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DEPARTMENT OF DEFENSE
HANDBOOK

PLUMBING



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MIL-HDBK-1003/1

ABSTRACT

The Naval Facilities Engineering Command has adopted the International Plumbing Code® (IPC) of the International Code Council™ as the voluntary consensus standard for use in design, installation, maintenance, alteration, and inspection of naval shore facility plumbing systems. This adoption is in response to the National Technology Transfer and Advancement Act of 1995.

Additional voluntary consensus standards are adopted to cover aspects of design, installation, maintenance, alteration, and inspection not fully covered by the IPC.

This military handbook includes the additions, deletions, and exceptions necessary to apply the IPC to the maximum extent, while retaining only those Navy-unique features that have proven beneficial. These additions, deletions, and exceptions are arranged and numbered to coordinate with the numbering system of the IPC, for ease of reference.

MIL-HDBK-1003/1

FOREWORD

This handbook is one of a series developed to provide guidance on the planning, engineering, and design of plumbing systems for Navy shore facilities. Unless otherwise noted, this handbook uses national professional society, association, and institute standards in accordance with the appropriate Naval Facilities Engineering Command (NAVFACENGCOM) policy. Do not deviate from this handbook for NAVFACENGCOM design documents without prior approval of NAVFACENGCOM Criteria Office.

Recommendations for improvements are encouraged and should be furnished on the DD Form 1426 provided inside the back cover and forwarded to: Commander, Atlantic Division, Naval Facilities Engineering Command, Code 15, 1510 Gilbert Street, Norfolk, Virginia 23511-2699; telephone commercial (757) 322-4200, facsimile machine (757) 322-4416.

DO NOT USE THIS HANDBOOK AS A REFERENCE IN A PROCUREMENT DOCUMENT FOR FACILITIES CONSTRUCTION. USE IT IN THE PURCHASE AND PREPARATION OF FACILITIES PLANNING AND ENGINEERING STUDIES AND DESIGN DOCUMENTS USED FOR THE PROCUREMENT OF FACILITIES CONSTRUCTION (SCOPE, BASIS OF DESIGN, TECHNICAL REQUIREMENTS, PLANS, SPECIFICATIONS, COST ESTIMATES, REQUEST FOR PROPOSALS, AND INVITATION FOR BIDS). DO NOT REFERENCE IT IN MILITARY OR FEDERAL SPECIFICATIONS OR OTHER PROCUREMENT DOCUMENTS.

MIL-HDBK-1003/1

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MIL-HDBK-1003/1

PLUMBING

CONTENTS

	<u>Page</u>
Section 1 INTRODUCTION	
1.1 Scope	1
1.2 Background	1
1.2.1 Model Code Organizations	1
1.2.2 Public Law 104-113	1
1.2.3 International Plumbing Code ©	1
1.3 Purpose	1
1.4 Cancellation	2
1.5 Primary Voluntary Consensus Standard Reference.....	2
1.5.1 IPC Additions, Deletions, and Revisions	2
1.6 Secondary Voluntary Consensus Standard References.....	2
1.7 Construction Documents	3
1.8 Conflicts in Criteria	3
1.8.1 MIL-HDBK-1008	3
1.8.2 MIL-HDBK-1022	3
1.9 Policy	3
1.9.1 Economy	3
1.9.1.1 Fixtures, Equipment, and Piping	3
1.9.1.2 Piping Arrangement	3
1.9.2 Reliability	4
1.9.3 Material and Construction	4
1.9.3.1 Design	4
1.9.3.2 Health and Sanitation	4
1.10 Protection of Computers, Telephone Switches and Terminal Equipment, and Other Elec- tronic Equipment From Water Damage	4
1.10.1 Dedicated Computer, Telephone, and Other Electronic Equipment	4
1.10.2 Prohibited Piping	4
1.10.3 Restricted Piping	4
1.10.4 Waterproof Floor Above	4
Section 2 NAVY SUPPLEMENTAL TECHNICAL CRITERIA (NSTC)	
2.1 NSTC	5
2.2 Revise	5
2.2.1 For Construction Contract Documents.....	5
2.2.2 For Architect and Engineering Contract Documents.....	5

MIL-HDBK-1003/1

	<u>Page</u>
APPENDIX H DESIGN GUIDANCE FOR EMERGENCY SHOWER AND EYEWASH STATIONS.....	30
REFERENCES 	36
GLOSSARY 	38

MIL-HDBK-1003/1

Section 1: INTRODUCTION

1.1 Scope. This military handbook, MIL-HDBK-1003/1, provides NAVFACENGCOM criteria for designing, specifying, inspecting, and accepting plumbing systems for various naval shore facilities. These include the design of the following systems within the building and out to a distance of 5 feet outside the building: water supply and distribution, fixtures and equipment, drainage (sanitary and storm), and special gases (medical and oxygen).

1.2 Background. Lack of a nation-wide plumbing code familiar to Navy engineers, architect and engineer (A/E) consultants, Navy Construction representatives (resident officers in charge of construction (ROICCs)), and construction contractors forced the Navy to issue Navy-unique criteria, Design Manual (DM) 3.01, Plumbing Systems (DM 3.01), to provide uniform Naval shore facilities.

1.2.1 Model Code Organizations. Three major voluntary consensus building code organizations jointly organized the International Code Council™ (ICC), which issued the IPC. They are the Building Officials and Code Administrators International (BOCA)®; International Conference of Building Officials (ICBO)®; and the Southern Building Code Congress International (SBCCI)®.

1.2.2 Public Law 104-113. Public Law 104-113, the National Technology Transfer Act of 1995, requires the Navy to adopt voluntary consensus standards whenever possible.

1.2.3 International Plumbing Code©. The availability of the IPC allows the Navy to comply with Public Law 104-113 by adopting the IPC. Sufficient familiarity to the Architects and Engineers, and the Construction Contractor is assured by the broad usage of the IPC and the prior plumbing codes of the three code organizations of the ICC.

1.3 Purpose. This plumbing criteria is developed to define facilities engineering and design technology, functional and operational requirements, quality, and health and safety for military and civilian personnel. Building codes establish minimum construction safety requirements;

MIL-HDBK-1003/1

NAVFACENGCOM criteria combine the owner's interlocking functional requirements and reasonable and consistent life-cycle costs.

1.4 Cancellation. This handbook, MIL-HDBK-1003/1, dated 15 February 2000, cancels and supersedes DM-3.01, dated 01 May 1986.

1.5 Primary Voluntary Consensus Standard Reference. NAVFACENGCOM adopts the current issue of the International Code Council™ International Plumbing Code® as the primary voluntary consensus standard for Navy shore facility plumbing systems.

1.5.1 IPC Additions, Deletions, and Revisions. The additions, deletions, and revisions to the IPC sections listed below, in the section titled Navy Supplemental Technical Criteria, preserve the appropriate supplemental technical criteria for use in current and future designs of Navy facilities. When and if these supplemental technical criteria are adopted into the IPC, or into a DOD-wide supplemental technical criteria document, they will be removed from this document.

1.6 Secondary Voluntary Consensus Standards References. NAVFACENGCOM adopts the current issue of the following voluntary consensus standards, fully referenced in a later paragraph:

a) American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) Handbook Series, including the latest editions of the following:

Fundamentals
HVAC Applications
HVAC Systems and Equipment
Refrigeration

b) ASHRAE Standard 90.1, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings.

c) ICC Model Energy Code.

MIL-HDBK-1003/1

1.7 Construction Documents. Ensure the construction documents include in Naval Facilities Guide Specification (NFGS)-15050, Mechanical Material and Methods, paragraph 1.3.5.1 that defines the relationship between IPC terms and the contract language, and paragraph 1.3.5.2 that requires the Contracting Officer to interpret the administrative requirements under the contract.

1.8 Conflicts in Criteria

1.8.1 MIL-HDBK-1008. If a conflict exists between this document and MIL-HDBK-1008, Fire Protection for Facilities Engineering, Design, and Construction, including its referenced standards (National Fire Protection Association (NFPA), Underwriters Laboratories, Inc. (UL), Factory Mutual Corporation (FM), etc.), MIL-HDBK-1008 and its referenced standards take precedence.

1.8.2 MIL-HDBK-1022. If a conflict exists between this document and MIL-HDBK-1022, Petroleum Fuel Facilities, including its referenced standards (American Petroleum Institute (API), American National Standards Institute (ANSI), NFPA, UL, FM, etc.), MIL-HDBK-1022 and its referenced standards take precedence.

1.9 Policy. Design plumbing systems to provide economy and reliability:

1.9.1 Economy. Design systems to provide the lowest life-cycle cost, and to maximize water and energy efficiency.

1.9.1.1 Fixtures, Equipment, and Piping. Design fixtures, equipment, and piping material to be compatible with the life of the structure. Materials are to be selected from those specified in NFGS-15400, Plumbing Systems.

1.9.1.2 Piping Arrangement. In permanent type structures, conceal piping. In limited life structures, piping may be installed exposed except when specific project criteria justify concealment or where concealment will not increase the cost of the project.

MIL-HDBK-1003/1

1.9.2 Reliability. Where interruption of a service cannot be tolerated or where failure of a system would drastically reduce the efficiency of a facility, provide redundant system components for those subject to failure.

1.9.3 Material and Construction

1.9.3.1 Design. Provide simple, clean, and functional designs.

1.9.3.2 Health and Sanitation. In material selection, consider health and sanitation for personnel served by the systems and for operating and maintenance personnel.

1.10 Protection of Computers, Telephone Switches and Terminal Equipment, and Other Electronic Equipment From Water Damage

1.10.1 Dedicated Computer, Telephone, and Other Electronic Equipment. These areas within buildings should be located to minimize exposure to water and other listed hazards from adjoining areas and activities; refer to NFPA-75, Protection of Electronic Computer/Data Processing Equipment.

1.10.2 Prohibited Piping. Chilled water piping, domestic water piping, sanitary drains, roof drains, gas lines, fuel oil lines, steam lines, water mains, and other utility lines not serving the electronic equipment area are prohibited from the electronic equipment and record storage areas.

1.10.3 Restricted Piping. Utilities containing water or other fluids, which serve the electronic equipment and record storage areas, are not to be routed to pass directly over electronic equipment or stored records, whether the utilities are installed over or below the finished ceiling.

1.10.4 Waterproof Floor Above. The floor above each of these rooms should be waterproofed to prevent passage of accidental spillage. As an alternative, allow no prohibited pipe in the rooms above the electronic equipment and record storage areas.

MIL-HDBK-1003/1

Section 2: NAVY SUPPLEMENTAL TECHNICAL CRITERIA (NSTC)

2.1 NSTC. The additions, deletions, and revisions to the IPC and its Commentary are listed below. The following are arranged in the order established by the Table of Contents of the IPC.

2.2 Revise. Revise the IPC to read in part as follows:

Delete in its entirety "**CHAPTER 1 ADMINISTRATION.**"

2.2.1 For Construction Contract Documents. References to IPC Chapter 1 will be interpreted in accordance with paragraph 1.7 of this document.

2.2.2 For Architect and Engineering Contract Documents. Replace IPC Chapter 1 with the following:

"©Copyright 1997 by International Code Council, Inc., Falls Church, Virginia, U.S.A. All rights reserved. This MIL-HDBK-1003/1, Plumbing, prepared by the Department of the Navy, Naval Facilities Engineering Command, designates and incorporates portions of Chapter 1 only from the International Plumbing Code/1997 ("IPC/1997"), a copyrighted work owned by the International Code Council, Inc ("ICC"). The portion of IPC/1997 Chapter 1 is distributed by the Department of the Navy, Naval Facilities Engineering Command, with permission provided that (a) said portion is incorporated into the aforesaid Military Handbook Plumbing and not as a separate work apart from said Military Handbook Plumbing and (b) this entire copyright and proprietary rights notice (both paragraphs) is included with any and all copies. Except as stated above, without advance written permission from ICC or its duly authorized agent, no portion of the IPC/1997 may be reproduced, distributed, or transmitted in any form or by any means, including, without limitation, electronic, optical, or mechanical means (by way of example and not limitation, photocopying, or recording by or in an information storage and retrieval system). For information on permission to copy IPC/1997 material exceeding fair use, please contact:

Chief Executive Officer, BOCA International, Inc.,
4051 West Flossmoor, Country Club Hills, IL 60470-5795 (Phone:
708.799.2300; Internet: WWW.BOCAL.ORG).

MIL-HDBK-1003/1

The aforesaid portion of a copyrighted work is furnished solely to the Department of the Navy, Naval Facilities Engineering Command, for the limited purpose of including portions of IPC/1997 Chapter 1 only, a copyrighted work, in the MIL-HDBK-1003/1, Plumbing, prepared by the Department of the Navy, Naval Facilities Engineering Command, and for no other uses or purposes. This Technical Data Commercial Item was developed at private expense and is subject to FAR 12.211 and DFARS 227.7102. Use, duplication, or disclosure of the copyrighted work by the United States government and parties acting on its behalf is governed by, and subject to the aforesaid limitations. The Contractor/manufacturer of the IPC/1997 is BOCA International, Inc., 4051 West Flossmoor, Country Club Hills, IL 60470-5795 U.S.A. (Phone: 708.799.2300; Internet: WWW.BOCAL.ORG).

CHAPTER 1**ADMINISTRATION****SECTION 101****GENERAL**

101.1 Title. These regulations will be known as the Plumbing Code for Naval Shore Facilities, of the Naval Facilities Engineering Command, hereinafter referred to as "this code."

101.2 Scope. Use this code to regulate the design, installation, maintenance, alteration, and inspection of plumbing systems that are permanently installed and utilized within the naval shore facilities. Use this code also to regulate those plumbing systems, system components, equipment, and appliances specifically addressed in this code.

101.2.1 Appendices. Provisions in Appendices A and G do not apply, and provisions in Appendices B, C, D, E, and F apply, unless specifically noted otherwise.

101.3 Intent. The purpose of this code is to provide minimum standards to safeguard life or limb, health, property and public welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation, and maintenance or use of plumbing systems.

MIL-HDBK-1003/1

101.4 Severability. If any section, subsection, sentence, clause or phrase of this code is, for any reason, held to be unenforceable, such decision will not affect the validity of the remaining portions of this code.

101.5 Code Official. The term code official means Commander, Naval Facilities Engineering Command and his designees.

101.6 Owner. The term owner means the Commanding Officer of the activity holding the real property account, for government owned facilities. For leased facilities, owner means the lessor.

SECTION 102 APPLICABILITY

102.1 General. The provisions of this code apply to all matters affecting or relating to structures, as set forth in Section 101. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive govern.

102.1.1 Leased Facilities. Where, in any specific case, a different plumbing code adopted by the local jurisdiction controlling the lessor, specifies different materials, methods of construction, or other requirements, the more restrictive govern.

102.2 Existing Installations. Except as otherwise provided for in this chapter, a provision in this code does not require the removal, alteration, or abandonment of, nor prevent the continued utilization and maintenance of, an existing plumbing system in existence at the time of the adoption of this code.

102.3 Maintenance. (Deleted in its entirety.)

102.4 Additions, Alterations, or Repairs. Additions, alterations, renovations or repairs to a plumbing system should conform to that required for a new plumbing system without requiring the existing plumbing system to comply with

MIL-HDBK-1003/1

all the requirements of this code. Additions, alterations, or repairs that cause an existing plumbing system to become unsafe, hazardous, or overloaded will be disapproved.

Minor additions, alterations, renovations, and repairs to existing plumbing systems will be permitted in the same manner and arrangement as in the existing system, provided that such repairs or replacement are not hazardous and are approved.

102.5 Change in Occupancy. (Deleted in its entirety.)

102.6 Historic Buildings. The provisions of this code relating to the construction, alteration, repair, enlargement, restoration, relocation, or moving of buildings or structures will not be mandatory for existing buildings or structures identified and classified by the state or local jurisdiction as historic buildings when such buildings or structures are judged by the code official to be safe and in the public interest of health, safety and welfare regarding any proposed construction, alteration, repair, enlargement, restoration, relocation or moving of buildings.

102.7 Moved Buildings. Except as determined by Section 102.2, plumbing systems that are a part of buildings or structures moved onto or within a naval shore facility will be required to comply with the provisions of this code for new installations.

102.8 Referenced Codes and Standards. The codes and standards referenced in this code are those that are listed in Chapter 16 and such codes and standards will be considered part of the requirements of this code to the prescribed extent of each such reference. Where the requirements of the referenced codes and standards, or manufacturer's installation instructions, do not conform to minimum provisions of this code, the provisions of this code apply.

102.9 Requirements Not Covered by Code. Any requirements necessary for the strength, stability, or proper operation of an existing or proposed plumbing system, or for the public safety, health, and general welfare, not specifically covered by this code will be determined by the code official.

MIL-HDBK-1003/1

SECTION 103
DUTIES OF PLUMBING INSPECTION

103.1 General. The duties of plumbing inspection are hereby created and assigned to the code official.

103.2 Appointments. (Deleted in its entirety.)

103.3 Deputies. In accordance with the prescribed procedures, the code official will have the authority to appoint Commanders of Naval Facilities Engineering Command Field Activities as deputy code officials. These deputy code officials will have the authority to appoint Officers in Charge of Construction (OICCs), Resident Officers in Charge of Construction (ROICCs), and civilian employees as technical officers, inspectors, and other employees.

103.4 Restriction of Employees. (Deleted in its entirety.)

103.5 Liability. (Deleted in its entirety.)

SECTION 104
DUTIES AND POWERS OF THE CODE OFFICIAL

104.1 General. The code official will enforce all of the provisions of this code and will act on any question relative to the installation, alteration, repair, maintenance, or operation of all plumbing systems, except as otherwise specifically provided for by statutory requirements or as provided for in Sections 104.2 through 104.8.

104.2 Rule-making Authority. The code official will have authority as necessary in the interest of public health, safety and general welfare to adopt and promulgate rules and regulations to interpret and implement the provisions of this code to secure the intent thereof and to designate requirements applicable because of local climatic or other conditions. Such rules will not have the effect of waiving structural or fire performance requirements specifically provided for in this code, or of violating accepted engineering practice involving public safety.

MIL-HDBK-1003/1

104.3 Applications and Permits. (Deleted in its entirety.)

104.4 Inspections. The code official will make all the required inspections, or will accept reports of inspection by approved agencies or individuals. All reports of such inspections will be in writing and be certified by a responsible officer of such approved agency or by the responsible individual. The code official is authorized to engage such expert opinion as deemed necessary to report on unusual technical issues that arise.

104.5 Right of Entry. (Deleted in its entirety.)

104.6 Identification. (Deleted in its entirety.)

104.7 Notices and Orders. The code official will issue all necessary notices or orders to ensure compliance with this code.

104.8 Records. The code official will keep official records of reports of inspections, and notices and orders issued. Such records will be retained in the official records as long as the building or structure to which such records relate remains in existence unless otherwise provided for by other regulations.

SECTION 105
APPROVAL

105.1 Modifications. Whenever there are practical difficulties involved in carrying out the provisions of this code, the code official will have the authority to grant modifications for individual cases, provided the code official first finds that special individual reason makes the strict letter of this code impractical and the modification is in conformity with the intent and purpose of this code and that such modification does not lessen health, life and fire safety requirements. The details of action granting modifications will be recorded and entered in the files of the code official.

MIL-HDBK-1003/1

105.2 Alternative Materials, Methods, and Equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material or method of construction will be approved where the code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

105.3 Required Testing. Whenever there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or to substantiate claims for alternate materials or methods, the code official will have the authority to require tests as evidence of compliance to be made at no expense to the Government.

105.3.1 Test Methods. Test methods will be as specified in this code or by other recognized test standards. In the absence of recognized and accepted test methods, the code official will approve the testing procedures.

105.3.2 Testing Agency. All tests are to be performed by an approved agency.

105.3.3 Test Reports. Reports of tests will be retained by the code official for the period required for retention of public records.

105.4 Alternative Engineered Design. (Deleted in its entirety.)

105.5 Material, Equipment, and Appliance Reuse. Materials, equipment, appliances, and devices are not to be reused unless such elements have been reconditioned, tested, placed in good and proper working condition, and approved by the code official. Only Government furnished materials, equipment, appliances and devices supplied by this contract may be reused in this contract.

MIL-HDBK-1003/1

SECTION 106

PERMITS

(DELETED IN ITS ENTIRETY)

SECTION 107

INSPECTIONS AND TESTING

107.1 Required Inspections and Testing. The code official, upon notification from the construction contractor or the construction contractor's agent, will make the following inspections and such other inspections as necessary, and will either release that portion of the construction or will notify the construction contractor or an agent of any violations that are to be corrected. The construction contractor is responsible for the scheduling of such inspections.

1. Underground inspection will be made after trenches or ditches are excavated and bedded, piping installed, and before any backfill is put in place.

2. Rough-in inspection will be made after the roof, framing, fireblocking, firestopping, draftstopping, and bracing is in place and all piping and other components are complete, and prior to the installation of wall or ceiling membranes.

3. Final inspection will be made upon completion of the plumbing systems

The requirements of this section will not be considered to prohibit the operation of any plumbing equipment or appliances installed to replace existing equipment or appliances serving an occupied portion of a structure provided that a request for inspection of such plumbing equipment or appliances has been filed with the code official not more than 48 hours after such replacement work is completed, and before any portion of such equipment is concealed by any permanent portion of the structure.

107.1.1 Approved Agencies. The code official may accept reports of approved agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

MIL-HDBK-1003/1

107.1.2 Evaluation and Follow-up Inspection Services. Prior to the approval of a prefabricated construction assembly having concealed plumbing work the code official will require the submittal of an evaluation report on each prefabricated construction assembly, indicating the complete details of the plumbing system, including a description of the system and its components, the basis upon which the system is being evaluated, test results and similar information, and other data as necessary for the code official to determine conformance to this code.

107.1.2.1 Evaluation Service. The code official will designate the evaluation service of an approved agency as the evaluation agency, and review such agency's evaluation report for adequacy and conformance to this code.

107.1.2.2 Follow-up Inspection. Except where ready access is provided to plumbing systems, service equipment and accessories for complete inspection at the site without disassembly or dismantling, the code official will conduct in-plant inspections as frequently as necessary to ensure conformance to the approved evaluation report or will designate an independent, approved inspection agency to conduct such inspections. The inspection agency will furnish the code official with the follow-up inspection manual and a report of inspections upon request, and the plumbing system will have an identifying label permanently affixed to the system indicating that factory inspections have been performed.

107.1.2.3 Test and Inspection Records. All required test and inspection records are to be available to the code official at all times during the fabrication of the plumbing system and the erection of the building, or such records as the code official designates are to be filed with the code official.

107.2 Special Inspections. (Delete in its entirety.)

107.3 Testing. Plumbing work and systems will be tested as required in Section 312 and in accordance with Sections 107.3.1 through 107.3.3. Tests are to be made by the construction contractor and observed by the code official.

MIL-HDBK-1003/1

107.3.1 New, Altered, Extended, or Repaired Systems. New plumbing systems and parts of existing systems that have been altered, extended, renovated, or repaired will be tested as prescribed herein to disclose leaks and defects, except that testing is not required in the following cases:

1. In any case that does not include addition to, replacement, alteration, or relocation of any water supply, drainage or vent piping, or special gas piping.

2. In any case where plumbing equipment is set up temporarily for exhibition purposes.

107.3.2 Equipment, Material, and Labor for Tests. All equipment, material, and labor required for testing a plumbing system or part thereof are to be furnished by the construction contractor.

107.3.3 Reinspection and Testing. Where any work or installation does not pass any initial test or inspection, the construction contractor is to make the necessary corrections to comply with this code. The work or installation will then be resubmitted to the code official for inspection and testing.

107.4 Coordination of Inspections. Whenever, in the enforcement of this code or another code or statute or regulation, the responsibility of more than one code official is involved, it will be the duty of the code officials involved to coordinate their inspections and administrative orders as fully as practicable so that the owners and occupants of the structure are not subjected to visits by numerous inspectors or multiple or conflicting orders. Whenever an inspector from any agency or department observes an apparent or actual violation of some provision of some law, regulation or code not within the inspector's authority to enforce, the inspector will report the findings to the code official having jurisdiction.

107.5 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval will be issued by the code official.

MIL-HDBK-1003/1

107.6 Temporary Connection. The code official will have the authority to authorize the temporary connection of a plumbing system to the source of energy for the purpose of testing plumbing systems or for use under a temporary certificate of occupancy.

**SECTION 108
VIOLATIONS**

108.1 Violation of the Code. It will be a violation of the code for any person, firm, corporation, or activity to erect, construct, alter, repair, remove, demolish, or utilize any plumbing system, or cause same to be done, in conflict with or in violation of any of the provisions of this code.

108.2 Notice of Violation. The code official will serve a notice of violation or order to the person responsible for the erection, installation, alteration, extension, repair, removal, or demolition of plumbing work in violation of the provisions of this code, or in violation of a detail statement or the approved construction documents thereunder. Such order will direct the discontinuance of the violating action or condition and the abatement of the violation.

108.3 Prosecution of Violation. (Deleted in its entirety.)

108.4 Violation Penalties. (Deleted in its entirety.)

108.5 Stop Work Orders. Upon notice from the code official, work on any plumbing system that is being done contrary to the provisions of this code or in a dangerous or unsafe manner is to immediately cease. Such notice will be in writing and will be given to the construction contractor or the person doing the work. The notice will state the conditions under which work is authorized to resume. Where an emergency exists, the code official will not be required to give a written notice prior to stopping the work. Any person who continues any work in or about the structure after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, will be subject to the penalties specified in the construction contract.

MIL-HDBK-1003/1

108.6 Abatement of Violation. (Deleted in its entirety.)

108.7 Unsafe Plumbing Systems. (Deleted in its entirety.)

**SECTION 109
MEANS OF APPEAL**

109.1 Application for Appeal. The construction contractor will have the rights granted by the Contracts Disputes Act of 1978 and the Disputes clause of the contract.

109.2 Membership of Board. (Deleted in its entirety.)

109.3 Notice of Meeting. (Deleted in its entirety.)

109.4 Open Hearing. (Deleted in its entirety.)

109.5 Postponed Hearing. (Deleted in its entirety.)

109.6 Board Decision. (Deleted in its entirety.)

109.7 Court Review. (Deleted in its entirety.)

End of revised Chapter 1 Administration.

SECTION 301.6 Prohibited Locations. Insert after the last sentence, and before the **Exception:** "No plumbing system components may be installed within any Air Handling Unit (AHU), ductwork, or room used as a plenum conveying supply air, return air, outside air, or mixed air. This will not prohibit connection of AHU components, such as humidifiers, to the water supply system, nor prohibit connection of trapped condensate pans and humidifier drains indirectly to the drainage system."

Add "**SECTION 301.7 Protection of Building Materials.** Where the seasonal design temperature of the cold water entering a building is below the seasonal design dew point of the indoor ambient air, and where condensate drip will cause damage or create a hazard, insulate plumbing piping with a vapor barrier type of insulation to prevent condensation. All chilled water

MIL-HDBK-1003/1

pipng from a central drinking water cooling system should be insulated with vapor barrier type insulation to prevent condensation."

SECTION 305.6 Freezing. Add after the last sentence:

"Although insulating water pipes, tanks, and cooling tower may not prevent water from freezing, these devices are to be insulated and possibly heat traced for protection against damage. The proper thickness or conductivity factor for this insulation is to be determined by the design engineer."

Add "**SECTION 313 Energy Conservation.** Design systems containing solar water heaters, air-to-water heat pump water heaters, and water-to-water heat pump water heaters in accordance with the ASHRAE Handbook Series, appropriate Chapters; and ASHRAE Standard 90.1."

SECTION 403.1 Minimum Number of Fixtures. Add additional Notes beneath IPC Table 403.1 as follows:

"For use in Navy facilities: (prevails when in conflict with Table 403.1 and notes above).

g For "male only" toilet facilities, urinals may be substituted for no more than one-third of the water closets required, one for one.

h For "Assembly" occupancies, provide drinking fountains at 1 per 400 persons.

i For "Business" (office, public buildings, and similar, and for bowling centers); "Educational" (Training); "Factory and Industrial" (Industrial, shops, warehouses, and similar), provide fixtures (both male and female) at the following rates:

- (1) water closets 1 per 20 persons (p), up to 100 p; then 1 per 40 p.
- (2) lavatories 1 per 20 p, up to 100 p; then 1 per 45p.
- (3) showers 1 per 15 p - Only if needed.
- (4) drinking fountains 1 per 75 p.

MIL-HDBK-1003/1

(5) service sinks 1 per floor.

j For "High hazard" occupancies involving exposure to skin contamination with poisonous, infectious, or irritating materials, provide fixtures per note *i*. "Business" above, except provide lavatories at 1 per 5 persons.

k For "Assembly - Stadiums, pools, etc." add a new line for Locker rooms (for athletes, not spectators). Provide fixtures per note *i*. "Business" above."

SECTION 411.3 Add the following: "Refer to Appendix H for additional requirements for use on Navy projects."

SECTION 412.4 Required Location and Construction. Add the following: "Floor drains are not required in service sink rooms and transformer rooms. Provide floor drains to serve, but not be limited to, the following areas and equipment:

1. Gang toilets, which are those having three or more water closets; and gang shower drying rooms, which are those serving two or more showers.
2. Subsistence buildings, as follows:
 - (a) Dish-washing, scullery or pot-washing, and food-cart washing areas.
 - (b) Vegetable peelers and vegetable preparation areas.
 - (c) Steam table and coffee urn areas.
 - (d) Soda fountain area.
 - (e) Adjacent areas to ice chests, ice-making machines, and walk-in, reach-in, and garbage refrigerators.
 - (f) Steam cookers and steam-jacketed kettles.
3. Cold-storage buildings are as follows:
 - (a) Fat-rendering, processing, salvage, and receiving rooms.
 - (b) Receiving and issuing vestibules.

MIL-HDBK-1003/1

- (c) Adjacent areas to meat coolers and milk, butter, and egg rooms.

When automatic priming is through a device connected to the water system, provide that device equipped with a vacuum breaker."

SECTION 412.5 Add the following: "Refer to Appendix H for additional requirements for use on Navy projects."

Add "**SECTION 501.9 Multiple Water Heaters.** Provide hospitals, laundry buildings, subsistence buildings, bachelor officers' quarters with mess and enlisted men's barracks with mess with multiple water heaters and storage tanks. Provide other facilities with a single water heater and storage tank. Multiple units, however, may be justified by circumstances such as (1) facility configuration, (2) space limitations, (3) limited access to tank room, and (4) hot water requirements necessitating an unusually high capacity heating and storage unit. When two units are provided, each will have a capacity equal to two thirds of the calculated load. When more than two units are provided, their combined capacity will be equal to the calculated load."

Add "**SECTION 504.9 Vacuum Breaker.** Provide a vacuum breaker on each copper-lined storage tank to prevent the creation, within the tank, of a vacuum which could cause loosening of the lining."

Add "**SECTION 505.2 Insulation of Hot Water Piping.** Insulate service hot water piping and storage to meet the more restrictive minimum requirements of the following:

- (1) IPC.

- (2) ASHRAE Standard 90.1."

Add "**SECTION 505.3 Upgrade Insulation.** The insulation requirements and maximum heat loss rates stated in this section are minimum design requirements. The designer is encouraged to upgrade the quality of insulation if he can show an improvement in the system performance, or that the insulation is cost effective, or both."

MIL-HDBK-1003/1

Add "**SECTION 506 Sizing Hot Water Systems.** Design in accordance with American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook - HVAC Applications-1999, Chapter 48, "Service Water Heating"; and in accordance with ASHRAE Standard 90.1, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings. For low-rise residential buildings, design in accordance with CABO Model Energy Code, (CABO Model Energy Code, was taken over by the International Code Council™). Size hot water system and set service water heater (SWH) storage temperature setpoint for not less than 140 degrees Fahrenheit (F) to limit the potential for growth of *Legionella pneumophila*. Provide a hot water and cold water blending, tempering valve immediately downstream of the SWH storage tank to provide anti-scalding protection. Set the blending valve to deliver 110 degree F water to the fixtures. Provide a balanced-pressure type tempering valve."

Add "**SECTION 506.1 Sizing Distributed or Residential SWH Systems.** Use ASHRAE Chapter 48, Table 5 to size small SWH systems typical for family housing, Navy lodges, and bachelor housing units provided with individual SWH's. For family housing, select the SWH size from Table 5 based upon the number of bathrooms and bedrooms in the unit. For Navy lodges, use the 1 to 1.5 baths, 2 or 3-bedroom column, since entire navy families of 3 to 5 persons or more occupy these single rooms for extended stays of up to 30 days. For bachelor housing projects with individual SWH's for each unit or a pair of units, use the number of baths and bedrooms to select from Table 5."

Add "**SECTION 506.2 Sizing Central SWH Systems.** Use ASHRAE Chapter 48, Table 9 to size central SWH systems, except revise the numbers in row "9. Showers" by multiplying by the correction factor calculated in Section 506.4. The revision reflects Public Law 102-486 maximum fixture flow of 2.5 gallons per minute (gpm), ASHRAE recommended service water storage temperature minimum of 140 degrees F, personnel safety maximum fixture delivery temperature of 110 degrees F, and the appropriate supply design cold water temperature, which varies according to location and season."

MIL-HDBK-1003/1

Use the Hotel column to size central SWH systems for Bachelor Housing and Navy Lodges, due to occupant's schedules resembling those of hotel and motel occupants – the rooms are inhabited mostly between 5 PM and 7 AM."

Add "**SECTION 506.3 Hot Water Mixing Equation.**

Let: Q_f = Fixture flow in gpm = 2.5 gpm per Public Law 102-486

Q_s = Flow from SWH Storage Tank in gpm

Q_c = Flow from Cold Water Supply in gpm

T_f = Temperature at fixture in degrees F = 110 F for personnel safety

T_s = Temperature at SWH Storage Tank in degrees F, 140 F minimum for Legionella

T_c = Temperature at Cold Water Supply in degrees F, varies due to location and season

Mixing Equation: $(Q_f \times T_f) = (Q_s \times T_s) + (Q_c \times T_c)$

Substituting $Q_c = Q_f - Q_s$ gives the following:

$$(Q_f \times T_f) = (Q_s \times T_s) + ((Q_f - Q_s) \times T_c)$$

$$(Q_f \times T_f) = (Q_s \times T_s) + (Q_f \times T_c) - (Q_s \times T_c)$$

$$(Q_f \times T_f) - (Q_f \times T_c) = (Q_s \times T_s) - (Q_s \times T_c)$$

$$Q_f \times (T_f - T_c) = Q_s \times (T_s - T_c)$$

$$Q_s = Q_f \times [(T_f - T_c) / (T_s - T_c)]$$

Substituting $Q_f = 2.5$ gpm, $T_f = 110$ F, $T_s = 140$ F, and $T_c = 50$ F gives the following:

$$Q_s = 2.5 \times [(110 - 50) / (140 - 50)]$$

$$Q_s = 1.667 \text{ gpm}$$

$$Q_c = Q_f - Q_s = 2.5 \text{ gpm} - 1.667 \text{ gpm} = 0.833 \text{ gpm}$$

$$\text{Check: } 2.5 \times 110 = (1.667 \times 140) + (0.833 \times 50)$$

$$275 = 233.38 + 41.65$$

$$275 = 275.03 = \text{OK}$$

The mixing equation may be used to evaluate the effect of variation of T_c temperatures on Q_s . At $T_s = 140$ F, for $T_c = 40$ F, $Q_s = 1.75$ gpm; and for $T_c = 80$ F, $Q_s = 1.25$ gpm.

MIL-HDBK-1003/1

The mixing equation may also be used to evaluate the required size of SWH storage tanks as T_s varies. Higher storage temperatures allow smaller tank sizes to deliver equal water to fixtures.

Add **"506.4 Revisions to ASHRAE Chapter 48, Table 9, Row 9, Showers.** Table 9, Row 9, Showers, indicates 225 gallons per hour (gph) per fixture for hot water flow in Gymnasiums, Industrial Plants, Schools, and YMCA's. Assume this represents continuous flow of shower fixture, what is the design fixture flow rate? Since 225 gph/60 min. per hour = 3.75 gpm of hot water flow = Q_s , calculate the fixture flow Q_f from the mixing equation, using $T_f = 110$ degrees F, $T_s = 140$ degrees F, and $T_c = 50$ degrees F. Observe that $Q_f = Q_s + Q_c$, therefore $Q_c = Q_f - Q_s$. Substituting:

$$\begin{aligned} Q_f \times T_f &= (Q_s \times T_s) + (Q_c \times T_c) \\ Q_f \times T_f &= (Q_s \times T_s) + ((Q_f - Q_s) \times T_c) \\ Q_f \times T_f &= (Q_s \times T_s) + (Q_f \times T_c) - (Q_s \times T_c) \\ (Q_f \times T_f) - (Q_f \times T_c) &= (Q_s \times T_s) - (Q_s \times T_c) \\ Q_f \times (T_f - T_c) &= Q_s \times (T_s - T_c) \\ Q_f &= Q_s \times [(T_s - T_c) / (T_f - T_c)] \\ Q_f &= 3.75 \times [(140 - 50) / (110 - 50)] \\ Q_f &= 5.625 \text{ gpm} \end{aligned}$$

Therefore, the proper correction factor (CF) for Chapter 48, Table 9, Row 9 is equal to 2.5 gpm per fixture (per PL 102-486) divided by 5.625 gpm (calculated above), which results in $CF = 0.444$ for T_c of 50 degrees F. This may also be calculated as $Q_s = 1.667$ divided by $Q_s = 3.75$ equals $CF = 0.444$.

Thus, the gymnasium shower at 225 gph x CF corrects to 225 gph x 0.444 = 100 gph for T_c of 50 degrees F.

Add **"SECTION 506.5 Life Cycle Cost Analysis.** Executive Order 13123 requires life cycle cost analysis (LCCA) of alternatives and maximum utilization of energy conserving methods and equipment. Evaluate alternative energy source options, such as electric, steam, oil-fired, and gas-fired service water heater units of similar first hour draw (FHD) or first hour rating (FHR) capacity, say plus or minus 5 percent.

MIL-HDBK-1003/1

Federal Energy Management Program analysis of residential-size single-family electric resistance versus natural gas fired SWH indicates a lifetime energy costs of \$2600 for electricity at \$0.06 per kW, and \$900 for natural gas at \$0.40 per therm.

Evaluate SWH storage tank capacity and electric heater element sizing to minimize electric demand charges to the government. Larger storage tanks with smaller heater elements may be cost effective due to reduced demand charges, although the longer storage recovery time and the additional costs for providing non-standard tank and element selections should also be considered. Do not exceed the ASHRAE recommended 8-hour maximum recovery time. Also consider the incremental cost of additional electric service capacity versus the incremental costs of providing steam or gas service or providing fuel oil storage and delivery. Include the costs of providing combustion air and flue gas exhaust for fuel-fired water heaters.

Do not consider the cost of the tempering valve in the life cycle costs analysis, it is required by the 140 degrees F storage temperature to avoid legionella. However, since it is required, consider the life cycle cost advantages of storing hot water at higher temperatures, if the source is electric, steam, or natural gas, and the tank insulation is increased to maintain equal total heat loss. A smaller SWH storage tank may reduce the size of the mechanical room and the building, which will reduce the energy and capital costs of the facility.

Consider a pre-heat tank upstream of the SHW storage tank for applications recovering heat from refrigerant hot gas, steam condensate, process waste cooling, solar collectors, and diesel engines. Provide a tempering valve for all heat recovery SWH systems to limit the supply temperature, because the recovered heat can heat the storage tank above the normal storage temperature. A pre-heat tank may increase the amount of heat useably recovered prior to allowing the water to be heated by prime energy.

Consider sealed combustion chambers for natural gas-fired SWH's, with combustion air ducted directly from and flue gases ducted directly to the outside air. This may reduce the

MIL-HDBK-1003/1

possibility of carbon monoxide poisoning within the occupied spaces. Ensure adequate clearances of inlet and outlet during snow, icing, flood, and heavy wind-driven rain conditions.

Add "**SECTION 604.9.1 Water Velocities.** Normally, provide water velocities not to exceed 10 feet per second (3.28 m/s). In hospitals and similar facilities, where a quiet system is desired, velocities are not to exceed 7 feet per second (2.13m/s)."

Add "**SECTION 606.5.11 Sizing Booster Systems and Pumps.** Water pressure may be increased by using a hydro-pneumatic system consisting of a tank, pumps, compressed air system, and associated control devices.

(a) Tank Pressure. The minimum pressure maintained within the tank is at low-water level and is equal to the pressure required to meet the fixture demands. The high pressure at high water level depends on the operating pressure differential selected for the system. A reasonable and most commonly selected pressure differential is 20 pounds per square inch (138 kPa).

(b) Pumps. Pumps normally are provided in duplex. Each pump is sized to meet the requirements of the facility. Pump capacities in gallons per minute (liters per second) will be in accordance with Table 1. Pump head is to be equal to the high pressure maintained within the hydro-pneumatic tank.

(c) Tank Capacity. Tank capacity is to be based upon a withdrawal, in gallons (liters), of 2-1/2 times the gallon per minute (liter per second) capacity of the pump and a low water level of not less than 10 percent of total tank capacity or 3 inches (76 mm) above top of the tank outlet, whichever is greater. Table 2 indicates high water levels and withdrawals for efficient operation of tanks with bottom outlets and a 10-percent residual. Using this table, the tank capacity may be determined as per Example 1. Pressure ranges are given in pounds per square inch (psi) and kilopascals (kPa).

MIL-HDBK-1003/1

TABLE 1
Tank Fill Pumps

Location	No. of Fixtures	Gpm (L/s) per Fixture	Min. pump Capacity gpm (L/s)
Administration building	1-25	1.23 (0.08)	25 (1.6)
	26-50	0.9 (0.06)	35 (2.2)
	51-100	0.7 (0.045)	50 (3.2)
	101-150	0.65 (0.04)	75 (4.7)
	151-250	0.55 (0.03)	100 (6.3)
	251-500	0.45 (0.03)	140 (7.8)
	501-750	0.35 (0.02)	230 (15.0)
	751-1000	0.3 (0.02)	270 (17.0)
	1000-up	0.275 (0.02)	310 (20.0)
Apartments	1-25	0.6 (0.04)	10 (0.6)
	26-50	0.5 (0.03)	15 (0.9)
	51-100	0.35 (0.02)	30 (1.9)
	101-200	0.3 (0.02)	40 (2.5)
	201-400	0.28 (0.02)	65 (4.1)
	401-800	0.25 (0.015)	120 (7.6)
	801-up	0.24 (0.015)	210 (13.0)
Hospitals	1-50	1.0 (0.06)	25 (1.6)
	51-100	0.8 (0.05)	55 (3.5)
	101-200	0.6 (0.04)	85 (5.4)
	201-400	0.5 (0.03)	125 (7.9)
	401-up	0.4 (0.025)	210 (13.0)
Industrial buildings	1-25	1.5 (0.10)	25 (1.6)
	26-50	1.0 (0.06)	40 (2.5)
	51-100	0.75 (0.05)	60 (3.8)
	101-150	0.7 (0.045)	80 (5.0)
	151-250	0.65 (0.04)	110 (7.0)
	251-up	0.6 (0.04)	165 (10.5)
Quarters and barracks	1-50	0.65 (0.04)	25 (1.6)
	51-100	0.55 (0.03)	35 (2.2)
	101-200	0.45 (0.03)	60 (3.8)
	201-400	0.35 (0.2)	100 (6.3)
	401-800	0.275 (0.02)	150 (9.5)
	801-1200	0.25 (0.015)	225 (14.5)
Schools	1201-up	0.2 (0.01)	300 (19.0)
	1-10	1.5 (0.09)	10 (0.6)
	11-25	1.0 (0.06)	15 (0.9)
	26-50	0.8 (0.05)	30 (1.9)
	51-100	0.6 (0.04)	45 (2.8)
	101-200	0.5 (0.03)	65 (4.1)
	200-up	0.4 (0.025)	110 (7.0)

MIL-HDBK-1003/1

TABLE 2

Hydro-Pneumatic Tank High Water Levels and Withdrawals
(Based on bottom outlet tanks and a 10-percent residual)

Pressure range psi (kPa)	High Water Level (% of total tank cap)	Withdrawal (% of total tank cap)
20-40 (140-275)	43	33
30-50 (205-345)	38	28
40-60 (275-415)	34	24
50-70 (345-480)	32	22
60-80 (415-550)	28	18
20-45 (140-310)	48	39
30-55 (205-380)	42	32
40-65 (275-450)	37	27
50-75 (345-520)	35	25
60-85 (415-590)	32	22

(d) Example 1. Determine the tank capacity when pump capacity is 150 gallons per minute and tank operating pressure range is 40 to 60 pounds per square inch. (Referring to Table 2, the withdrawal from the tank is 24 percent of the tank capacity.)

Total tank capacity = $2.50 \times 150 \text{ gpm} / 0.24 \text{ percent} = 1,563$ gallons

or

Total tank capacity = $2.5 \times 568 \text{ L/min} / 0.24 \text{ percent} = 5916$ liters

(e) Compressed Air. Compressed air is supplied for tank operation according to the tank capacities. Satisfactory operation has been attained by providing 1.5 cubic feet per minute (cfm) for tank capacities up to 500 gallons (1893 L) and 2 cfm for capacities from 500 to 3,000 gallons (1.89 to 11.35 m³+). For each additional 3,000 gallons (11.35 m³+), or fraction thereof, add 2 cfm (0.0566 m³+ / min.). (Quantities are expressed in cubic feet (cubic meter) per minute free air at pressure equal to the high pressure maintained within the hydro-pneumatic tank.)

MIL-HDBK-1003/1

(f) Controls. The controls of a hydro-pneumatic system are to maintain the predetermined pressures, water levels, and air-water ratio within the tank. When duplex pumps are provided, controls are to start only one pump at a time. Pumps are to be operated alternately and run simultaneously only when the predetermined low pressure cannot be maintained by a single pump. Controls are to admit compressed air into the tank only when tank pressure at high water level is below normal.

(g) Booster Pumps. Booster pumps may be the "on-off" type or continuous running type.

(I) On-Off Type. The installation of an "on-off" type of pumping system should be considered when relatively long periods of pump-on or pump-off are anticipated. Pumps are to be activated, only when pressure is inadequate, by a sensing device located in the pump suction line. Flow normally is through a single full-size pump bypass with check valve and two normally open (N.O.) isolating valves, whether the installation has one pump or multiple pumps. Provide each pump with a check valve on the discharge and two N.O. isolating valves.

(II) Continuous Running. Variable speed, constant pressure, continuous running pumps are to be considered when anticipated pressure fluctuation would result in short-cycling of the "on-off" type of pumps. Whether the installation is a single pump or multiple pumps, provide one full-size pump bypass having a check valve and two N.O. gate valves. Provide each pump with a check valve on the discharge and two N.O. isolating valves.

Add "**SECTION 607.2.3 Rate of Circulation.** Circulation should be at a rate that limits the water temperature drop to 20 degrees F (6.7 degrees C) (maximum temperature difference between supply and return). A method that has proved satisfactory and is generally accepted for determining rate of circulation is to allow 1 gallon (3.8 liters) per minute for each 20 fixtures using hot water. Valves for balancing the circulation should be provided in each return branch."

SECTION 712.3.1 Sump Pump. Add the following. "Provide a single pump unit where the function of the equipment is not critical, and provide duplex pump units where the function of the equipment is critical and also where six or more water

MIL-HDBK-1003/1

closets are being served. When duplex pump units are provided, the capacity of each pump is to be sufficient to meet the requirements of the facility."

SECTION 712.3.2 Sump Pit. Add the following. "Sumps are to contain, in gallons, between the high level and low level operating switch settings approximately twice the capacity of the sump pump, in gallons per minute."

SECTION 712.3.4 Maximum Effluent Level. Add the following. "A high water alarm actuator is to be installed within sump and operate an audible or visual alarm when the normal high-water level within sump has been exceeded."

Add "**SECTION 712.3.6 Controls.** Automatic controls are to be provided for each pump. Duplex pump units are to be equipped with controls to alternate the operation of the pumps under normal conditions and to operate pumps simultaneously when one pump cannot handle the flow."

SECTION 9.17 AIR ADMITTANCE VALVES. Delete in its entirety.

Revise **SECTION 1003.1.1 Interceptor Not Required.** To read as follows: "An interceptor should not be required or provided for individual dwelling units or any private living quarters."

SECTION 1003.5 Interceptors Required. Add the following. "Grease interceptors should be provided to receive the wastes from pot sinks, pre-wash sinks, dishwashers without pre-wash sections and soup kettles."

SECTION 1104.2 Combining Storm with Sanitary Drainage. Add the following. "When a combined drainage system is to be provided, the systems should be maintained as separate systems within the building. Systems should be combined outside of the building and preferably at a manhole."

Add "**SECTION 1104.4 Insulation of Rainwater Conductors.** To prevent condensation, insulate horizontal conductors and roof drains inside the building."

MIL-HDBK-1003/1

APPENDIX A is not adopted for use by the Navy.

APPENDIX B is adopted for use by the Navy.

APPENDIX C is adopted for use by the Navy, where conditions may warrant.

APPENDIX D is adopted for use by the Navy, except where it may conflict with P-89 Engineering Weather Data, which prevails.

APPENDIX E is adopted for use by the Navy.

APPENDIX F is adopted for use by the Navy.

APPENDIX G is not adopted for use by the Navy.

MIL-HDBK-1003/1

APPENDIX H
DESIGN GUIDANCE FOR
EMERGENCY SHOWER AND EYEWASH STATIONS

1. EMERGENCY SHOWER AND EYEWASH STATIONS (ES/EWS) - Provide ES/EWS meeting ANSI Z 358.1 where required by Occupational Safety and Health Act (OSHA) regulations or by other competent authority, such as NAVOSH, Military Handbooks, or Design Manuals. Consult with the local station, EFA, and EFD authorities, including the process, environmental, and safety engineers, and the Industrial Hygienist about ES/EWS locations, materials present, waste treatment systems available, and permits required. Locate ES/EWS as close to the hazard as possible, within 10 to 20 feet for highly corrosive chemicals, but not more than 10 seconds or 100 feet of unobstructed travel away, whichever is lesser.

a. For personnel protection within water-reactive (W/R) hazardous materials storage and handling areas, provide ANSI Z 78.1 chemical splash goggles, consider providing portable ANSI Z 358.1 personal eyewash (PEW) protection, for use within the W/R area, and provide ES/EWS immediately outside the W/R area, but not more than the 10 seconds or 100 feet away from the work location. Ensure water from ES/EWS will not enter the W/R area; this may require provision of partitions, walls, berms, trenches, or curbs. The PEW should be of the smallest reasonable volume necessary to enable initial flushing on the way to the ES/EWS, to minimize the W/R hazard due to spillage of the flushing fluid. A W/R material spill is the most probable cause of the need for flushing, and the spillage of the flushing fluid provides the other chemical needed to initiate the reaction. Carefully consider whether to provide PEW or not, and document the decision analysis. PEW fluid presence may increase the risk of a W/R chemical event due to risk of accidental PEW fluid spill, and due to valid usage of PEW. W/R materials are defined in MIL-HDBK-1005/13 and MIL-HDBK-1032/2.

2. ALARMS - Provide a waterflow-initiated alarm for each ES/EWS. For locations where potable water is not available, provide PEW protection and a manually initiated alarm. Provide a local audible signal device, a silencing switch, and a flashing strobe light for each ES/EWS and for each manual alarm, and optionally provide central reporting of the alarm to a 24 hour per day manned location. Alarm installations

MIL-HDBK-1003/1

APPENDIX H (Continued)

should be waterproof per NEMA Class 3. ES/EWS alarm systems in hazardous (classified) locations, per National Electric Code, should be listed and labeled for that purpose. Alarm audible signal devices should have a distinct sound, different from other alarms in this and adjacent facilities. Mount alarm audible signal device, silencing switch, and strobe light on wall or ES/EWS column, immediately above the level of the shower head.

Alarms protect people by promptly summoning help, and protect stored materials, equipment, and facilities by indicating or reporting ES/EWS activation, with its attendant waterflow.

3. FLOOR DRAINS - Floor drains for ES/EWS are not required by the International Plumbing Code (IPC) 1997 edition, see Section 411.

a. Owners and occupants prefer floor drains, for housekeeping and for material and facility protection reasons.

The floor drain may become a source of illicit disposal of prohibited substances. Careful supervision will be necessary.

b. Floor drains may be provided. The Environmental Protection Agency regulation, 40 CFR 261, describes "...the following mixtures of solid wastes and hazardous wastes listed in Subpart D are not hazardous wastes..." "...de minimis" losses include ..." "...discharges from safety showers and rinsing and cleaning of personal safety equipment;...". Therefore, ES/EWS discharges may be drained to the sanitary sewer system, as they are "de minimis" losses.

c. Floor drains, where provided, should comply with the following:

1) Minimum capacity of 45 gallons per minute water flow, based upon 1.5 times the ANSI Z 358.1 standard water flow minimum requirement.

MIL-HDBK-1003/1

APPENDIX H (Continued)

The floor drain must accommodate the full flow of the ES/EWS to avoid spilling water over the containment curb, into the hazardous material storage area, and to avoid damage to the material and the facility in case of continuous ES/EWS operation.

2) Floor drains should be provided with 4 inch deep seal traps. Frequent testing of the ES/EWS, as required by ANSI Z 358.1, will refill the trap seal.

The deep seal trap is provided to reduce the problem of the unused trap drying out and allowing the back flow of sewer gases, fumes, and vermin into the space. Weekly testing of the ES/EWS will be usage enough to refill the trap seal; otherwise, provide an automatic trap priming valve connected to the cold water supply to maintain the trap seal.

3) Provide a 1.5 inch high ES/EWS containment curb completely around the ES/EWS, slope the exterior (approach) face of the curb up at a slope of 1 inch rise in 12 inches horizontal, but not more than 1 inch rise in 8 inches per Uniform Federal Accessibility Standards (UFAS) 4.1.6, mark the ES/EWS curb as a trip hazard per OSHA regulations, and inform the personnel that the ES/EWS curb exists. Where ES/EWS with floor drains are located within hazardous material (hazmat) spill containment bermed or curbed areas, provide the crest of the ES/EWS curb to be 1.5 inches higher than the surrounding hazmat area curb, to ensure spills do not enter the floor drain. See the attached sketch.

The ES/EWS containment curb protects the floor drain from accidental spills in the surrounding hazmat area. The ES/EWS curb also protects the stored hazmat materials and facility from accumulated ES/EWS water flow by directing the flow into the floor drain.

4) Post a placard at each ES/EWS stating: **"NO DUMPING.** This drain discharges untreated into the sanitary sewer, contact Activity Environmental Office for proper disposal of spilled material or waste."

MIL-HDBK-1003/1

APPENDIX H (Continued)

The placard provides the occupants with sufficient information to avoid inadvertent "spills" caused by using the floor drain as a convenient sink for cleanup of spilled materials. Designer to revise the wording to correctly indicate the discharge destination and if it passes through a treatment system such as a neutralization tank or an oil-water separator.

d. Floor drains, where provided, should connect to drain as follows:

1) Extraordinary hazard materials - such as poisons, should **not** discharge into a drain system. Utilize the hazmat spill containment curb system to contain the ES/EWS water flow. Provide remote alarm reporting to a central manned station. Immediate action is required to prevent poison contaminated water from spreading throughout the facility.

The floor drain is omitted to prevent inadvertent exposure of persons downstream of the floor drain from unknowingly contacting the potentially poisonous runoff. The hazardous material spill response team answering the alarm will be aware of the hazards and capable of taking appropriate measures for self-protection. If the hazmat spill containment curbed area has insufficient volume to hold a minimum of 30 minutes of ES/EWS water flow, provide a floor drain to an above ground holding tank sized to hold at least 30 minutes of flow. Properly label the piping and the tank as holding poisonous fluids. Provide a hazmat spill containment berm around the holding tank. Provide an ES/EWS containment curb around the floor drain to preclude fire protection water from flooding the floor drain holding tank and tank berm. ES/EWS curb to be 1.5 inches higher than the hazmat curb.

2) Plating shops - Drain to the proper industrial waste treatment system. Segregate cyanide wastes, including ES/EWS drainage, from all acid wastes. Segregate hexavalent chromium wastes, including ES/EWS drainage, from all caustics

MIL-HDBK-1003/1

APPENDIX H (Continued)

and cyanides. Where the shower is located in a multiple use area, such as a material handling or shipping/receiving area, drain to the proper industrial waste treatment system.

3) Battery rooms or shops - Drain to the proper neutralization tank, if provided; otherwise, drain to the sanitary sewer system. Segregate caustics from the Nickel-Cadmium-Alkali battery area, including ES/EWS drainage, from acids. Segregate acids from the Lead-Acid battery area, including ES/EWS drainage, from caustics. Do not allow mixing of acid and alkali wastes in the drains.

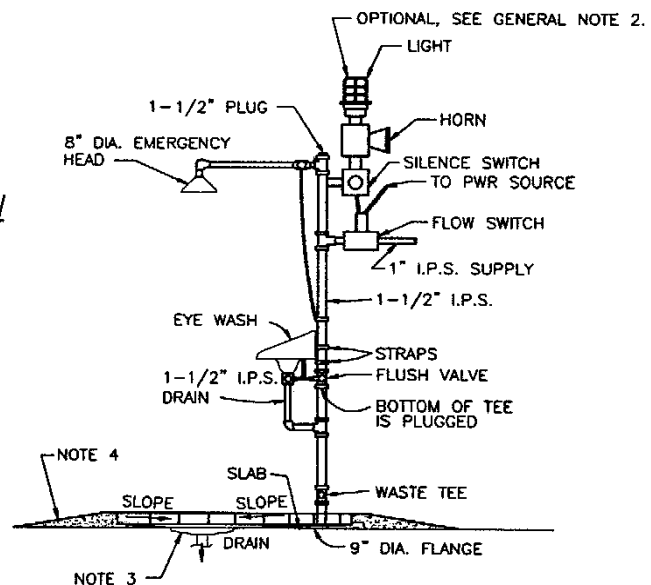
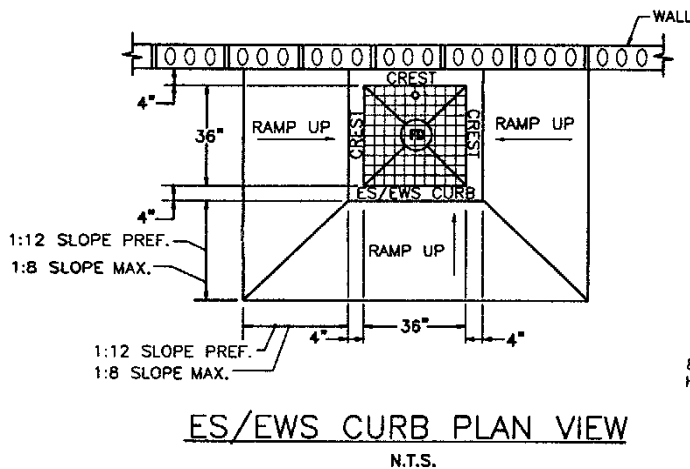
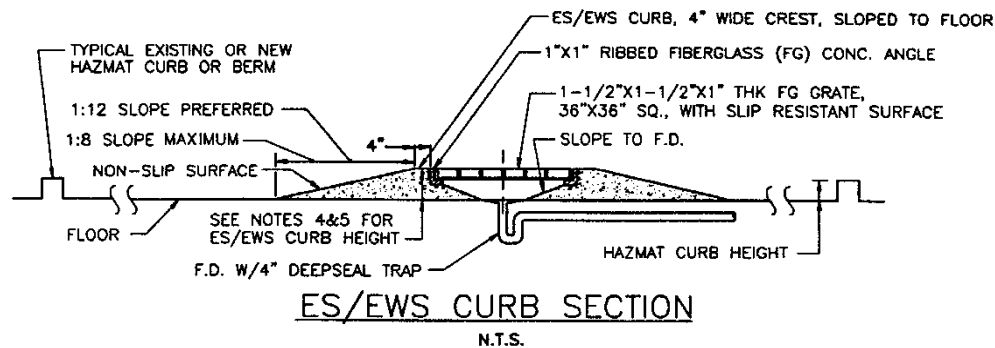
4) Oily Waste shops - Drain to the oil/water separator, if provided; otherwise, drain to the sanitary sewer system. Typical oily waste shops include the following: paint shops and hangers, paint mix rooms, paint equipment rooms, engine shops, ground support equipment (GSE) shops, refueler shops, Public Works automotive shops, locomotive and crane shops.

5) Miscellaneous materials - Drain to the sanitary sewer system.

6) Exterior ES/EWS - Slope impervious-surfaced grade to drain to a bermed or curbed impervious-surfaced area to allow cleanup without "spillage" to the environment; or provide a floor drain connected to an appropriate drain system, and an enclosure with roof to preclude storm water entry into the floor drain. Provide the ramp, curb, and grate around the floor drain, to preclude surface drainage into the floor drain.

Note: All drain connections must comply with all national, State, local, and Navy regulations. Coordinate this issue with the local authorities per paragraph 1. above.

4. ELECTRICAL - Provide Ground Fault Interrupter (GFI) protection for dedicated heat tape circuit, if provided, and for all electrical power outlets within 6 feet of an ES/EWS and below the elevation of the shower head.



GENERAL NOTES:

1. DETAILS SHOWN NOT TO SCALE.
2. DESIGNER SHALL DETERMINE ALARM, LIGHTING AND MONITORING REQUIREMENTS.
3. FLOOR DRAIN (FD) IS OPTIONAL, SEE ES/EWS ITG.
4. IF FD PROVIDED, PROVIDE MINIMUM ES/EWS FD CURB HEIGHT = 1-1/2 INCHES.
5. FOR ES/EWS WITH FD, WITHIN A HAZMAT CURBED OR BERMED AREA, PROVIDE ES/EWS FD CURB HEIGHT= HAZMAT CURB HEIGHT PLUS 1-1/2 INCHES, TO ENSURE NO HAZMAT SPILL ENTERS THE FD.
6. PROVIDE FREEZE PROTECTION, WHERE NECESSARY.
7. PROVIDE SHOWER CURTAIN AND SUPPORT ROD, FOR INDOOR USE.
8. PROVIDE ENCLOSURE FOR OUTDOOR USE, DRAIN TO A CURBED OR BERMED AREA.
9. IF FLOOR DRAIN IS NEEDED OUTDOORS, PROVIDE AN ES/EWS FD, CURB & GRATING, TO EXCLUDE STORM WATER FROM ENTERING TO FLOOR DRAIN.

MIL-HDBK-1003/1

REFERENCES

NOTE: THE FOLLOWING REFERENCED DOCUMENTS FORM A PART OF THIS HANDBOOK TO THE EXTENT SPECIFIED HEREIN. USERS OF THIS HANDBOOK SHOULD REFER TO THE LATEST REVISIONS OF CITED DOCUMENTS UNLESS OTHERWISE DIRECTED.

FEDERAL/MILITARY SPECIFICATIONS, STANDARDS, BULLETINS, HANDBOOKS, AND NAVFAC GUIDE SPECIFICATIONS:

Unless otherwise indicated, copies are available from the Naval Publishing and Printing Service Office (NPPSO), Standardization Document Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, Pennsylvania 19111-5094.

Department of Defense Index of Specifications and Standards (DODISS)

HANDBOOKS:

MIL-HDBK-1008	Fire Protection for Facilities Engineering, Design, and Construction
MIL-HDBK-1022	Petroleum Fuel Facilities

NON-GOVERNMENT PUBLICATIONS:

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.

ASHRAE™ Handbook	Fundamentals.
ASHRAE™ Handbook	HVAC Applications.
ASHRAE™ Handbook	HVAC Systems and Equipment.
ASHRAE™ Handbook	Refrigeration.
ASHRAE™ Std 90.1	Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings.

(Unless otherwise indicated, copies are available from American Society of Heating, Refrigerating and Air-

MIL-HDBK-1003/1

Conditioning Engineers, Inc. 1791 Tullie Circle, N.E. Atlanta, GA 30329, (404) 636-8400, <http://www.ashrae.org>).

INTERNATIONAL CODE COUNCIL, INC. (ICC)

International Plumbing Code

International Plumbing Code Commentary

Model Energy Code

(Unless otherwise indicated, copies are available from any of the following:

BUILDING OFFICIALS AND CODE ADMINISTRATORS INTERNATIONAL, INC. (BOCA), 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795, Telephone(708) 799-2300

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO), 5360 Workman Mill Road, Whittier, CA 90601-2298, Telephone(562) 699-0541

SOUTHERN BUILDING CODE CONGRESS INTERNATIONAL, INC. (SBCCI), 900 Montclair Road, Birmingham, AL 35213-1206, Telephone(205) 591-1853).

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA-75 Standard for the Protection of Electronic
Computer/Data Processing Equipment.

(Unless otherwise indicated, copies are available from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101, Telephone (617) 770-3000/Fax (617) 770-0700.)

MIL-HDBK-1003/1

GLOSSARY

A/E. Architect and engineer.

ANSI. American National Standards Institute.

API. American Petroleum Institute.

ASHRAE. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc.

BOCA. Building Officials and Code Administrators International.

FHD. First hour draw.

FHR. First hour rating.

FM. Factory Mutual Corporation.

ICBO. International Conference of Building Officials.

ICC. International Code Council.

IPC. International Plumbing Code.

LCCA. Life cycle cost analysis.

NAVFACENGCOM. Naval Facilities Engineering Command.

NFGS. Naval Facilities Guide Specification.

NFPA. National Fire Protection Association.

NSTC. Navy Supplemental Technical Criteria.

OICC. Officer in Charge of Construction.

ROICC. Resident Officer in Charge of Construction.

SBCCI. Southern Building Code Congress International.

SWH. Service water heater.

UL. Underwriters Laboratories Inc.

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NAVY - YD

PREPARING ACTIVITY:
NAVY - YD

PROJECT NO.:
FACR-5020

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