

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**

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 determine 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 or 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 TANKS - 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(1): | | | | |
| 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.

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.

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

| <u>Fire Flow Demands</u> (GPM) | <u>Storage Requirements</u> (hours) | <u>Storage Requirements</u> (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) |
| <u>1 Story</u> | | | | | | | |
| 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 |
| <u>Multistory</u> | | | | | | | |
| 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.

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)**

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)