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 support 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 containrr 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-7	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	2,975	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	2,905	2	34.6	76.9
WALLEYE MK 13 MODS	CNU-154-E	172.0	29.0	33.0	1	2,905	2	34.6	76.9
WALLEYE MK 23 MODS	CNU-154/E	127.0	29.0	33.0	1	2,905	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.

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.

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.

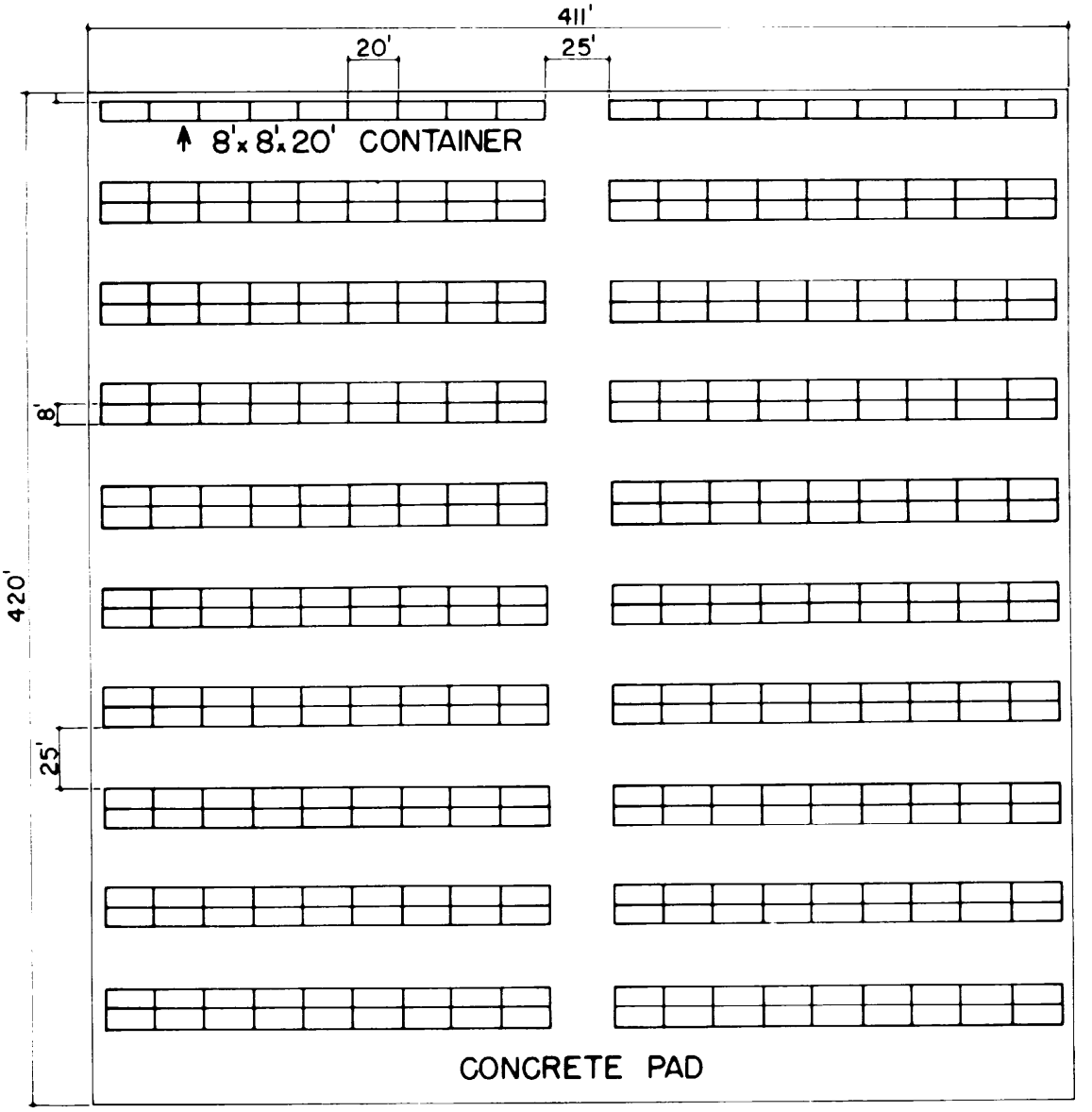


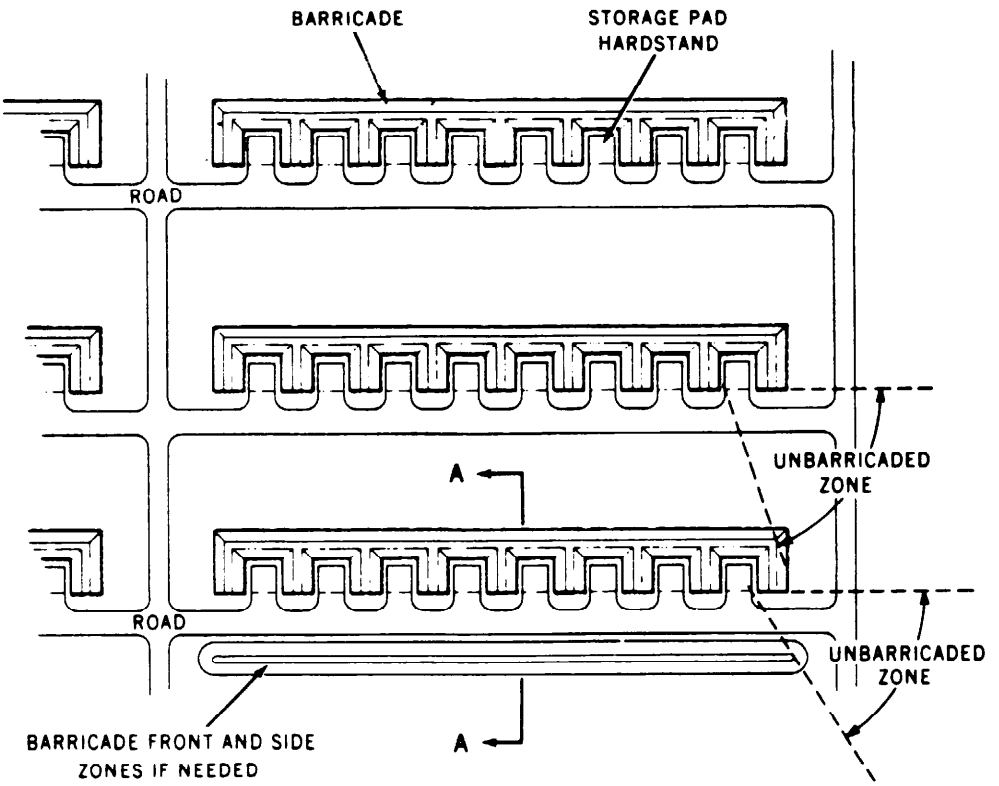
FIGURE 425-20
Container Holding Yard (Empty)

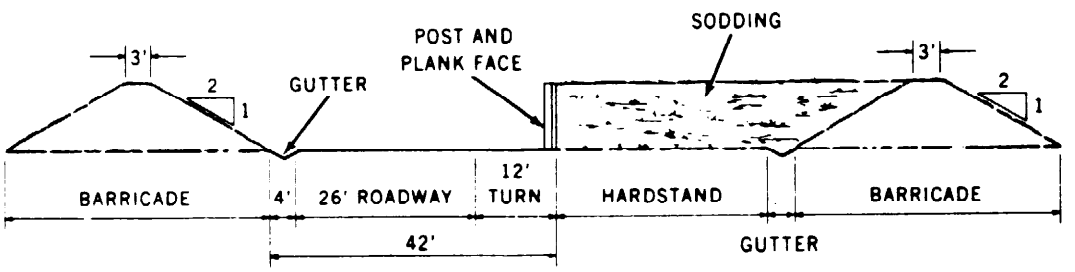
425 30 BARRICADED MODULE (SY)

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