A and 20B.

b) Calculate peak hour demand for each type of Playing Field by multiplying the population for each category by participation factors found in Tables 750 20A and 20B. Add the demand for all population categories to derive Total Demand for each type of field.

c) Derive the Total Number of Fields required by dividing the Total Demand by the maximum capacity per average peak hour per field, as indicated in Tables 750 20A and 20B.

d) Lighted fields may be provided as an alternative to the above unlighted fields. Calculate the Number of Lighted Fields by multiplying the Total Number of Fields of each type, as derived above, by the adjustment factors indicated in Tables 750 20A and 20B.

Notes for Demand Calculations - Tables 750 20A and 20B:

(1) Population numbers should be consistent with projected base loading data. Officers are O-1 through O-19 and enlisted are El through E-9. Civilians are authorized DoD employees. Retirees are all military retirees within a 30-minute drive of the installation.

For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all of the non-deployable population, plus two-thirds of the deployable population, to reflect time away on deployment. However, calculation of the deployable population may be adjusted based on the actual deployment experience at individual installation.

(2) Usage of facilities by spouses and dependents has been considered in the participation factors used in the table. These participation factors may be revised periodically by NAVFAC HQ and BUPERS, and the most current figures must be used in all demand calculations.

(3) Lighted fields may be provided as an alternative to unlighted fields, in proportion to their relative total numbers as calculated in the Tables.

(4) Regulation baseball fields may be provided at large installations only if there is a demonstrated need for this specific facility.

(5) One junior baseball field may be provided for every 600 elementary school age (6-12 years old) dependents residing on the installation, in addition to other fields allowed. An additional junior baseball field may be provided if the installation supports its own high school and a field is required for interscholastic play.

(6) Outdoor running tracks and stadiums may be provided at large installations where there is a demonstrated need for these specific facilities.

TABLE 750 20A
SOCCER/FOOTBALL FIELD DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0029	=	.....	users
(1),(2)	Officers	.....	x	.0028	=	+	users
(1),(2)	Retirees	.....	x	.0001	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0003	=	+	users
				Total Demand	=	.....	users
	divide by maximum capacity per soccer/football field per average peak hour					÷ 8	
(6)	Total Number of Soccer/Football Fields (round to the nearest whole unit)				=	.....	fields
	multiply by 0.67 to obtain the number of lighted fields					x 0.67	
(3)	Total Number of Lighted Fields (round to the nearest whole unit)				=	.....	fields

TABLE 750 20B
SOFTBALL/BASEBALL FIELD DEMAND CALCULATION

Note	Population Category	Population (per Base Loading)	x	Participation Factor	=	Peak Hour Demand	
(1),(2)	Enlisted	.....	x	.0081	=	.....	users
(1),(2)	Officers	.....	x	.0068	=	+	users
(1),(2)	Retirees	.....	x	.0003	=	+	users
(1),(2)	Authorized Civilians	.....	x	.0018	=	+	users
				Total Demand	=	.....	users
	divide by maximum capacity per softball/baseball field per average peak hour					÷ 10	
(4),(5),(6)	Total Number of Softball/Baseball Fields (round to nearest whole unit)				=	.....	fields
	multiply by 0.67 to obtain the number of lighted fields					x 0.67	
(3)	Total Number of Lighted Fields (round to the nearest whole unit)				=	.....	fields

750 30 OUTDOOR SWIMMING POOL - INSTALLATION (sq.m./SF)

(Use CC 740 53 SWIMMING POOL - INDOOR for sizing standards)

750 31 OUTDOOR SWIMMING POOL - OFFICER (EA)

There are no special allowances for outdoor swimming pools for either Officers' Club or Petty Officers'/Noncommissioned Officers' Club. Any swimming pools provided for clubs shall be accommodated within allowances given in Table 750-30. These codes are to be used for inventory purposes only.

750 32 OUTDOOR SWIMMING POOL - PETTY OFFICER/NCO (EA)

There are no special allowances for outdoor swimming pools for either Officers' Club or Petty Officers'/Noncommissioned Officers' Club. Any swimming pools provided for clubs shall be accommodated within allowances given in Table 750-30. These codes are to be used for inventory purposes only.

750 33 POOL PUMP/FILTER/TREATMENT FACILITY-REMOTE (EA)

This code is for inventory purposes and only in those cases where such facilities are located in a structure remotely situated from the swimming pool proper.

750 34 WADING POOL (EA)

Wading pools normally are planned as adjuncts to main pools (see CC 740 53 Swimming Pool -- Indoor). This code is for inventory purposes and only in those cases where wading pools are detached from the main facility.

750 35 ACTIVITY TV RECEIVER ANTENNA (EA)

750 36 TV DISTRIBUTION SYSTEM (EA)

Category Codes 750 35 and 750 36 are for inventory purposes only. Such facilities are provided only at remote installations where central TV reception and local distribution systems can be individually justified.

750 40 GOLF COURSE (EA)

Project Review: EFD, NAVFAC HQ, BUPERS (Pers-656D)
Commandant of the Marine Corps (CMC) code LFL
Design Criteria: Military Handbook (MIL-HDBK-1037/3) - Outdoor Sports and Recreation Facilities

1. **GENERAL.** See introduction to 750 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** Golf Courses are recreational facilities which may accommodate: recreational golfing, practice, instruction, tournaments, exhibitions, special events, and winter recreational activities such as cross-country skiing, ice skating, sledding and tobogganing. In addition to the Golf Course, space permitting, the facility may include a driving range and putting green(s).

3. **RELATED FACILITIES.** The Golf Course must be collocated with the following recreational facilities in order to (i) take advantage of potential savings in space requirements and operating costs, and (ii) provide users with the increased convenience of clustered facilities:

   - 740 80 Golf Club House (including grounds keeping equipment building and cart storage facilities).
   - 750 56 Golf Driving Range.

4. **DEMAND.** The number of golf rounds expected at an installation is estimated as follows:

   a) Use projected base loading data to determine the population for each significant user population category, as listed in Table 750 40A.

   b) Calculate the rounds golfed per year by multiplying the population for each category by participation factors drawn from the installation's most recent Smart Compass Leisure Needs Assessment data, and by adjustment factors as indicated in Table 750 40A. If Leisure Needs Assessment data is not available or not statistically valid, Navy-wide golf participation percentages (available from BUPERS) should be used (for Marine Corps Installations use historical patron data to determine the participation factor). Add the demand for all population categories to derive the Basic Total Rounds golfed per year.

   c) Add the Operating Season Adjustment Factor for the number of operating months per year, from Table 750 40B, to the Basic Total Rounds in Table 750 40A, to derive the Adjusted Total Rounds golfed per year. This accounts for installation-specific conditions regarding the length of operating season.

   d) Subtract the factors for lost golfing patronage due to routine deployments and school study schedules, and for off-base competition, as indicated in Table 750 40A.

   e) Add the Local County Population Adjustment Factor for the size of population in the vicinity of the installation, found in Table 750 40C.

   f) Divide the Vicinity-Population-Adjusted Total Rounds golfed per year by the average number of operating months per year to derive the Total Rounds Golfed per Month, as directed in Table 750 40A.

   g) Determine the Allowed Number of Golf Course Holes, based on the Number of Rounds per Month calculated, as indicated in Table 750 40D.

TABLE 750 40A
BASIC GOLF ROUNDS DEMAND CALCULATION

Note	Population Category	Population (per base loading)	x	Participation Factor	x	Adjustment Factor			Rounds Golfed per Year
(1),(2),(3)	Officers	.....	x	.....%	x	40	=		.....
(1),(2),(3)	Enlisted	.....	x	.....%	x	1	=	+	.....
(1),(2),(3)	Retirees	.....	x	.....%	x	1	=	+	.....
(1),(2),(3)	Authorized Civilians	.....	x	.....%	x	1	=	+	.....
						Basic Total Rounds Golfed per Year	=	+	.....
						add rounds for average number of operating months per year (see Table 750 40B, below)		+	.....
						Operating-Season-Adjusted Total Rounds Golfed per Year	=		.....
(4)						subtract 20,800 rounds for large installations which lose golfing patronage due to routine deployments, school study schedules, or other activities which affect significant numbers of personnel on a regular basis		-	.....
						subtract 1,500 rounds for each off-base public and military golf course within a 30-minute drive of the installation (not including private or pitch-and-putt courses)		-	(1,500 x #)
(5)						add rounds per year based on size of local county population (see Table 750 40C, below)		+	.....
						Vicinity-Population-Adjusted Total Rounds Golfed per Year	=		.....
(6)						divide by the average number of operating months per year			+ #
						Total Rounds Golfed per Month	=		.....

Notes for Golf Rounds Demand Calculations:

(1) Population numbers should be consistent with projected base loading data. Officers arc O-1 through O-10 and enlisted are E-1 through E-9. Civilians are authorized DoD employees. Retirees are all military retirees within a 30-minute drive of the installation.

For facility planning purposes at installations with deployable forces, the active duty demand population is comprised of all of the nondeployable population, plus two-thirds of the deployable population, to reflect time away on deployment. However, calculation of thc deployable population may be adjusted based on the actual deployment experience at individual installations.

(2) Participation factors are to be taken from the installation's most recent Smart Compass Leisure Needs Assessment data. If Leisure Needs Assessment data is not available or not statistically valid, Navy-wide golf participation percentages (available form BUPERS) should be used (for Marine Corps Installations use historical patron data to determine the participation factor). Usage of facilities by spouses and dependents has been statistically incorporated in the participation factors. These participation factors may be revised periodically by NAVFAC HQ and BUPERS, and the most current figures must be used in all demand calculations.

(3) The adjustment factors are statistically derived to reflect differential usage patterns by the different user population categories.

(4) This factor applies to the following commands: NAVSTA Charlston SC, NTC Great Lakes IL, NAVSTA Mayport FL, NAVSTA Norfolk VA, NTC Orlando FL, NAVSTA Pearl Harbor HI, NAVSTA San Diego CA, and NTC San Diego CA.

(5) Do not add the Local County Population Adjustment Factor if there are no off-base golf courses within a 30-minute drive of the installation, since it is such competition for which this factor is designed to compensate.

(6) This divisor should equal the same number of months used in the Operating Season Adjustment Factor.

TABLE 750 40B

OPERATING SEASON ADJUSTMENT FACTOR

Average Number of Operating Months per Year	Additional Rounds of Golf per Year
5	+ 9,300
6	11,200
7	13,000
8	14,900
9	16,700
10	18,600
11	20,400
12	22,300

TABLE 750 40C

LOCAL COUNTY POPULATION ADJUSTMENT FACTOR

Local/County Population	Additional Rounds of Golf per year
up to 100,000	+ 2,500
100,001 to 200,000	7,500
200,001 to 400,000	14,400
400,001 to 700,000	28,800
700,001 to 1,000,000	40,000
1,000,001 and over	50,000

5. **FACILITY ALLOWANCE.** At installations where the necessary land and water resources are available, and where there are no foreseeable operational requirements for such land, Golf Course facilities may be provided as given in Table 750 40D. The projected number of rounds of golf per month for each installation is obtained from the calculations in Table 750 40A.

TABLE 750 40D
ALLOWANCE FOR GOLF COURSES

Note (1),(2)	Rounds of Golf per Month	Golf Course Number of Holes
	Up to 2,000	None
(3)	2,001 to 3,000	9
	3,001 to 6,000	18
	6,001 to 7,500	27
	7,501 to 10,500	36
	for each additional 1,500	additional 9

Notes for Golf Coarse Allowance Table:

(1) A pitch-and-putt (Par-3) golf course may be considered as an alternative to a tall-size regulation golf course, depending on the nature of local demand.

(2) Golf courses typically require 45 to 65 hectares (110 to 160 acres) for a standard 18-hole course, and 20 to 36 hectares (50 to 90 acres) for a standard 9-hole course. Specific terrain and layout features will affect the precise hectares (acreage) requirement.

(3) Golf courses of 9 holes are generally considered uneconomic to operate. Courses of this size can only be approved in exceptional cases, with substantial justification of their economic viability.

750 50 OUTDOOR THEATER (EA)

No planning factors are available. If an outdoor theater (either seat- type or drive-in) is provided, the requirements for theaters (Code 740 56) must be reduced accordingly.

750 52 SKEET AND/OR TRAP RANGE (EA)

Where suitable land is available, a skeet and/or trap range may be established at activities with military population over 100. A range building is authorized, see Category Code 740 52 for criteria. Table 750-52 gives the corresponding land requirements.

TABLE 750-52
Land Requirements for Skeet and Trap Ranges

Military Population (1)	Land Area			
	Skeet Range		Trap Range	
Up to 100	none	none	none	none
101 to 10,000	335m x 732m	100' x 2400'	335m x 549m	1100' x 1800'
10,001 to 15,000	335m x 732m	1100' x 2400'	335m x 576m	1100' x 1890'
15,001 to 20,000	335m x 732m	1100' x 2400'	335m x 604m	1100' x 1980'
20,001 to 25,000	335m x 732m	1100' x 2400'	335m x 631m	1100' x 2070'
25,001 to 30,000	335m x 732m	1100' x 2400'	335m x 658m	1100' x 2160'
30,001 to 40,000	335m x 777m	1100' x 2550'	335m x 686m	1100' x 2250'
over 40,000	335m x 823m	1100' x 2700'	335m x 713m	1100 x 2340'

(1) Military population consists of active duty military supported by the installation.

750 54 BAND STAND (EA)

No planning factors are available. Requests for this facility will require individual justification.

750 56 GOLF DRIVING RANGE (EA)

Each installation, where the necessary land is already available, is authorized a golf driving range. See Category Code 750-40

750 57 RECREATION GROUNDS (EA)

No specific guidance is available. Local conditions usually will govern the development of any parks, playgrounds, or picnic areas. Recreation Pavilions (Code 740 78) are authorized in. conjunction with these facilities.

750 58 RECREATIONAL CAMPGROUND (sq.m./SF)

Project Review: Base MWR representatives, EFD, NAVFAC HQ, BUPERS (Pers-656D)
Design Criteria: *(Military Handbook is not currently available)*

1. **GENERAL.** See General Notes to 750 series category codes for General Instructions regarding facility allowance planning procedures.

2. **DEFINITION.** Recreational Campgrounds provide the military community with outdoor recreation opportunities at locations with attractive natural resources. In addition to campsites and related support facilities, short-term accommodation alternatives at such locations may also include MWR Rental Cabins and RV sites to provide patrons with a range of options. To complement the camping experience, and depending on location, Recreational Campgrounds may offer activities such as boating, canoeing, fishing, hiking, hunting, skiing and swimming. Facilities should be designed to take advantage of the natural features of the site, from vegetation to good views to unusual topography. At the same time, development should be environmentally appropriate, and not threaten the preservation of the natural heritage and scenic resources.

   The planning criteria in this Category Code addresses only the camping sites and patron support facilities such as showers, toilets and laundromats. Other campground support facilities (particularly in relatively remote locations) such as an on-site manager's office and convenience are not included in this Category Code. Space allowances for MWR Rental Cabins are addressed under Category Code 740 81.

   Dump stations are also not included in the planning criteria for this Category Code. Such stations should generally be provided at campgrounds which accommodate RV's. The sizing and design of dump stations will vary according to local conditions (such as topography, soil conditions, proximity to water sources, etc.). All dump station facilities must comply fully with all applicable environmental regulations.

3. **RELATED FACILITIES.** Where such locations are adjacent to the sea or other body of water, support facilities such as marinas, and boat repair and storage yards may be sited in close proximity to Recreational Campgrounds.

4. **SPACE ALLOWANCE.** The total number of camping and/or RV sites provided at a location is primarily determined by two considerations:

   - Financial viability based on an analysis of projected costs and revenues.

   - Capacity of the location to accommodate the proposed facilities at a recommended level of use density, and other site planning requirements for access and provision of utilities.

   The number of campsites which may be accommodated per acre will vary depending on the natural features (topography, geology, vegetation, etc.) of the proposed location and the desired degree of privacy between individual sites. Development of as few as 2.4 sites per hectare (6 sites per acre) to a maximum of 5.7 sites per hectare (14 sites per acre) is recommended as a planning guideline. However, this guideline may be modified by the financial analysis which may, for example, indicate that 2.4 sites per hectare (6 sites per acre) may be too low to justify the investment required to provide the necessary infrastructure (paths, roads, patron support facilities, utilities, etc.). Furthermore, the financial analysis may also indicate a total minimum number of sites required to justify the investment in this recreational resource.

   Once the total number of campsites at a location has been determined, the required patron support facilities may be selected from the criteria in Table 750 58A.

TABLE 750 58 SANITARY FACILITIES REQUIREMENTS FOR RECREATIONAL CAMPGROUNDS

# Tent/Trailer Sites	#Water Closets	# Lavatories Male/Female	# Showers Male/Female	# Urinals Male/Female
1-15	1/1	1/1	1/1	1
16-30	1/2	2/2	1/1	1
31-45	2/2	3/3	1/1	1
46-60	2/3	3/3	2/2	2
61-80	3/4	4/4	2/2	2
81-100	3/4	4/4	3/3	2

Notes for Table 750 58

(1) For recreational areas having more than 100 tent/trailer/camper/RV sites, provide one additional water closet and lavatory per each additional 30 sites, and one additional urinal per each additional 60 sites.

(2) For laundry facilities, provide one washer and one dryer for every increment of 12 sites or portion thereof.

All facilities which have the potential for causing environmental contamination - such as, for example, dumpsters and dump stations - must comply fully with all applicable local, state and federal regulations. The planning of Recreational Campgrounds located in areas under the jurisdiction of other agencies such as State Parks and Forests Divisions, the U.S. Forest Service and the National Park Service, must adhere to all applicable development guidelines and review procedures.

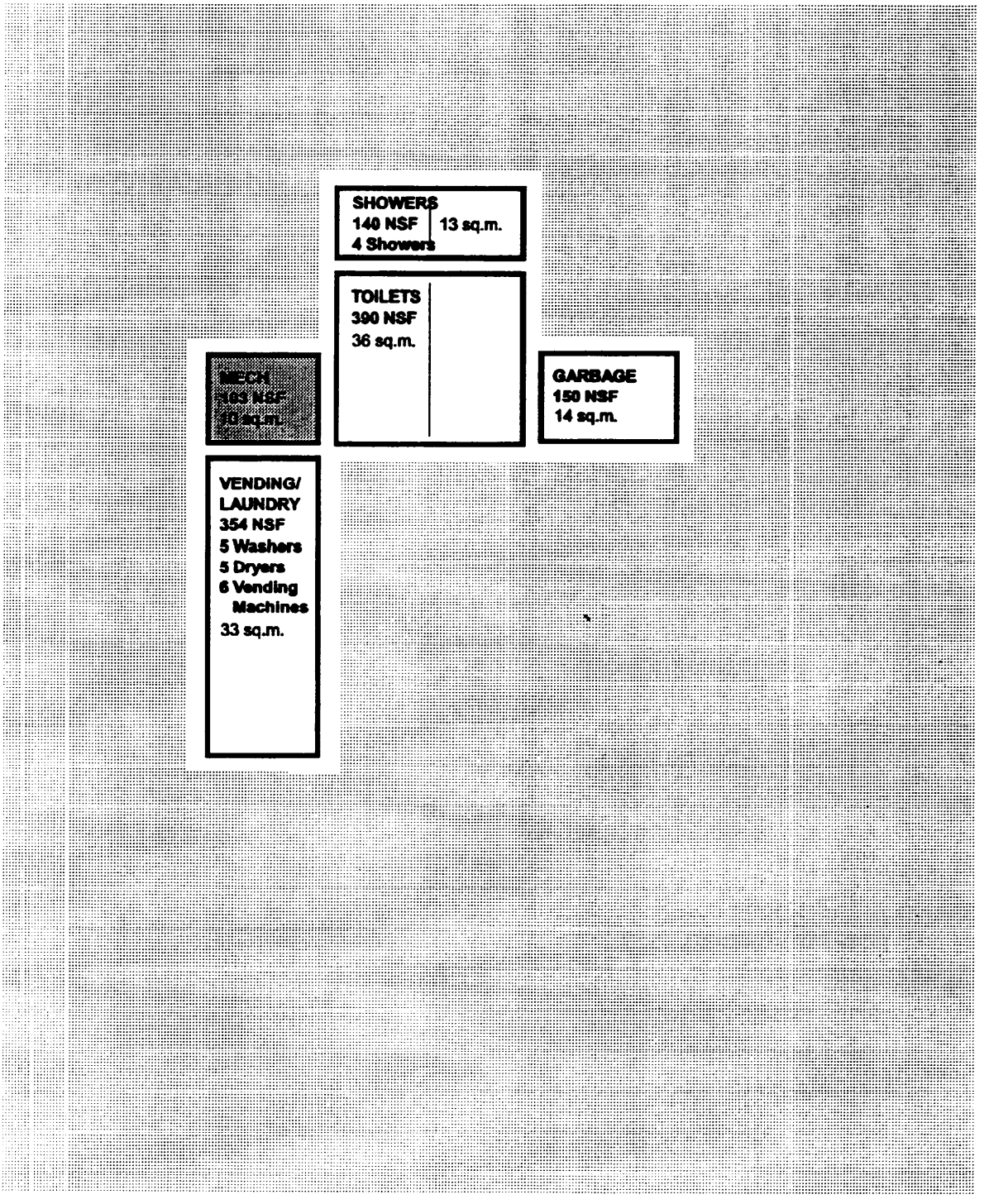
5. **ILLUSTRATIVE SPACE PROGRAMS.** Space programs for support facilities for small (16-30 sites), medium (46-60 sites) and large size (81-100 sites) Recreational Campgrounds are presented to illustrate the application of the space allowance criteria, showing possible patterns of functional components, with their respective sizes and capacities. These space programs are for illustrative purposes only.

6. **SAMPLE LAYOUT DIAGRAM.** A layout diagram is presented for a support facility for a medium-size Recreational Campground. The layout diagram is for illustrative purposes only.

RECREATIONAL CAMPGROUND (Category Code 750 58)

Sample Space Programs

Functional Component/ Sub-Component	Space Allocation Standard		SMALL SIZE: 16 to 30 sites; 0.5 to 2 hectares			MEDIUM SIZE: 46 to 60 sites; 1.3 to 4 hectares			LARGE SIZE: 81 to 100 sites; 2.3 to 6.7 hectares		
			Capacity	Net sq.m.	Sub-Total Net sq.m.	Capacity	Net sq.m.	Sub-Total Net sq.m.	Capacity	Net sq.m.	Sub-Total Net sq.m.
ACTIVITY SUPPORT											
Patron Support					61			100			144
Toilets (male and female)											
Water Closets/Urinals	3	Net sq.m. per fixture	4	12		7	21		9	27	
Lavatories	3	Net sq.m. per fixture	4	12		6	18		8	24	
Showers (male and female)	3	Net sq.m. per shower	2	6		4	12		6	18	
Vending Machines	2	Net sq.m. per machine	4	8		6	12		8	16	
Bill Changing	1	Net sq.m. per machine	2	2		3	3		4	4	
Laundry											
Washers	2	Net sq.m. per machine	3	6		5	10		9	18	
Dryers	2	Net sq.m. per machine	3	6		5	10		9	18	
Garbage Disposal Facility				9			14			19	
BUILDING SUPPORT					19			26			31
Circulation/Housekeeping Supplies/Janitor's Closet/ Structure/Paritions	10-15%	total Net sq.m. facility		11			16			20	
Mechanical/Electrical/Communication Equipment Space	5-10%	total Net sq.m. facility		8			10			11	
TOTAL FACILITY ALLOWANCE (Gross sq.m.)					80			126			175
Maximum Gross Area per Site (sq.m.)					5			3			2
Minimum Gross Area per Site (sq.m.)					3			2			2



LAYOUT DIAGRAM - RECREATIONAL CAMPGROUND
Medium Size Support Facility

750 60 MARINA (EA)

This facility requires special considerations and must be developed based on local conditions and supported by a detailed analysis. A marina support building or boathouse is authorized in conjunction with a marina. See Code 740 87 for marina support building criteria.

750 61 RECREATIONAL PIER (EA)

No specific criteria are available.

760 MUSEUMS AND MEMORIALS

760 10 MUSEUM/MEMORIAL* BUILDING (SF)

Project Approval (Museums) : Assistant Secretary of the Navy
SECNAV INSTRUCTION 5755.1 (Museums)

No specific planning factors are available for this group. Requirements for each of the above facilities will be established based on individual studies and supporting justification. Museums must be approved by SECNAV.

*The Office of the Comptroller of the Navy has ruled the use of appropriated funds (including OM&N funds) for the construction and maintenance of memorials is restricted to those memorials specifically approved by Congressional authority. Alternative funding sources should be explored.

760 20 OUTDOOR MONUMENT/MEMORIAL (EA)

*The Office of the Comptroller of the Navy has ruled that the use of appropriated funds (including OM&N funds) for the construction and maintenance of memorials is restricted to those memorials specifically approved by Congressional authority. Alternative funding sources should be explored.

760 30 CEMETERY (EA)

No specific planning factors are available for this group. Requirements for each of the above facilities will be established based on individual studies and supporting justification. SECNAV approval will be required.

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Section 8

FACILITY CLASS 800 - UTILITIES AND GROUND IMPROVEMENT

The technical planning information for utilities and ground improvement facilities provided under this facility class include the following category groups:

Code 810 Electric Power
Code 820 Heat and Refrigeration (A/C)
Code 830 Sewage and Waste
Code 840 Water
Code 850 Roads and Streets
Code 860 Railroads
Code 870 Ground Improvement Structures
Code 880 Fire and Other Alarm Systems

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810 ELECTRIC POWER

The electric power demand of a Navy or Marine Corps installation will normally be predicated upon an engineering study of personnel and industrial-type consumption load of the installation activities. (See Electrical Engineering, NAVFAC DM-4 for criteria for determining specific electrical requirements common to structures in this category group.) However, in the absence of an engineering study the following should be utilized for broad planning purposes:

Electric Demand Planning Factors

Cat. Group	Description	Unit of Measure (UM)	Maximum Demand Per Unit of Measure (Watts)
130	Communication & Navigational Aid	SF	13,5
	Airfield Lighting	LF	6
140	Land Operational Facilities	SF	7.5
150	Waterfront Operational Facilities	SF	5
		FB	5×10^3
170	Training Facilities	SF	7.5
210	Maint. Shops & Facilities	SF	7.5
220	Production Bldgs. & Plants	SF	7.5
310	Research, Development & Test Bldg.	SF	7.5
440	Storage, Covered	SF	2
510/20	Hospital Buildings	SF	6
		BD	4×10^3
530/40/50	Labs, Clinics, Dispensaries	SF	8
610	Administration Buildings	SF	6
710	Family Housing	SF	4.5*
		FA	6×10^3 *
720	Troop Housing	SF	5.5
		MN	500
730/40	Community Facilities	SF	7
821	Heating Plants	SF	5
		MBH	3×10^3
830	Sewage Treatment Plants	MGPD	200×10^3

*Coincident demand for multiple units.

For definitive drawings of electric power plants and steam electric generator plants, see Definitive Designs, NAVFAC P-272, Part 2.

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811 ELECTRIC POWER-SOURCE

Electric power for base facilities operation is normally derived from local commercial sources. Where commercial sources are used, transformer substations are required to transform the electrical energy to satisfy the station's load requirement. Where commercial electricity is not available, power plants will be planned. Standby generator plants are planned to provide adequate uninterrupted power supply in emergencies. Planning for power plants will include the building, the power generating equipment, and supporting appurtenances such as fuel storage for plant operation, auxiliary power, and switching stations. Power plants will be listed by code in accordance with the type fuel used as follows (excep 811 09):

811 09 ELECTRIC POWER PLANT BUILDING (SF)
811 10 ELECTRIC POWER PLANT - DIESEL (KW)
811 25 ELECTRIC POWER PLANT - STEAM (KW)
811 45 ELECTRIC POWER PLANT - GAS TURBINE (KW)

A standby generator plant will be coded separately under Code 811 60.

811 10--811 45 ELECTRIC POWER PLANTS

Consideration as to whether an electric power generating plant is to be planned will depend on the station's geographical location, the availability of a firm uninterrupted adequate power supply from a local electric utility, the economics of using byproduct steam for space heating and industrial process work, and the availability of the required fuel. The electric generating plant (diesel or steam) shall have a total installed capacity equal to the station's total kilowatt demand and in the case of diesel generators there must be one additional standby generating unit with a capacity equal to the largest unit on the line. In the planning and determination of power plant capacity, due consideration should be given to the estimated demand of all of the station's consumption, both domestic and industrial, plus the anticipated load growth. The estimated electrical requirements for most repetitive types of Navy buildings and structures are shown on the definitive drawings in Definitive Designs, NAVFAC P-272. For initial planning purposes, power plant capacity may be computed by either (1) utilizing the factors indicated under 810 above, or (2) totalling all of the estimated demands in kilowatts of all existing and proposed station buildings as shown on the definitive drawings and multiplying this total by an appropriate diversity factor. Where a diversity factor is not provided a factor of eight percent (80%) may be used. The resultant total is the estimated power plant capacity or the estimated amount of electrical power needed by the station facilities. See Definitive Designs, NAVFAC P-272, Part 2, for various types and sizes of electrical power plants. See NAVFAC DM-4, Electrical Engineering for design information.

811 59 STANDBY GENERATOR BUILDING (SF)
811 60 STANDBY GENERATOR PLANT (KW)

Central standby generator plants are desirable and should be planned to provide adequate power in the event of outages of the essential facilities

of the base. Emergency generating units with automatic changeover should be planned for essential loads such as hospital operating rooms, electronic devices (radar, communications, navigation aids), control tower, fire alarm systems, water pumps, certain aviation facilities, sewage plants, and other uses as determined by local operational factors. The standard drawings in Definitive Designs; NAVFAC P-272, give the estimated power demands. The capacity of the standby generator plants is computed from the power demand of the essential activities requiring support during an outage. See NAVFAC DM-4, Electrical Engineering for design information.

812 ELECTRIC POWER - TRANSMISSION AND DISTRIBUTION LINES

Distribution and transmission lines are required to supply electricity to buildings, street lighting, floodlighting, and perimeter lighting. Lines may be either overhead or underground and will include poles, ducts, and controls to distribute electrical energy from the source to each using facility. Planning for distribution and transmission lines will require engineering calculation of critical power demand loads and future load growth. Airfield pavement lighting is planned as described under Code 136 herein.

812 09 ELECTRIC DISTRIBUTION BUILDING/SHELTER (SF)
812 12 TRANSFORMER STATION LESS THAN 500 KV (KV)

A transformer station is an intermediate station between a generating station and the utilization point, in which the electrical power is transformed to another voltage and where the total output of a transformer is through a single protective device.

A transformer station should be located as near the load center as practicable, and be capable of supplying the maximum demand of the area served. See NAVFAC DM-4, Electrical Engineering, for factors and methods of calculating demand and load.

812 20 STREET LIGHTING (LF)

Street lighting is required for both safety and security of station personnel and vehicular movement. A street lighting system consists of transformers, street lighting circuits, light poles or standards, and light assemblies to illuminate vehicular and pedestrial traffic areas. Street lighting systems should be planned for all primary and secondary streets and roads and also for administrative, recreational, medical, piers, and any other areas where pedestrial or vehicular traffic is significant. The number of linear feet (LF) of street lighting and the power demand (KW) will be determined by an engineering survey.

812 30 ELECTRICAL DISTRIBUTION LINES (LF)

Distribution lines are those components of an electrical utility system that connect the power source to the consuming facility. A planned distribution system will supply adequate electrical service to the load area, allow for expansion, and meet acceptable limits of communication and electronic interference. The distribution planning must include such considerations as the type and physical layout of the installation served, the planned load growth, and necessary safety clearances. Overhead distribution lines are usually planned for reasons of economy. Lines are placed underground at air installations in those areas where they are a hazard to aircraft. The distribution system should be flexible so that expansion and changing load conditions can be met with a minimum of modification and expense. Requirements of an area will dictate the type of system that will be necessary, whether it is to be overhead or

underground. Linear feet (LF) of distribution lines required will be determined by an engineering survey.

812 40 PERIMETER/SECURITY LIGHTING (LF)

This utility provides uniform illumination for security purposes and for activities such as aircraft and vehicle servicing or outdoor recreation. The intensity, number, and location of lights will be determined by an engineering survey. To eliminate hazards, pole mounted floodlights should be avoided in the vicinity of airfields and lights mounted on adjacent structures if possible.

This code should be used for reporting pole-mounted floodlighting systems. In cases where lights are mounted on buildings or structures, they should be considered as part of the supporting element.

813 ELECTRIC POWER - SUBSTATIONS AND SWITCHING STATIONS

813 10 SWITCHING/SUBSTATION BUILDING/SHELTER (SF)
813 20 SUBSTATION MORE THAN 499 KV (KV)

A substation at Navy installations is used to transform electrical energy, received from a commercial utility source or from a station power plant, to satisfy the requirements (KW) of the station facilities to be served. The substation facility normally consists of a structure, buses, transformers, switchgear, grounding system, and related protective devices. The capacity of a source substation shall be at least equal to the capacity of the electrical power demand (KW) of the facilities served in each respective load center. The area and activity load on a distribution substation is the product of the connected load times the demand factor and coincident peak demands. See NAVFAC DM-4, Electrical Engineering for methods of calculating demand and load.

813 30 SWITCHING STATION FOR SECTIONALIZED DISTRIBUTION CIRCUITS (KV)

A switching station is an intermediate station between a generating station or substation where electric power is switched without transformation.

Switching stations are located at points where it is necessary to branch off from a main feeder or feeders with smaller components due to physical location of the facilities to be served. See NAVFAC DM-4, Electrical Engineering, for factors and methods of calculating demand and load.

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820 HEAT AND REFRIGERATION (A/C)

The requirements for heat, hot water, and industrial steam at Naval installations will be based on an engineering study of the overall station demand. A central heating facility will include a heating plan, fuel storage, distribution system, and controls. Planning information for heating facilities under the following basic category codes:

Code 821 Heat, Steam--Source
Code 822 Heat, Transmission and Distribution Lines
Code 823 Heat, Gas--Source
Code 824 Heat, Gas--Transmission
Code 826 Refrigeration/Air Conditioning

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821 HEAT--SOURCE

The source of heat from steam or high temperature water (HTW) includes a complete central plant and associated fuel storage. The source of heat and steam/HTW are coded to indicate the type of fuel used by the plant. The Navy codes are as follows:

821-09 HEATING PLANT BUILDING (SF)
821-12 HEATING PLANT-FOSSIL FUEL - MEDIUM (MB)
821-22 HEATING PLANT-FOSSIL FUEL - LARGE (MB)
821-40 STEAM PLANT-NUCLEAR, ALL SIZED (MB)
821-50 STEAM PLANT-NONNUCLEAR (MB)

821-09--821-50 HEATING PLANTS

A central heating plant will include a structure, piping, equipment, controls, fuel, storage, and all equipment necessary to make a complete usable facility. Central heating plants are justified only when the total owning and operating costs for central plants and distribution systems are less than similar costs for heating systems in individual buildings. Central heating plants are also justified when the overall energy use for providing heat from extraction steam in a steam-electric-power plant would be less than a central plant plus purchased electricity. The type of fuel for the plant, whether an electric power generating plant with by-product heat and steam, or a heating plant, will be selected on the basis of an economic analysis. The heating plant capacity will be based on BTU rating, and this rating will be determined from an engineering analysis of the need for steam, heat, and hot water at the station. The standard drawings in Definitive Designs, NAVFAC P-272, give the estimated heating requirements in MBTU/HR required to maintain inside temperature of +70°F for outside design temperatures of -5°F, +5°F, +15°F, and +25°F. the standard drawings also indicate hot water requirements. For planning purposes, central heating plant capacities (in thousands of BTU/HR) for installations in the above temperature ranges may be determined by totalling the heating requirements (MBTU's/HR) for all existing and/or planned station buildings. Heating plants of various types and sizes are shown in Definitive Designs, NAVFAC P-272, Part 2.

821 60 DISTILLATE HEATING FUEL OIL STORAGE (GA)
821 61 RESIDUAL HEATING FUEL OIL STORAGE (GS)

These two category codes replace category code 124-65, Activity Heating Fuel Storage, which applied to the storage of both distillate and residual heating fuel oils. These fuel oil tanks store oil used for heating buildings, generation of steam, power plant requirements, and for other heat generating facilities as required.

The following criteria pertains to both category codes 821-60 and 821-61. The planning factor is based upon the combined fuel oil consumption at the activity for heating.

The amount of storage varies with the number of personnel attached to the station and the activity. In temperature zones the normal average consumption is 70 gallons per person per month (including civilian employees). This figure would of necessity be revised in zones of extreme temperatures. Use this planning factor only if historical data is not available.

Department of Defense policy is that heating plants burning fuel oil must have a minimum of 30 day storage capability based on the coldest 30 day requirement. Installations which have direct access to and/or are supported directly by major military bulk fuel distribution systems should establish storage requirement based on detailed support agreement with the supply terminal Command. Installations which do not have direct access to major fuel distribution systems should investigate logistic support factors (transportation modes; delivery times; precipitation, temperature and weather histories; etc.) to determine if it may be necessary to have storage capability exceeding the 30 day requirements. Activities utilizing fuels for dual purposes (i.e., diesel fuel for heating/transportation) should consider combined consumption when computing storage requirements. Installations should fill all storage tanks by late summer each year in order to reduce cold weather delivery problems, and tanks should be kept as full as possible at all times. This policy has been promulgated by OPNAV Instruction 4100.6 series. Additional justification is necessary for the fuel requirements associated with the generation of steam, operation of power plants, etc. The same 30 day storage requirement is also applicable.

The category codes and corresponding types of oil stored by each facility are as follows:

Category Code 821-60:

Grade No. 1. A light distillate oil intended for use in burners of the vaporizing type in which the oil is converted to a vapor by contact with a heated surface or by radiation. (Includes kerosene and JP-5 aviation turbine fuel).

Grade No. 2. A heavier distillate than grade no. 1. It is intended for use in atomizing-type burners which spray the oil into a combustion chamber where the tiny droplets burn while in suspension. The grade of oil is used in most domestic burners and in many medium-capacity commercial-industrial burners where its ease of handling and ready availability sometimes justify its higher cost over the residual grade S. (Includes Diesel Marine Fuel (DMF), DF-2 and commercial diesel fuels).

Grade No. 4. Usually a light residual but sometimes a heavy distillate. It is intended for use in burners equipped with devices that atomize oils of higher viscosity than domestic burners can handle. Its permissible viscosity range allows it to be pumped and atomized at relatively low storage temperatures. Thus, except in extreme cold weather, it required no preheating for handling.

Category Code 821-61:

Grade No. 5 (light). A residual fuel of intermediate viscosity for burners capable of handling fuel more viscous than grade no. 4 without preheating. Preheating may be necessary in some types of equipment for burning and in colder climates for handling. (Includes Navy Special Fuel Oil (NSFO)).

Grade No. 5 (heavy). A residual fuel more viscous than grade no. 5 (light). It is intended for similar service. Preheating may be necessary in some types of equipment for burning and in colder climates for handling.

Grade No. 6. A high-viscosity oil, sometimes referred to as "Bunker C", and used mostly in commercial and industrial heating. It requires preheating in the storage tank to permit pumping and additional preheating at the burner to permit atomizing. The extra equipment and maintenance required to handle this fuel usually preclude its use in small installations.

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822 HEAT - TRANSMISSION AND DISTRIBUTION LINES

This basic category encompasses the transmission and distribution lines for steam and associated hot water lines throughout an installation. In temperate and tropical climates, and at locations where the water table is high, steam lines will be aboveground. Routing of steam or hot water lines requiring underground installation under runways and taxiways should be held to a minimum to avoid interference by maintenance and repair operations. Adequate clearances shall be provided above roads, railroads, streets, walks, and towways. Other restrictions such as flight clearances must be maintained, see Category Code Ill-Supplement. Steam and hot water transmission lines are coded as follows:

822-09 STEAM/HEAT BUILDING/SHELTER (SF)
822-12 STEAM LINES FROM MEDIUM PLANTS (LF)
822-14 CONDENSATE LINES TO MEDIUM PLANTS (LF)
822-16 HOT WATER OR HTW/HP LINES TO MEDIUM PLANTS (LF)
822-22 STEAM LINES FROM LARGE PLANTS (LF)
822-24 CONDENSATE LINES TO LARGE PLANTS (LF)
822-26 HOT WATER OR HTW/HP LINES FROM LARGE PLANTS (LF)

The requirement for steam and condensate or hot water pipelines is determined from an engineering study.

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823 HEAT, GAS--SOURCE

This basic category includes a central plant for generation of gas and related facilities and appurtenances, including connected fuel storage for plant operation and storage of gas for direct heating or as a fuel for central plants. Gas generating and storage facilities are coded as follows:

823 09 GAS GENERATING BUILDING (SF)
823 10 GAS GENERATING PLANT (MB)
823 15 GAS METER SHED/SHELTER (SF)
823 20 GAS STORAGE TANKS (CF)

See NAVFAC DM-3, Mechanical Engineering, and Code 411 60 herein, for information on the receipt, storage, distribution and vaporizing capacities of Liquefied Petroleum Gases (LPG).

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824 HEAT, GAS--TRANSMISSION

This basic category applies to exterior lines, mains, and systems for transmission of gas for direct heating or as fuel for central plants.

824 10 GAS MAINS (LF)

The planning of gas pipelines includes trenching, piping, valve boxes, controls, and meters. The pipe capacity, strength, and linear footage requirements will be determined by an engineering study.

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826 REFRIGERATION/AIR CONDITIONING

This category code group is for chilled water and air conditioning plants over 25 tons capacity. Exclude cold storage facilities (see Category Code 430 series). For air conditioning plants of 5 to 25 ton capacity, use Category Code 890 42. this group includes the following individual category codes:

826 10 REFRIGERATION/AIR CONDITIONING PLANT BUILDING (SF)
826 20 CHILLED WATER PLANT 25-100 TONS (TN)
826 25 CHILLED WATER PLANT OVER 100 TONS (TN)
826 30 AIR CONDITIONING PLANT 25-100 TONS (TN)
825 40 AIR CONDITIONING PLANT OVER 100 TONS (TN)

826 10--826 40 REFRIGERATION/AIR CONDITIONING PLANTS

A central refrigeration/air conditioning plant will include a structure with all equipment necessary to make a complete usable facility. If cooling towers are to be used for heat rejection, prevailing winds shall be considered when siting the facilities to avoid problems with moisture drift from the cooling towers; i.e., parking facilities should not be downwind from cooling towers. Vehicle access for equipment maintenance and replacement should be considered. Central plants should be considered when a life cycle cost analysis demonstrate that the owning and operating cost of the plant will be less than that for individual building refrigeration equipment. The drawings in Definitive Designs, NAVFAC P-272, give the estimated cooling loads in MBTU/HR required to maintain inside design conditions at 75°F, 50° relative humidity with outside design conditions of 95°F, db; 78°F, wb. For planning purposes, central refrigeration/air conditioning plant capacities can be determined by totaling the cooling requirements for all existing and for planned station buildings.

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827 CHILLED WATER-AIR CONDITIONING TRANSMISSION/DISTRIBUTION

This basic category encompasses the transmission/distribution of chilled water from a central refrigeration/air conditioning plant to buildings throughout an installation for space air conditioning with water being returned to the plant. Routing of chilled water lines under runways, taxiways, buildings, etc., should be held to a minimum to avoid interference by maintenance and repair operations to the chilled water lines. If lines are located above ground, adequate clearances shall be provided above roads, railroads, walks and tow-ways. Other restrictions such as flight clearance must be considered. See NAVFAC Publication P-80.3. Underground lines have the advantage of reducing undesired heat gains and may not require insulation, depending on ground temperatures.

827-10 AIR CONDITIONING VALVE HOUSE/SHED/SHELTER (SF)
827-20 AIR CONDITIONING-CHILLED WATER TRANSMISSION/DISTRIBUTION SYSTEM MEDIUM (25-100 TONS) (LF)
827-25 AIR CONDITIONING-CHILLED WATER TRANSMISSION/DISTRIBUTION SYSTEM LARGE (OVER 100 TONS) (LF)

See NAVFAC DM-3, Mechanical Engineering for design information.

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830 SEWAGE AND WASTE

Category group 830 provides for the disposition of all sewage and refuse by facilities for the collection, transportation, treatment, and disposal of sewage and industrial waste, and disposal of storm drainage water in storm and sanitary sewer systems. Components of sewage and refuse facilities include sewage treatment plants, outfall sewer lines, septic tanks, septic tank drain fields, sanitary sewers, sewage pumping stations, and incinerators. Certain industrial waste must be kept separate, and treated separately, from the sanitary sewage. In planning for sewage and waste facilities cognizance shall be taken of the Federal Water Pollution Control Act as amended, applicable to municipalities, industries, and others that may contribute to the pollution of surface and underground waters in the United States.

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831 SEWAGE AND INDUSTRIAL WASTE, TREATMENT AND DISPOSAL

831 09 COMBINED SEWAGE AND INDUSTRIAL WASTE TREATMENT BUILDING (SF)
831 10 COMBINED SEWAGE AND INDUSTRIAL WASTE TREATMENT PLANT (KG)

The preferred method of sewage disposal is by discharge to a municipal or regional sewage system. Where this is not feasible, an on-station sanitary sewage treatment plant will be necessary to provide for the processing of sanitary sewage for ultimate disposal. Disposal of sewage is usually in a stream or other body of water or on land by subsurface irrigation or by direct absorption into the soil. A sewage treatment plant may include aeration tanks or trickling filters, settling basins, sump or storage wells, dry wells, pumps, screens, and accessories. The type and capacity of sewage treatment plant is determined by an engineering study of the installation, including planned population, number of family quarters, and industrial peak loads. See NAVFAC P-272, Definitive Designs, Part 2, for standard drawings of sewage treatment plants.

831 11 BALLAST CONTAMINATION SKIMMER (KG)
831 14 INDUSTRIAL WASTE TREATMENT BUILDING (SF)
831 15 INDUSTRIAL WASTE TREATMENT FACILITY (KG)
831 16 RUNOFF OIL/WATER SEPARATOR (KG)

No planning criteria for Category Codes 831 11, 14 and 15 are currently available. Each facility requires individual justification.

831 20 OUTFALL SEWER LINE (KG)

An outfall sanitary sewer line receives the sewage from a collecting system, or the effluent from a sanitary sewage plant, and carries it to a point of final discharge. Planning for outfall sewer lines will include land acquisition. The requirements for an outfall sewer line will be determined by an engineering survey.

831 30 SEPTIC TANK AND DRAIN FIELD (GA)

A septic tank and drain field facility provides sewage treatment for human waste at isolated facilities where an extension of the central sewer collection system would not be economically sound. The planning of a septic tank and drain field will include a concrete or protected steel tank and a drain field system including headers, laterals, open joint clay or concrete pipe, gravel, ditching, and land acquisition. The requirements for a septic tank and drain facility will be determined by an engineering survey.

831 39 RADIOACTIVE WASTE HANDLING BUILDING (SF)
831 40 RADIOACTIVE WASTE HANDLING FACILITY (EA)

No planning criteria for Category Codes 831 39 and 40 are currently available. Each facility requires individual justification.

831 41 HAZARDOUS WASTE STORAGE AND TRANSFER FACILITY (SF)

The requirement for this facility is the result of the necessity to ensure that the transfer and storage of hazardous wastes will meet the Federal Criteria mandated by Title 40 of the Code of Federal Regulations (CFR), Parts 260 thru 266 as well as complying with OPNAVINST 6240,3 Series, which implements the requirements of the Resource Conservation and Recovery Act (PL 94-580) (42 USC 6901-6987), the Clean Water Act (PL 92-500), and the Navy Hazardous Materials Environmental Management Program by expanding controls on hazardous materials management in order to protect the environment. It is the intent of Congress and the Policy of the President, (Executive Order 12088), that naval activities comply with these requirements to the same extent as any other entity or person.

Hazardous waste is any substance that cannot legally be disposed of in a normal sanitary landfill or into a refuse incinerator designated to handle municipal type refuse or cannot be discharged into a sanitary sewerage system. This facility is not intended to handle certain hazardous materials such as radioactive or ordnance wastes, for which other category codes have been designated. Any hazardous material can become a waste after having served its intended purpose, after exceeding its shelf life, by becoming contaminated, or by having been spilled. However, hazardous materials that have served a primary purpose and/or are excess to their primary user may have a secondary use. Such recyclable materials, though "excess" or "waste" to one organization, are not considered waste if their disposition is to a secondary user. By elimination, a hazardous waste is a non-reusable material that must be treated and/or disposed of in a specially designated facility that meets the regulatory requirements of the Resource Conservation and Recovery Act (RCRA) of 1976 (PL 94-580). it might be noted that sludges generated from treatment facilities may also be hazardous wastes.

There are basically two types of facilities to handle hazardous waste; a short-term storage facility, where materials are stored for periods of less than 90 days and a long term storage facility where materials are stored for more than 90 days. The short-term facility does not require a permit to operate, but is required to meet all packaging and labeling requirements and to date the receipt of hazardous wastes. The requirements for short-term facilities are given in 40 CFR 262.34. The long term facility is subject to the requirements of 40 CFR, parts 264 and 265 and the permit requirements of 40 CFR, part 122.

The design requirements set forth in NAVFAC DM-5.13 are mandatory for the long term facility and desirable for the short-term facility. It has been assumed that covered storage will be required to minimize the run-off from the facility and that the run-off will be packaged. In climate where run-off will not create a problem, open storage is acceptable and category

code 831-41, Hazardous Waste Storage Area, may be used. The modification of existing facilities is an acceptable alternative to the construction of new facilities.

The square footage requirements for this facility is directly related to the Hazardous Waste Management Plan that must be filed by every identified activity handling this type of material in accordance with OPNAVINST 6240. This plan must indicate the type of hazardous waste collected, the rate of accumulation and the frequency it will be removed from the activity in accordance with prescribed procedures. The selection of a short-term facility vs a long term facility is dependent upon the permits requested by the activity for the disposal of said waste. Definitive drawings for these typical facilities have been prepared and are indicated on NAVFAC Dwg. Nos. 1404293 and 1404294 which are part of DM 5.13 Hazardous Waste Storage and Transfer Facilities.

Prior to planning and establishing hazardous waste storage and transfer facilities, any actions must be cleared with the cognizant NAVFAC EFD which has the responsibility for area-wide coordination of the Navy Hazardous Materials Environmental Management program.

Siting. A buffer zone of 150 meters (500 feet) shall be provided between the facility and the nearest inhabited area, stream, body of water, or critical mission areas such as ammunition, POL, or flammable stores.

Both of the facilities will have space allocated for the following type functions: laboratory, operation room office/lunchroom, enclosed loading dock and storage for the following kinds of waste: reactive, unknown, acid, general, organic, oxidizer and caustic.

831-42 HAZARDOUS WASTE STORAGE AREA (SY)

The requirements for this facility are similar to those for category code 831-41, Hazardous Waste Storage and Transfer Facility. This type of storage facility is acceptable in climates where run-off will not create a problem. A buffer zone of 150 meters (500 feet) shall be provided between this facility and the nearest inhabited area, stream, body of water, or critical mission area such as ammunition, POL and inflammable stores. However, this facility may be located in the proximity of the Hazardous Waste Storage and Transfer Facility when it is used to augment it.

Segregation of Material. The danger involved in the storage of hazardous material are not measured solely by the quantity of material stored, but also by its sensitivity to reaction with one type of material with another. Tables showing compatibility relationship can be found in NAVFAC DM 5.13, Table 2, "Compatibility of Hazardous Waste Categories."

Planning Procedures:

1. Determine the number and types of hazardous waste to be stored and their compatibility.

2. Determine rate of accumulation by past records.

3. Determine length of storage required (i.e. less than 90 days, etc.).

4. Item 1, 2 and 3 determine maximum number of drums to be stored at any given time. Note: Not all drums will be filled and sometimes more than one drum will be required for any given type of waste.

5. Criteria: Use 2.1 gross square yard s per d rum stored when each 55 gallon drum is stored in clusters of 4 per pallet or area.

Example: Given: 24 drums in six clusters, four per cluster.
Determine: size and configuration of concrete pad.

A typical layout for this type of facility would be a concrete pad 23.0 ft. long and 19.5 ft. wide. An 8.0 ft. access aisle in the middle of the 19.5 ft. wide pad would provide room for the forklift truck to deposit and retrieve pallets which are orientated at a 45 degree angle to the aisle. Each four foot square pallet would support four drums and the apex of each pallet would be three feet from the adjacent pallet. The centerline of the aisle would also serve as the high point of the slab so that any accidental spillage of the waste would not react with any of the surrounding material.

832 SEWAGE AND INDUSTRIAL WASTE - COLLECTION

This basic category includes collection systems and lines including pumping stations for sewage and industrial waste, and collection of storm drainage in combined storm and sanitary sewer systems.

832 10 SANITARY SEWER (LF)

A sanitary sewer system collects, transports, and pumps sanitary sewage. Planning for the sanitary sewer system will include piping, fittings, pumps, lift stations, and accessories. An sanitary sewer collection system will be required at all Naval installations and it will be based primarily on the population. The requirements will be determined by an engineering survey.

832 20 COMBINED SEWER (LF)

Combined sewers have been used for the collection of both sanitary sewage and storm drainage into one system. They were used as an expedient in old antiquated systems that have not been renovated, and are being eliminated. Do not consider using combined sewers for both sanitary sewage and storm water at new installations.

832 29 SEWAGE PUMPING STATION SHED/SHELTER (SF)
832 30 SEWAGE/INDUSTRIAL WASTE PUMPING STATION (GM)

A sewage pumping station is a facility used to move sewage through mains to a treatment plant, to serve where a gravity system is not feasible, and/or to lift sewage from one level to another in a gravity system. A sewage pumping station will include at least a sump or storage well and a structure to house pumping equipment, automatic controls, and hose facilities for cleaning the tanks. The capacities and other requirements for sewage pumping stations will be determined by an engineering survey.

832 40 INDUSTRIAL WASTE SEWER (LF)

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833 REFUSE/GARBAGE (SOLID WASTE)

833 09 INCINERATOR BUILDING AND INCINERATOR (TN)
833 10 INCINERATOR - EXTERIOR (TN)

An incineratory is a facility for burning combustible refuse to reduce it to stable gases and inert solids. An incinerator may be justified when the refuse of the Naval installation cannot be disposed of in a sanitary fill; when such method of disposal would create an unhealthy condition or nuisance and the land is not available for such purposes; when local municipal facilities or other Government facilities for disposal are not suitable or available at reasonable prices; or when contract prices for collection and disposal of refuse are economically excessive as opposed to collection and disposal by station personnel. Incinerator capacity will not exceed the capacities listed for applicable populations.

Population (military-civilian residing on station)	Incinerator capacity (tons per 8 hr day)
up to 2,000	5
2,001 to 4,000	10
4,001 to 6,000	15
6,001 to 8,000	20
8,001 to 10,000	25

The capacities, as shown, include 25 percent excess over average hourly needs to allow for irregularity in delivery of refuse to the incinerator. The planner should consider the merits of the dump and charge method where the refuse may be stored for periodic regular burning with resultant economy of operation. See NAVFAC DM-3, Mechanical Engineering, for technical information.

833 15 SANITARY/CUT-FILL DISPOSAL AREA (EA)
833 20 GARBAGE GRINDER BUILDING (TN0
833 21 GARBAGE GRINDER (TN0
833 30 GARBAGE STAND (EA)
833 40 GARBAGE HOUSE (SF)

No planning criteria for Category Codes 833 15 through 833 40 are currently available. Each facility requires individual justification.

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840 WATER

Water facilities at Naval installations shall provide sufficient quantities of potable water for domestic and industrial use; purification of raw water from deep wells, lakes, and rivers; storage of water in bulk storage tanks or reservoirs; and distribution of water to demand areas. The location of the supply sources may be determined by topographic maps, soil maps, climate data and, in some cases, geologic surveys. The selection of water sources must be consistent with economic considerations, such as gravity delivery if possible. Separate nonpotable water fire protective systems may be provided where applicable. Planning information is provided for the following facility groups:

Code 841 Potable Water - Supply, Treatment, and Storage
Code 842 Water - Distribution System, Potable
Code 843 Water - Fire Protection
Code 844 Water Supply/Storage - Nonpotable
Code 845 Water Distribution System - Nonpotable

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841 POTABLE WATER - SUPPLY, TREATMENT, AND STORAGE

841 09 WATER TREATMENT FACILITY BUILDING (SF)
841 10 WATER TREATMENT FACILITIES (KG)

Planning for the treatment of water will include, as applicable, screening, settling, coagulation and sedimentation, filtration, disinfection, softening, and aeration. The water treatment systems are normally planned in millions of gallons (MG) per day capacity and distribution is in linear feet (LF). The systems must be adequate to meet the domestic and industrial requirements, and to provide fire protection if a separate fire protection system is not provided. If separate nonpotable water protective systems are not provided, the capacity of the water supply system will be determined by the fire flow demand (see Code 843). Planning requirements for water treatment facilities will be based on the results of an engineering survey and an economic analysis to determined sources of water versus commercial or municipal supply. For water treatment methods see NAVFAC DM-5, Civil Engineering.

841 15 NUCLEAR REACTOR WATER TREATMENT FACILITY (KG)

No criteria for this facility are currently available.

841 20 SUPPLY MAINS AND PUMPING FACILITIES (PRETREATMENT ONLY) (LF)

These facilities transmit water from source to point of treatment or to the point of consumption. A pressure main will be needed if the water is pumped. However, if topography permits, a gravity system is planned. A twin conduit may be used to insure uninterrupted water supply. Important points to consider are, (a) the transmission pipe must have capacity for peak loads and future growth, (b) it must have durability to assure usefulness for many years without costly repair to replacement, and (c) it must usually carry raw, untreated water. Linear feet of pipe, types and capacities of pumps, quantities of water required for domestic and industrial use are determined by an engineering survey. See NAVFAC DM-5, Civil Engineering.

841 25 DESALINIZATION PLANT (KG)

No criteria for this facility are currently available.

841 30 STORAGE TANKS - ELEVATED, POTABLE (GA)
841 40 STORAGE TAN-KS - GROUND LEVEL, POTABLE (GA)

Water storage tanks for potable water are elevated or ground-level structures used to store bulk quantities of potable water. Elevated tanks for potable water provide both storage and static pressure for the distribution system. Ground-level tanks accommodate peak demand

requirements without affecting the capability of the source. The planning for potable water storage tanks will be based on the requirements determined by an engineering survey. These surveys will determine the capacities and pressures required for the water system. Elevated tanks will not be planned in the immediate vicinity of an airfield. Water uses which must be considered in estimating potable water requirements for shore installations are (a) domestic, (b) industrial, and (c) fire protection.

Domestic uses include drinking water, household uses, and lawn sprinkling. The average daily gallons per capita requirements for potable water for domestic uses are as follows:

Facility Type	Permanent Installations		Temporary Installations (w/no flush toilets)
	Tropic	Temperate	
Barracks			
Enlisted Men	150	150	75
Enlisted Women	190	175	90
Quarters	150	150	90
Hotels	110	100	
Industrial Plants - (human consumption			
Persons in one shift	50	50	25
Hospital (per bed)	200	200	100

Industrial uses include cooling, processing, flushing, issues to ships, lawn sprinkling, air-conditioning, and boiler makeup. Potable water requirements for industrial uses at permanent installations may be computed from the table below.

INDUSTRIAL WATER REQUIREMENTS
Potable Water-Permanent Installations

Use	Unit	Requirements		
		Min.	Avg.	Max.
Air Conditioning:				
With conservation	g.p.m./ton		0.05	0.10
Without conservation	g.p.m./ton		2.50	4.00
Cooling--diesel engines:				
With conservation	g.p.m./b.h.p.		0.01	0.02
Without conservation	gal./KWH	.25	0.33	.40
Cooling--steam power plants(l):				
With conservation	gal./KWH	1.30	0.80	1.70
Issue to ships (domestic uses):				
Single berth	g.p.m.		1,000 (2)	
More than single berth	g.p.m.		1,000(2)	2,000 (3)

INDUSTRIAL WATER REQUIREMENTS (Continued)
Potable Water--Permanent Installations

Use	Unit	Requirements		
		Min.	Avg.	Max.
Laundries	gal./lb.	3	-	6
Lawn Sprinkling:				
Small lots	g.p.d./100 sq ft	16	-	32
Large areas	g.p.a.d.	7,000	-	14,000
Motor vehicle maintenance	g.p.d./car	30	-	50
Restaurants	gal./meal	0.5	-	40

(1) Use as a guide only.
(2) Up to 2,000 lineal feet of berthing length.
(3) 500 gallons per minute for each additional 2,000 lineal feet of berthing length, but not exceeding 2,000 gallons per minute.

Fire Protection. Fire flow requirements for fire protection are listed under Code 843. See NAVFAC DM-5, Civil Engineering, and NAVFAC DM-8, Fire Protection Engineering, for technical information.

841 50 WELLS - POTABLE WATER (KG)

These facilities are planned only where adequate municipal sources are not available. More than one well may be required for an adequate water supply. No permanent installation is planned without knowledge of the underground strata.

841 51 RESERVOIR - POTABLE WATER (MG)

A reservoir has a greater capacity than a water storage tank and a sufficient quantity of water in reserve to insure an uninterrupted flow for station needs. Ponds or lakes may be used as reservoirs. Planning for reservoirs must be considered whenever a large natural source of water, or a municipal source is not available. Water storage facilities will be planned only at stations where an emergency might cause an interruption in the flow of the principal source or the principal source or the principal source is not adequate for normal usage. Planning requirements will be determined by engineering surveys. See NAVFAC DM-5, Civil Engineering, for technical information.

841 52 WATER CATCHMENT AREA (SY)

No criteria are currently available.

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842 WATER - DISTRIBUTION SYSTEM, POTABLE

842 09 WATER DISTRIBUTION BUILDING/SHELTER, POTABLE (SF)

842 10 WATER DISTRIBUTION LINE, POTABLE (LF)

Potable water will be transmitted from a storage tank or a treatment plant to all station demand points through a pipeline. An engineering study of the pressures and quantities of water required at the demands points will serve as the basis for planning the sizes and lengths of pipe required for the water distribution pipelines. Planning for a potable water distribution pipeline will include requirements for piping, valves, pumps, connections, excavation, and backfilling. The pipeline shall be listed in linear feet (LF). See NAVFAC DM-5, Civil Engineering.

842 15 PUMPING STATION, ETC. - POTABLE WATER (GM)

This category code will include any additional pipeline facilities, such as water pumping stations. A water pumping station is required where increased-water pressure is needed or to raise water from-one level to another. An engineering survey will determine the need and also the capacity and size of the station. Water pumping stations capacities are given in gallons per minute (GM). See NAVFAC DM-5, Civil Engineering, for technical information.

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843 WATER, FIRE PROTECTION

Fire protection requirements often dominate the plans of a water supply system. When the supply of fresh water is not adequate, salt water may be used. Since fire flow demands are usually greater than either the domestic or industrial demands, the capacity of the system will generally be determined by the fire flow demands. Fire flows are expressed in gallons per minute and are separate from the other water requirements. Normal fire flow demands are as follows:

Dwellings. The fire flow requirements for residential areas shall be as follows:

Individual and duplex units--1 story--500 GPM
Individual and duplex units--2 story--750 GPM
Multifamily (3 or more) units--1 story--750 GPM
Multifamily (3 or more) units--2 story--1,000 GPM

Light and Ordinary Hazards. In both light and ordinary hazard areas, the fire flow requirements for both hose streams and automatic sprinkler systems shall be as indicated in the table on page 843-3.

Special Areas. For areas of extra hazards and areas of special consideration, see requirements as listed in NAVFAC DM-8, Fire Protection Engineering. If the source demands are for a combination system then it must be of sufficient capacity to provide for the domestic, industrial, and fire flow requirements simultaneously. If the source of supply is unreliable, a storage system may be justified. Normally the most practical facility is the ground-level reservoir. Water storage requirements for fire protection are as listed in the following table:

Water Storage Requirements for Fire Protection

Fire Flow Demands (GPM)	Storage Requirements (hours)	Storage Requirements (gallons)
up to 750	1-1 1/2	66,500
Up to 1,250	2	150,000
up to 1,750	2	210,000
Up to 2,250	2-2 1/2	338,000
up to 3,000	3	540,000
Over 3,000	4	960,000

The Category Group 843 contains the following individual codes:

843 10 FIRE PROTECTION WATER PIPELINES (LF)

Fire protection pipelines are used exclusively for firefighting. Planning for protection pipelines includes hydrants, valves, connections, pumps, piping, excavating, and backfill. This facility is planned only when a nonpotable water fire protection system is necessary at large, or multimission activities. It may be planned where two separate maximum fire flows are needed, or where large quantities of water must be

available for fire flow and for an automatic sprinkler system demand over or above normal requirements. Fire protection pipelines will be planned in linear feet (LF). Planning requirements will be determined by an engineering survey and from the factors contained under Code 843. See NAVFAC DM-5, Civil Engineering, for design information.

843 20 FIRE PROTECTION PUMPING STATION (GM)

A fire protection pumping station provides a high flow of nonpotable water for high pressure firefighting. Since this facility will generally be used in conjunction with fire protection pipelines, the planning requirements will be determined by the same methods as those for Code 843 10.

843 30 WATER STORAGE TANK - FIRE PROTECTION WATER (GA)

This facility provides a large supply of nonpotable water for firefighting. Since this facility will generally be used in conjunction with fire protection pipelines and pumping sections, planning requirements will be determined from the factors contained in Code 843.

843 35 RESERVOIRS - FIRE PROTECTION WATER (MG)
843 40 WELLS - FIRE PROTECTION WATER (GM)
843 50 VALVE HOUSE/SHED/SHELTER - FIRE PROTECTION SYSTEM (SF)

No specific criteria are available for Codes 843 35 through 843 50.

Fire Flow Requirements

Height and Area (Sq Ft)	Unsprinklered		Sprinklered				
	Hose Streams		Hose Streams		Sprinkler Demand	Total	
	Fire Resistive, N.C. (Masonry) Ordinary, and Heavy Timber	Frame, N.C. (All Metal)	Fire Resistive, N.C. (Masonry) Ordinary, Heavy Timber	Frame, N.C. (All Metal)		Fire Resistive, N.C. (Masonry) Ordinary, Heavy Timber	Frame, N.C. (All Metal)
1 Story							
0 - 10,000	750	1,250	250	250	500	750	750
10,000 - 20,000	1,000	1,750	250	250	750	1,000	1,000
20,000 - 80,000	1,250	2,500	250	500	1,000	1,250	1,500
Multistory							
0 - 10,000	1,000	2,000	250	500	500	750	1,000
10,000 - 20,000	1,250	2,500	250	500	750	750	1,250
20,000 - 80,000	1,750	3,000	500	750	1,000	1,500	1,750

NOTES:

1. All one store buildings above 20 feet in height shall be classified as multistory.
2. Flows for hose streams shall be provided at 20 psi residual pressure.
3. Sprinkler demand requirements shall be based on a residual pressure at grade to provide a minimum pressure of 15 psi at the highest sprinkler.
4. In unsprinklered one story buildings, less than 1,000 square feet ground floor area, hose streams requirement of 500 gpm generally will be satisfactory.

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844 WATER SUPPLY/STORAGE, NONPOTABLE WATER

The water from these facilities will be used primarily for industrial purposes or as an emergency supply, should there be a failure of the principal source. When a requirement for nonpotable water source exists, firefighting water requirements usually will be combined with this group. Requirements planning for this facility group is similar to that for Category Group 841 and 843 where applicable. The Category Group 844 contains the following individual codes:

844 10 WATER SUPPLY/STORAGE (NONPOTABLE) BUILDING (SF)
844 20 WELLS - NONPOTABLE WATER (KG)
844 30 SUPPLY PUMPING STATION - NONPOTABLE WATER (KG)
844 40 STORAGE TANKS - NONPOTABLE WATER (GA)
844 50 RESERVOIRS - NONPOTABLE WATER (MG)

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845 WATER DISTRIBUTION SYSTEM - NONPOTABLE

Facilities in this group support nonpotable water supply systems and are similar to those described under Category Group 842. This group contains the following individual codes:

845 10 PIPELINE BUILDING - NONPOTABLE WATER (SF)
845 20 PIPELINE - NONPOTABLE WATER (LF)
845 30 BOOSTER PUMP STATION - NONPOTABLE WATER (KG)

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850 ROADS AND STREETS

851 10 ROADS (SY)
851 15 LOAD/UNLOAD RAMP (SY)
851 20 VEHICULAR BRIDGES (SY)

Roads, streets, and bridges are planned to conform in general with the standards and practices of the American Association of State Highway Officials (AASHO), Bureau of Public Roads (BPR), and State and local governments.

Planning is derived from the general development map of the station. See NAVFAC DM-5 for design criteria.

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852 10 PARKING AREA (SY)

Organizational Vehicle Parking. The paved and/or stabilized area within an organizational motor pool and parking lot, including space required for entrance and exit roads and aisles within the lot, will not exceed the following:

1. Navy and Marine Corps installations (except Marine Corps installations with FMF Ground Units assigned.) Forty square yards per unit for 75% of the equipment supported. The 40 square yards per unit takes into account the varied sizes and types of automotive, construction, and materials handling equipment to be parked.

2. Marine Corps installations with FMF Ground Units assigned. Seventy-five square yards for each vehicle to be accommodated. The 75 SK will be reduced to 50 SK per vehicle if more than 50% of the vehicles to be accommodated have an overall length of 18 feet or less and a width of 6 1/2 feet or less (such as administrative-type vehicles).

Nonorganizational Vehicle Parking. Authorized parking spaces for non-organizational vehicles are listed in Table 852-10. The space allowance for each parking space is 35 square yards. This provides room for the parked vehicle and for normal interior lanes, entrances, and exits. Parking spaces for a facility not listed in the table shall be based on a special study of traffic analysis taking into account eligible vehicles, multiple utilization, time and space intervals, available public transportation, group-car riding and government -furnished transportation. For example, no planning factor has been established for parking space required for shipboard personnel while in homeport. Therefore a special study would be required to determine parking space needed to support this requirement. Such a study would take into consideration the number of ships which would be in the homeport at any one time and a derivation therefrom of the number of shipboard personnel requiring parking space. Where there is no direct experience, valid projections of available data may be made. Parking space for a listed facility, whether existing or planned, may be increased when justified by a special study or traffic analysis.

TABLE 852-10
Allowances for Nonorganizational Vehicle Parking

Facility	Number of parking spaces
Administrative Buildings	50% of assigned personnel
Bachelor Housing - Officers' Quarters	90% of capacity
Bachelor Housing - Enlisted Quarters	60% of capacity
Bakeries	38% of employees, largest shift
Cafeterias, when not included in Community Shopping Center	15% of seating capacity
Chapels	15% of seating capacity
Commissaries, when not included in Community Shopping Center	See Category Code 740 23
Community Shopping Center	4% of population served
Exchange Retail Store, when not included in Community Shopping Center	2% of military strength served
Family Housing	2 spaces per living unit
Field House, combined with Football and Baseball facilities	1% of military strength
Fire Stations: 3-stall	7 spaces
7-stall	10 spaces
Correctional Centers, Police Stations	30% of guard strength
Temporary Quarters	90% of units
Gymnasiums (if more than one on station, prorate total allowance)	1% of military strength
Laundries and Dry Cleaning Plants	38% of employees, largest shift
Libraries: Central	1 space per each 500 SF of floor area
Branch	2 spaces
Maintenance Shops	38% of assigned personnel, largest shift
Dental Clinic (either separate or as part of another medical facility	3 spaces per DOR/OHTR
Hospitals and Medical Clinics	Use the following formula:
X1 - All personnel (staff) working in the facility on a continuous basis	
X2 - Average daily outpatient/visitor load for the peak month. Factor X2 is excluded at troop clinics.	
Reserve Training Centers	80% of reservists, largest drill period.
Dependent Schools: without auditorium	2 spaces per classroom
with auditorium	2 spaces per classroom plus 15% of auditorium seats

Table continued on next page.

TABLE 852-10 (Continued)
Allowances for Nonorganizational Vehicle Parking

Facility	Number of parking spaces
Security Offices (at activity gate):	5 spaces
2,001 to 4,000 population	10 spaces
4,001 to 6,000 population	15 spaces
6,001 to 10,000 population	Special study required
Swimming Pools	20% of pool design capacity
Theaters, when not included in Community Shopping Center	25% of seating capacity
Enlisted Dining Facility: As a general rule, dining facility parking requirements will be determined based on individual studies. More specific parking criteria are currently under development, however, as a general guidance, use 30% of capacity plus 38% of dining facility employees.	
Clubs and Open Messes:	
Officers' Mess, Open	20% of officer strength served
Enlisted Mens' Club	2% of enlisted strength served
PO Mess, Open/NCO-SNCO Club	1 space for each 500 SF of office area plus 1 space for each 4 persons assigned to warehouse operations.
Warehouses	

Refueling Vehicle Parking. A paved area to provide parking for partially or fully loaded refueling units is required where such units are employed to provide fuel for aircraft. This area is to be differentiated from line vehicle parking (Category Code 116 45) which may provide operational parking for some refueling units requiring immediate access to aircraft apron. To determine the area required, a planning factor of 400 square yards per vehicle (refueling semitrailer with tractor) may be used as a guide. The following criteria shall be adhered to:

One hundred feet is the optimum separation between fueling vehicle parking areas and surrounding buildings. This separation should be applied in the planning of new areas. For existing areas this separation should be used whereever possible without requiring extensive relocation or ground improvement. In such cases the 100-foot distance may be modified on the basis of local conditions, taking into consideration the size, nature, and importance of nearby exposed buildings. However, this separation distance should not be reduced below 50 feet.

A separation of 25 feet of centers will be-maintained between parked fueling vehicles in designated areas. Distance between rows will vary depending upon the type and the length of the individual vehicles and their turning characteristics. However, the distance between rows will not exceed 50 feet.

Vehicles should be aligned in single rows and should be capable of being driven out of storage areas in a single turn.

NOTE: The above-mentioned requirements do not apply to spacing and/or placing fueling vehicles in structures designed for servicing equipment of this nature.

852 20 SIDEWALK (SY)
852 30 PEDESTRIAN BRIDGES (SY)

Planning of sidewalks and pedestrian bridges is derived from the general development map of the activity. See NAVFAC DM-5 for design criteria.

852 35 OTHER PAVED AREAS NOT CODED IN THE 100 OR 400 SERIES (SY)

This code is for miscellaneous vehicular pavements. No planning factors are available.

852 40 MISCELLANEOUS OPEN STORAGE OR LAYDOWN AREA (SY)

This code is for open storage areas other than those used for general supply operations (Category Code 451 10). It includes Public Works Open Storage facilities; see Table 852 40 for allowances.

TABLE 852 40
Allowances for
Public Works Open Storage

PW Shop Type	Square Yards
A,B,C,	225
D	380
E	780
F	1,180

NOTE: For Public Works Open Storage supporting PW shops larger than type F, add 2 SY of open storage for each maintenance craftsman over 500.

860 RAILROAD TRACKS

This category group covers all two-rail tracks including spurs, sidings, yards, turnouts, with accessories and appurtenances such as barricades. It includes trackage on ship repair facilities marine railways and portal crane structures, Code 213. For design information on facilities in the 860 series, see NAVFAC DM-5, Civil Engineering.

860 10 RAILROAD TRACKAGE (MI)

The planning of railroad trackage will be based on an economic analysis of the cost of truck haulage versus the cost of the proposed use of railroad facilities. Trackage is planned to connect the base with the common carrier and for holding and unloading freight cars as required. The amount of railroad trackage to be constructed by the government is determined by the proximity of the common carrier lines and the traffic volume.

863 20 EXPLOSIVE BARRICADE FOR SUSPECT TRUCKS AND RAILROAD CARS (EA)

A suspect truck and rail car facility provides a holding area, barricaded on three sides, having rail sidings to accommodate two railcars and a paved area for four trucks, to park suspect incoming ordnance shipments. The facility can be used jointly for both trucks and railcars or separately as a truck or rail facility. The size is relative to the total flow of traffic in a given handling area. Figure 860 20 represents a typical facility, which can handle an outloading of 750 containers in 24 hours.

860 30 RAILROAD BRIDGE AND TRESTLE (MI)

860 40 CRANE TRACKAGE (MI)

When planning track layouts, railroad trackage should be separated from portal crane trackage, because, apart from the similarity of the rails, portal crane trackage requirements are completely different from railroad trackage. Where separation is impossible, both cranes and rolling stock will utilize a common rail, and the other railroad trackage rail shall be placed inside the crane gauge.

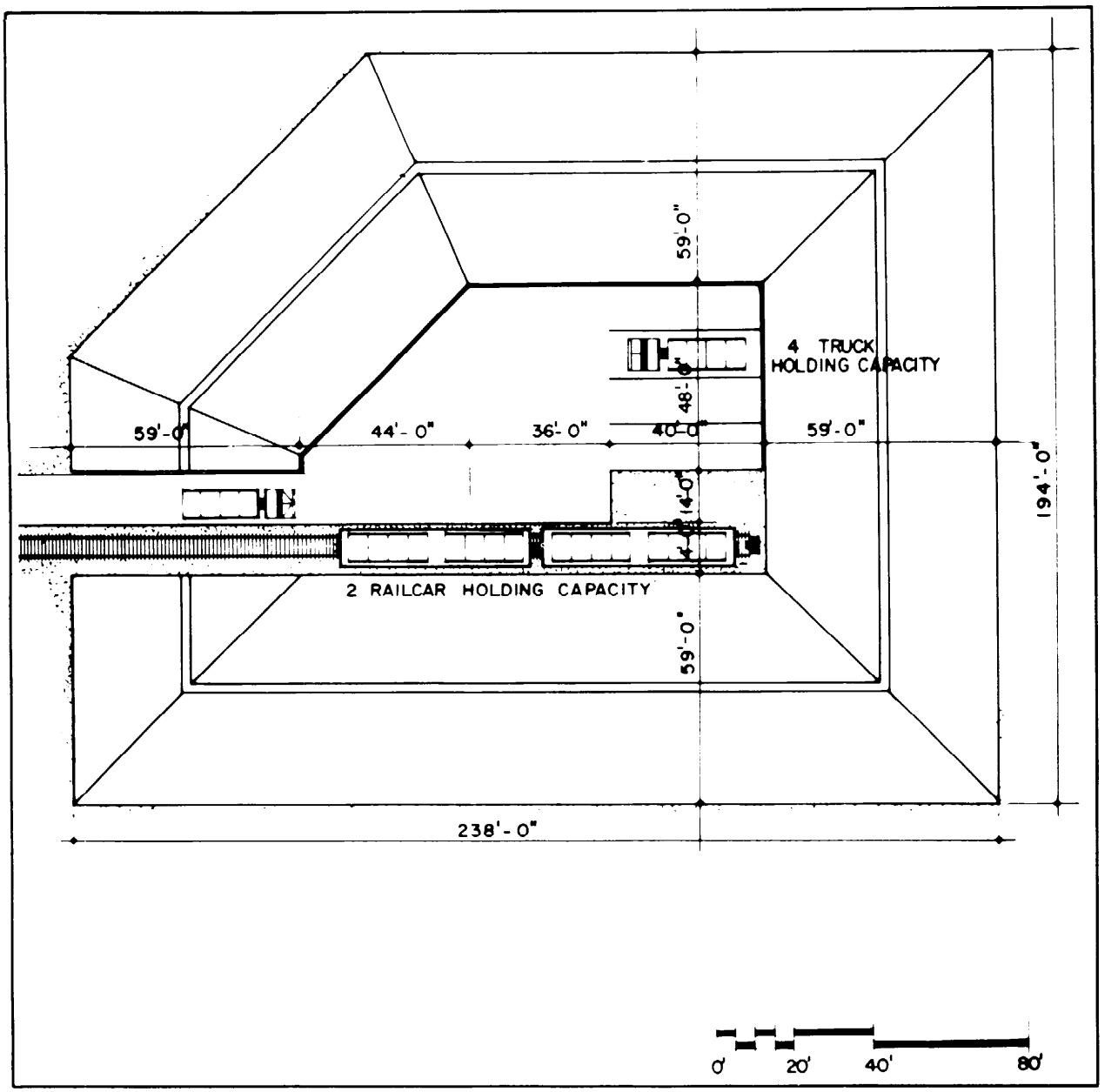

FIGURE 860-20
Explosive Barricade for Suspect Trucks and Railroad Cars

870 GROUND IMPROVEMENT STRUCTURES

This category group includes drainage and storm sewer systems, boundary fencing, gates, guard towers and shelters and other related facilities.

871 GROUNDS, DRAINAGE

871 10 STORM SEWER (LF)

Storm sewers are components of a storm drainage system that collects the surface runoff water and conveys it to outlet points. Storm sewers are required at installations or areas where open drainage ditches would create a hazard to the operation of vehicles and aircraft or would prove hazardous to pedestrians. Storm sewers shall not be combined with sanitary sewers. See NAVFAC DM-5, Civil Engineering, for design information.

871 11 OIL/WATER SEPARATOR - RUNOFF WATER (KG)
871 15 STORM WATER PUMPING STATION (EA)

Requirements for Category Codes 871 11 and 15 must be individually justified. No criteria are available.

871 20 DRAINAGE DITCH (LF)

Drainage ditches serve the same purpose as storm sewers. They are preferable to covered structures to minimize construction, to conserve materials, and to facilitate maintenance. Ditches should be planned to provide adequate depth to contain all runoff water anticipated from snow, ice, thaws, frozen ground, and severe rainfalls. In the planning of the drainage system, consideration should be given to the location of ditches to minimize the creation of hazards to vehicles or personnel. See NAVFAC DM-5, Civil Engineering, for technical information.

871 25 DYKE/DAM (LF)
871 30 IRRIGATION FACILITY (LF)
871 35 RETAINING WALL (LF)
871 40 RECLAIMED OWNED LAND (AC)
871 45 DREDGED SPOIL HANDLING FACILITY (GM)

Requirements for Category Codes 871 25 and 35 must be individually justified. No criteria are available.

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872 GROUNDS FENCING, GATES AND GUARD TOWERS

This basic category provides boundary security in the form of fencing, walls, gates, watch towers, guard walks, and guard shelters. The type and amount of security planned is a function of the security classification required, and the economical utilization of security guards.

872 10 STATION SECURITY AND PERIMETER FENCING AND WALLS (LF)
872 15 INTERIOR FENCING (NOT CODED IN 872 10) (LF)

Security fencing and walls define the limits of security areas, and facilitate the effective and economical use of security personnel. Fencing is planned on the basis of a study of the security classification requirements of the installation. The permanency of the installation, availability of materials, presence of natural aids to security, guard personnel, security hazards, and problems and degree of security required, must be considered in all fence construction. Security fencing is generally of the type known as chain link or cyclone, or under certain conditions it may be barbed wire. Fences should be 50 to 150 feet from buildings or critical supplies to be protected. There should be at least 20 feet between perimeter fences and structures, parking areas, or natural features outside the fenced area which could offer concealment or assistance to unauthorized access to area protected. When this is not possible, perimeter fencing should be increased in height or otherwise designed to compensate for the proximity of aids to concealment or access.

Standard Security Fencing. The average standard security fence of the so-called manproof type is the 7-foot cyclone, chain link fence with 1-1/2 foot outriggers mounting 3 barbed wire strands at 45 degrees, increasing the overall height of the fence to 8 feet.

Barbed Wire. There are instances such as in isolated air stations, where three strand barbed wire cattle fence will suffice around the entire perimeter of the station, augmented by standard security fencing of critical areas, if such exist and can be adequately patrolled.

Walls. Where walls, floors, and roofs serve as barriers, they should be constructed and arranged to provide uniform protection equivalent to that provided by chain link fencing as specified. See Table 872-l for appropriate applications and characteristics of fences.

872 20 GUARD AND WATCH TOWERS (EA)

Where authorized, guard or watch towers should be constructed at locations that will provide the best observation of security areas. The general building of guard towers at other than correctional facilities and certain special weapons projects is not presently considered appropriate. Each local security situation should be solved on its own merits. For design criteria, see NAVFAC DM-5.

TABLE 872-1
Applications and General Characteristics of Fences

Application	Location or Special Requirement	Suitable Type	Height	
			Feet	Inches
Security	Restricted Areas--See U.S. Navy Physical Security Manual for locations.	Chain link security fence with three strands of barbed wire mounted on outriggers (facing out except for brigs).	See Physical Security Manual.	
Security	Where restrictions of visibility into activity is desired.	Wooden Security Fence.	See Physical Security Manual.	
	At radio direction-finder structures.	Wooden Security Fence.		
	Where chain link materials are not available.	Wooden Security Fence.		
Protection of sports facilities, users and spectators	Athletic courts.	Chain link.	10-12	-
	Swimming pools.	Chain link or decorative wood.	6	-
	Playgrounds.		5	-
Snow fencing	Where drifting snow is a problem.	Picket interwoven with wire-studded metal posts.	4	-
Right-of-way fencing	Railways, highways.	Woven wire fencing or wooden or metal posts with or without barbed wire.	4.5	-

Table continued on next page.

TABLE 872-1 (continued)
Applications and General Characteristics of Fences

Application	Location or Special Requirement	Suitable Type	Height	
			Feet	Inches
Animal fencing		Woven wire fencing with wooden or metal posts--barbed wire as indicated:		
	Horses, mules, cattle, general.	1 strand top	-	47
	Hogs.	1 strand at bottom	-	32-39
	Sheep and goats.	1 strand at top	-	39-47
	Poultry.	None	-	48-72
Perimeter marking	Property lines, firing ranges, outside security barrier of high security area.	Two strand barbed wire.	-	42
		Three strand barbed wire (wood or metal posts).	-	48
Decorative wood fencing	To discourage passage or access.	Picket fence.	3-5	-
		Post and rail or horizontal board.	4	-
	To provide privacy and screening.	Stockade fence.	6-8	-
		Louver fence.	6-7	-
		Basket weave fence.	6-8	-

See U.S. Navy Physical Security Manual, current OPNAVINST P 5510.45 series for definitions of critical areas.

For design criteria, see NAVFAC DM-5.

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880 FIRE AND OTHER ALARM SYSTEMS

This basic category includes separate integral signal systems such as fire alarm, watch reporting, and security. Telephone reporting systems are planned with telephone systems (see Code 130).

880 10 FIRE ALARM SYSTEM (BX)

Fire alarm systems are of two general types: exterior systems and interior systems. Exterior systems normally have alarm initiating devices outside buildings, but may have components within buildings. Interior systems service a single building or group of buildings and may be connected to an exterior system.

Exterior Fire Reporting Facilities.

Exterior fire reporting systems of either telegraphic radio or supervised telephonic types are authorized for installation in built-up areas at military installations. The type of system selected for use shall be established on the basis of dependability, initial cost, and ability to maintain the system in operating condition. Extension of fire reporting systems will require consideration of compatibility with existing equipment. Fire reporting facilities will not normally be provided at isolated small areas, ammunition and ordnance storage, and similar restricted areas where personnel are not generally present to detect fires.

Interior Fire Reporting Facilities.

Automatic Fire Alarm Systems. Automatic fire detection and alarm systems are authorized for installation in:

1. Buildings, for protection of life, or in isolated and/or important facilities where automatic sprinkler protection would normally be provided but is not economically or technically feasible.

2. Combustible buildings used for the confinement of military prisoners where automatic sprinklers, normally provided, cannot be made available.

3. Combustible buildings of hospital groups and specific areas of noncombustible buildings of hospital groups, where automatic sprinklers are not provided.

4. One and two-story combustible dormitory-type living quarters, including bachelor officers' quarters, guesthouses, nurses' quarters, civilian dormitories, and similar buildings used for sleeping purposes.

Manual Fire Alarm Systems. Manual fire and evacuation alarms are authorized for installation in:

1. Barracks, dormitories, bachelor officers' quarters and similar sleeping quarters, involving 20 or more persons not otherwise provided with automatic fire detection alarms.

2. Combustible buildings used for confinement of military prisoners, not otherwise provided with automatic sprinkler or automatic fire detection systems.

3. Buildings involving personnel occupancy such as administration, clubs, schools, classrooms, hospitals, laboratories, industrial and similar structures. Normally, such buildings having an occupancy of 20 or more persons will be provided with this type of alarm system.

See NAVFAC DM-8, Fire Protection Engineering, for technical design information.

880 20 WATCH REPORTING SYSTEM (BX)

A watch reporting system provides a method for the non-automatic detection of fire and for security protection throughout designated areas, buildings, and structures. The watch reporting system provides local alarms and central station alarms to building occupants and to station security and firefighting personnel. Watch reporting systems are planned on the basis of engineering surveys to determine the degree of fire protection and security required. See NAVFAC DM-4, Electrical Engineering, for technical design information.

880 30 AIR RAID ALARM SYSTEMS (EA)

Air raid alarm systems shall be planned for all Navy installations and shall be complete and self-operational. The system shall be coordinated with local civil defense authorities, and follow their directives. Horns of high-power type shall be used as signal devices. Their locations shall be coordinated with structures and buildings, to spread audible signals evenly and with enough intensity to be heard over a whole area or activity.

880 40 AIR CRASH/ALERT (EA)

No planning criteria are currently available.

890 MISCELLANEOUS UTILITIES

890 09 BUILDING HOUSING MISCELLANEOUS UTILITY PLANT (SF)

This code is used in cases where any of the miscellaneous utilities components are or must be enclosed in a building. No planning criteria are available.

890 10 ACETYLENE PLANT (EA)
890 11 ACETYLENE DISTRIBUTION SYSTEM (LF)

Generally the generation of acetylene is a function of private industry. Where commercial sources are nonexistent or of poor quality, a generating plant may be built. The quantity of acetylene required and the siting of an acetylene plant within safety criteria are determined by an engineering study. A typical acetylene generator building has an approximate gross area of 2,200 square feet.

890 15 NITROGEN PLANT (EA)

A nitrogen plant is required for the provision of large quantities of nitrogen for special applications. Nitrogen is used where an inert gas is required. It prevents oxidation in welding and soldering. It prevents spoilage of perishable supplies by displacing air in special storage facilities. Nitrogen is also used in the quick freezing of food. Nitrogen is provided by commercial sources where available. A requirement for a nitrogen plant shall be determined by a special study. Nitrogen and oxygen are by-products of each other, so preliminary guidance may be taken from oxygen plant criteria. See 141 87 Liquid Oxygen Facility, and 890 30 Industrial Oxygen Plant.

890 20 COMPRESSED AIR PLANT (EA)
890 21 COMPRESSED AIR DISTRIBUTION SYSTEM (LF)

Compressed air is used by the Navy in numerous applications, such as for pneumatic tools, laundry equipment, instrumentation and control equipment, and in hospitals and laboratories. If the requirement is sufficiently large at an installation, a central compressed air plant and distribution system should be installed. A careful analysis of all compressed air operating requirements is necessary to determine the capacity and pressure of the distribution system. Usually, compressed air is distributed at 100 to 125 psig from a central system for general purpose needs. Special, high pressure systems are required for ordnance plants, ammunition depots, catapults, and submarine facilities.

890 25 CARBON DIOXIDE PLANT (EA)

A carbon dioxide plant at a Naval activity provides space for the storage and transfer of carbon dioxide. The space contains a storage tank and a

distribution system used for refilling carbon dioxide fire extinguishers and the like. The space required will approximate 1,200 to 2,000 square feet.

890 27 ICEMAKING PLANT (TN)

No planning criteria are currently available.

890 30 INDUSTRIAL OXYGEN PLANT (EA)
890 31 OXYGEN DISTRIBUTION SYSTEM (LF)

Industrial oxygen is obtained from private industry where feasible. Where oxygen must be produced, it is obtained by breakdown of air into oxygen and nitrogen. Nitrogen is a by-product.

Breathing oxygen is handled separately from industrial oxygen because of more stringent purity requirements. See Category Code 141 87 Liquid Oxygen Facilities for breathing oxygen.

890 42 AIR CONDITIONING PLANT (5 to 25 TONS) (TN)
890 45 VALVE HOUSE OR OTHER SHED/SHELTER (SF)
890 46 UTILITY TUNNEL (LF)

No planning criteria for Category Codes 890 42 through 890 46 are currently available. Each facility requires individual justification.

890 50 ENERGY MONITORING AND CONTROL SYSTEM (EA)

This facility is an automated control network designed to monitor and reduce energy consumption at shore installations. The system consists of a central computer, remote sensor equipment, automated utility controls at buildings to be serviced, and data transmission links. In large building complexes, there may be secondary operator terminals at several locations with data links to the central computer. One network may service the entire installation, a group of selected buildings, or there may be more than one network at a given installation. One system usually controls the following building services.

Heating and air conditioning
Hot water, chilled water and steam
Air and gasses
Electrical power and lighting
Emergency power generation

In addition to utility control, the system can be designed to perform other functions such as:

Fire alarm and smoke management
Security
Voice communications

Data collection for energy cost accounting
Equipment performance monitoring and alarms
Equipment maintenance management

890 56 WEIGHING FACILITY (EA)

890 77 STORAGE FOR UTILITY SYSTEMS (READY ISSUE/SHOP STORES/MISC.) (SF)

No planning criteria for Category Codes 890 50 through 890 77 are currently available. Each facility requires individual justification.

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Section 9

FACILITY CLASS 900 - REAL ESTATE

This Facility Class applies to real estate in which the Navy has, or intends to obtain, a vested interest. The interest may be acquired by purchase, condemnation, donation, or exchange, and may be held in fee simple, leasehold, or easement. Real estate planned for the Navy is defined under the category codes for classifying real property as found in NAVFAC P-72. Classification is done according to the methods of acquisition and the type of real estate acquired as follows:

Code 910 Land - Government-Owned
Code 920 Other Rights
Code 930 Site Improvements

Policy. As a general policy, all permanent Naval installations within the United States, and its possessions shall be established on land owned in fee by the Federal Government under the custody and accountability of the Department of the Navy. This policy is based on the need for the unconditional use of the land for the unrestricted execution of the assigned military mission. Additional real estate will not be acquired for the Department of the Navy by any method unless a determination has been made that consistent with the requirements of the military mission, such needs cannot be fulfilled by maximum utilization of the real estate under the control of the three military departments. Current requirements will, in the absence of unusual circumstances, be given preference over anticipated future needs and mobilization requirements. Care must be taken however, to prevent modifications that would interfere with mobilization plans for the property. The following are broad policies of the Department of the Navy in connection with the real estate transactions:

1. To acquire only the real property necessary to meet present and immediately foreseeable requirements;

2. To acquire title or other interest to real property by negotiation and direct purchase wherever possible;

3. To base estimate of value upon appraisals made by private local appraisers or by staff appraisers;

4. To take prompt action to dispose of real property excess to current and foreseeable needs of the Navy;

5. To authorize for private use, after advertising, real property which is temporarily excess to the needs of the Navy and is not required for use by other Federal agencies;

6. To require the payment of fair value for easements granted and for property which is made available for private use under out-leases, licenses or otherwise; and

7. To construct buildings or improvements of permanent type only on lands in which the rights of the Government are fee title or permanent easements.

Determination of Requirements. Prior to acquisition of additional land, it shall be determined that the requirements cannot be met by:

1. Exercise of recapture-of-use rights;
2. Use of property excess to the needs of other military departments or another government agency;
3. Exercise of joint use with other agencies;
4. Acquisition of land from public domain; or
5. Transfer from state or municipal governments.

Acquisition Code versus Retention Code. Real estate is acquired under the 900 Code but is transferred, usually at the end of the fiscal year, to the code under which it is used. Coding in the 900 series denotes the type of interest acquired in the property and the means of acquisition.

Reasons for Acquisition. Land is acquired to supply operational and building areas and to provide security and safety clearances. Requirements for real estate are generated by the assignment of missions for which facilities are not available. When a mission has been assigned to a specific activity, the Commanding Officer reviews available facilities and such deficiencies as exist from the basis of a requirement for the expansion of the installation or the development of a new one. These requirements are submitted for CNO approval through the Military Construction Review Board procedures. See NAVFAC P-73, Real Estate Administration, for the detailed procedures.

Authority to Acquire Real Property. The authority to acquire real property and execute real estate functions is vested in the Naval Facilities Engineering Command. Authority to acquire real property must be supported by legislative authorization with an appropriation of funds available for that purpose.

Delegation of Authority. Authority is delegated to the field offices from time to time for certain functions in relation to real property. This delegation is made to the Commanders/CC's, Naval Facilities Engineering Command Field Divisions.

Legislative Authorization (MCON Acts). Navy Department land acquisitions usually are provided for in Acts of Congress authorizing construction projects at Naval installations. These Acts are commonly known as Military Construction Acts (MCON Acts). They are sometimes referred to as Public Works Authorization Acts.

Acquisition Cost. Acquisition exceeding $50,000 is included with the MCON Acts as a line item for action of the Congress. Acquisition not exceeding $25,000 is vested in the Secretary of the Navy. This authority is for land or

real property interest determined necessary for national defense. The authority for expenditure up to $25,000 may not be used to acquire two or more contiguous parcels that together cost more than $50,000. The detailed method of acquisition is found in NAVFAC P-73, Real Estate Procedural Manual.

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910 LAND - GOVERNMENT OWNED

All land interests are included in Category Group 910 with the exception of easement rights, in-lease rights, and foreign rights which are in Category Group 920.

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911 LAND - PERMANENT USE LAND

This basic category includes lands acquired in fee purchase, condemnation, donation, exchange or transfer, which is owned in fee by the Federal Government, and under custody and accountability of the Department of the Navy.

911 10 LAND - PURCHASE

Land acquired in fee by purchase is a negotiated sale of the property from private owners to the Federal Government by conveyance of deed.

911 20 LAND - DONATION

Land acquired in fee by donation usually consists of a conveyance of fee title by the donor without monetary consideration.

911 30 LAND - TRANSFER

911 40 LAND - CONDEMNATION

Land is acquired by condemnation where land is essential for a project which affects national defense or security, and the consideration for purchase cannot be mutually agreed upon between the owner and the Navy.

911 50 LAND - EXCHANGE

Land acquired by exchange is similar in principle to acquisitions by purchase except that the consideration is by land value rather than cash. Land exchange may be negotiated at the Field Engineering Division level between the Navy and private owners after approval by the interested bureau or office and the Naval Facilities Engineering Command. For value exceeding $50,000, approval by the Congressional Armed Services Committees is required.

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912 LAND - PUBLIC DOMAIN WITHDRAWAL

The Navy Department may acquire land by withdrawal from public domain under jurisdiction of the Department of the Interior. Withdrawals of less than 5,000 acres are made by Public Land Order. Withdrawal of more than 5,000 acres for any one project must be approved by Act of Congress. In addition to securing authorization from the Armed Services Committees of Congress, a bill must be introduced in the Committees on Public Land and Insular Affairs for acquisition of public domain lands in excess of 5,000 acres. Land withdrawn from public domain is coded as follows:

912 10 LAND - PUBLIC DOMAIN - PERMANENT
912.15 LAND - SET ASIDE - HAWAII
912 20 LAND - PUBLIC DOMAIN - TEMPORARY

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913 LAND - LICENSE OR PERMIT

This category does not include land acquired by a withdrawal from public domain.

913 10 LAND - TEMPORARY USE, LICENSE, PERMIT, OR AGREEMENT

This land is acquired for temporary use under license or permit. The license or permit is a privilege, revocable at will, to use the property of the licenser, for a specified purpose and period of time.

913 20 LAND - PUBLIC DOMAIN - TEMPORARY PERMIT

Land from Public Domain used under temporary permit is obtained under agreement between the Navy Department, and the Department of the Interior. The temporary permit implies no use detrimental to the land such as contamination.

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914 PUBLIC LAND - TERRITORIES AND POSSESSIONS

Land from U.S. possessions is acquired for temporary or long-term use by Executive Order or permit agreement for a limited specific use.

914 10 LAND - PUBLIC-TEMPORARY OR LONG-TERM

This code is used for public land of U.S. possessions acquired and used under long-term agreements or temporary agreements.

914 20 LAND - PUBLIC-TEMPORARY PERMIT

This code is used to designate public land of U.S. possessions assigned to the Navy on temporary permit.

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920 LAND OTHER RIGHTS

This category group includes easements, leases, and foreign rights.

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921 LAND - EASEMENT

An easement is a conveyance of interest in real property for particular purposes and needs of the Navy. An easement is acquired by deed for a term of years or in perpetuity. The grantor of an easement may continue to use the land within the stipulations of the easement.

921 10 LAND - AVIGATION EASEMENT - BY PURCHASE

An avigation easement is purchased to convey certain property rights from the private owner to the Federal Government. This is done by conveyance of deed. Easements are acquired to insure free and unobstructed aircraft passage through the airspace. The easement provides the right to limit structure height and natural growth.

921 20 LAND - AVIATION EASEMENT - BY CONDEMNATION

This code varies from 921 10 only in the method of acquisition. Possession is obtained by condemnation only when the purchase price cannot be mutually agreed upon between the owner and the Navy.

921 30 LAND - OTHER EASEMENT - BY PURCHASE

Easements other than for avigation are acquired by negotiated sale. These easements provide rights-of-way for typical utility lines and access roads as well as many other purposes, including restrictions on use.

921 40 LAND - OTHER EASEMENT - BY CONDEMNATION

This is similar to 921 30 but differs in that agreement on a negotiated easement cannot be reached, and the easement is obtained by condemnation for reason of national defense or security.

921 50 LAND - OTHER EASEMENT - BY EXCHANGE

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922 LAND - IN-LEASED

An in-lease is a conveyance of a possessory interest in real property for a term of years for rent or other consideration. Leased property is categorized under three groups as follows.

922 10 LAND - IN-LEASE - PRIVATE ENTERPRISE

This land is leased from private owners for periods under 25 years.

922 20 LAND - IN-LEASE - STATE AND LOCAL GOVERNMENTS

This land is leased from State and local governments for periods under 25 years.

922 30 LAND - IN-LEASE - LONG-TERM

Land in-lease for 25 years or more is categorized as "long-term". The land may be leased from private enterprise, or State or local governments.

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923 LAND - FOREIGN RIGHTS

This is land under custody and accountability of the Navy Department COW prising a Navy installation in a foreign country except land under easement, Code 921. The method of acquisition or use of real property in a foreign country depends upon, and is accomplished by, diplomatic agreement and subsidiary military agreements or, where applicable, by lease or other agreement. Fee simple title to real property in a foreign country is not acquired. The extent of interest which may be acquired in such property depends upon the agreement. Acquisition or use of real property in an occupied country is accomplished by requisition or other local arrangements. The Navy codes for foreign rights are as follows:

923 10 LAND - FOREIGN, 99-YEAR LEASE
923 20 LAND - FOREIGN, BASE RIGHTS
923 30 LAND - FOREIGN RECIPROCAL AID
923 40 LAND - FOREIGN, OCCUPIED AREA
923 50 LAND - FOREIGN, IN-LEASE
923 60 LAND - FOREIGN, MISCELLANEOUS

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930 SITE IMPROVEMENTS

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931 BUILDINGS

931 10 BUILDING - ACQUISITION (SF)

This code is to be used for budgeting purposes and for reporting buildings on land at the time land is acquired. Such facilities are carried under this code for the balance of the fiscal year when such land or buildings are acquired, then inventoried as appropriate in the 100 through 800 series of codes

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932 STRUCTURE/UTILITY SITE IMPROVEMENTS

This code group is for site improvements which are not associated with a specific building or structure within it's own category code such as clearing, grading, landscaping, erosion control, and similar. This group contains the following individual codes:

932 10 OTHER SITE IMPROVEMENTS - STRUCTURE (EA)
932 20 OTHER SITE IMPROVEMENTS - UTILITY (EA)

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933 DEMOLITION

This group is for demolition of buildings, structures, or utilities and removal of debris performed primarily to make usable or disposable an otherwise unusable site. Demolition directly related to a construction project is assigned the same code as for the project.

933 10 DEMOLITION (EA)

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