Technical Committee on Water Tanks (WAT-AAA)

M E M O R A N D U M

DATE:	April 7, 2016
TO:	Principal and Alternate Members of the Technical Committee on Water Tanks (WAT-AAA)
FROM:	Chad Duffy, NFPA Staff Liaison Office: (617) 984-7562 Email: cduffy@nfpa.org
SUBJECT:	**AGENDA – NFPA 22 First Draft Meeting (Fall 2017)**

Enclosed is the agenda for the First Draft meeting for NFPA 22, *Standard for Water Tanks for Private Fire Protection*, which will be held at the Holiday Inn – Inner Harbor, Baltimore, MD **12:00pm to 5:00pm ET on Tuesday April 26, 2016, and Wednesday, April 27, 2016 from 8:00am to 5:00pm ET.**

Please submit requests for additional agenda items to the chair at least seven days prior to the meeting, and notify the chair and staff liaison as soon as possible if you plan to introduce any first revisions at the meeting.

All NFPA Technical Committee meetings are open to the public. Please contact me for information on attending a meeting as a guest. Read NFPA's Regulations Governing the Development of NFPA Standards (Section 3.3.3.2) for further information.

Additional Meeting Information:
See the Meeting Notice on the Document Information Page (www.nfpa.org/22next) for meeting location details. If you have any questions, please feel free to contact **Elena Carroll**, *Project Administrator* at 617-984-7952 or by email ecarroll@nfpa.org.

C. Standards Administration

Technical Committee on Water Tanks (WAT-AAA)

NFPA 22 First Draft Meeting (Fall 2017)

Tuesday, April 26, 2016, 12:00pm – 5:00pm ET
and Wednesday April 27, 2016, 8:00am – 5:00pm ET
Holiday Inn – Inner Harbor, Baltimore, MD

AGENDA

Tuesday, April 26, 2016

1. Call to Order – 12:00 PM
2. Introductions and Attendance
3. Review Agenda/Discussion of Next Meeting Location
4. NFPA Staff Liaison Presentation and Review of Key Dates in Current Cycle
5. Chairman Comments
6. Approval of Previous Meeting Minutes
7. Act on Public Input for NFPA 22
8. Adjourn – 5:00 PM

Wednesday, April 27, 2016

1. Call to Order – 8:00 AM
2. Act on Public Input for NFPA 22
3. New business
4. Adjourn – 6:00 PM

Please submit requests for additional agenda items to the chair at least seven days prior to the meeting.

Please notify the chair and staff liaison as soon as possible if you plan to introduce any first revisions or committee input at the meeting.

Key Dates for the Fall 2017 Revision Cycle

Proposal Closing Date	January 7, 2016
Final Date for First Draft Meeting	**June 16, 2016**
Posting of First Draft and TC Ballot	August 4, 2016
Ballots Returned By	**August 25, 2016**
Post Final First Draft	September 8, 2016
Comment Closing Date	November 17, 2016
Final Date for Second Draft Meeting	**May 18, 2017**
Posting of Second Draft and TC Ballot	June 29, 2017
Ballots Returned By	**July 20, 2017**
Posting Final Second Draft	August 3, 2017
Closing Date for Notice of Intent to Make a Motion (NITMAM)	August 31, 2017
Issuance of Consent Document (No NITMAMs)	*October 12, 2017*
NFPA Annual Meeting	June 4-7, 2018
Issuance of Document with NITMAM	*August 14, 2018*

Technical Committee deadlines are in **bold**.

Meeting Preparation

Committee members are strongly encouraged to review the published input prior to the meeting and to be prepared to act on each item.

Handout materials should be submitted to the chair at least seven days prior to the meeting.

Only one posting of the input will be made; it will be arranged in section/order and will be pre-numbered. This will be posted to the NFPA Document information pages located at www.nfpa.org/22. If you have trouble accessing the website please contact Elena Carroll at ecarroll@nfpa.org.

Mandatory Materials:

- Last edition of the standard
- Meeting agenda
- Public input/comments
- Committee Officers' Guide (Chairs)
- Roberts' Rules of Order (Chairs; An abbreviated version may be found in the Committee Officer's Guide)

Optional Materials:

- NFPA Annual Directory
- NFPA Manual of Style
- Prepared committee input/comments (If applicable)

Regulations and Guiding Documents

All committee members are expected to behave in accordance with the Guide for the Conduct of Participants in the NFPA Codes and Standards Development Process.

All actions during and following the committee meetings will be governed in accordance with the Regulations Governing the Development of NFPA Standards. Failure to comply with these regulations could result in challenges to the standards-making process. A successful challenge on procedural grounds could prevent or delay publication of the document.

The style of the document must comply with the Manual of Style for NFPA Technical Committee Documents.

General Procedures for Meetings

- Use of tape recorders or other means capable of producing verbatim transcriptions of any NFPA Committee Meeting is not permitted.
- Attendance at all NFPA Committee Meetings is open. All guests must sign in and identify their affiliation.
- Participation in NFPA Committee Meetings is generally limited to committee members and NFPA staff. Participation by guests is limited to individuals, who have received prior approval from the chair to address the committee on a particular item, or who wish to speak regarding public input or comments that they submitted.
- The chairman reserves the right to limit the amount of time available for any presentation.
- No interviews will be allowed in the meeting room at any time, including breaks.
- All attendees are reminded that formal votes of committee members will be secured by letter ballot. Voting at this meeting is used to establish a sense of agreement, but only the results of the formal letter ballot will determine the official action of the committee.
- Note to Special Experts: Particular attention is called to Section 3.3(e) of the NFPA Guide for the Conduct of Participants in the NFPA Codes and Standards Development Process in the NFPA Directory. This section requires committee members to declare any interest they may represent, other than their official designation as shown on the committee roster. This typically occurs when a special expert is retained by and represents another interest category on a particular subject. If such a situation exists on a specific issue or issues, the committee member shall declare those interests to the committee and refrain from voting on any action relating to those issues.
- Smoking is not permitted at NFPA Committee Meetings.

NEW PROCESS ACTIONS AND MOTIONS

	Possible Action #1: Resolve PI (no change to section)	
	Action Required	**Sample motion**
	Make a statement to resolve a PI	I move to resolve PI # with the following statement . . .
	Possible action #2: Create First Revision (make a change to a section)	
	Action Required	**Sample motion**
Step 1	Create a First revision based one or more PIs	I move to create a First Revision based on PI #
Step 2	If the revision is related to multiple PIs, generate a statement to respond to all of them together	
Step 1	Create a First Revision	I move to create a First Revision as follows . . .
Step 2	Generate a statement (substantiation)	
Possible Action 3: Create Committee input		
Step 1	Create proposed revision for solicitation of public comments	I move to create CI with a proposed revision to X as follows . . .
Step 2	Generate a statement to explain the intent and why the Committee is seeking public comment	

Attachment #1:
Previous Meeting Minutes

NFPA 22 –ROC Meeting
Day 1
Web Conference

April 09, 2012 – 12 PM-5 PM EDT

Attendees:
See attached attendance sheet

NFPA Liaison:
Chad Duffy

1. Chairman Robert M. Gagnon called the meeting to order at 12:05 pm EDT on April 9th and welcomed the committee.

2. Attendance was completed.

3. Chairman Robert M. Gagnon reviewed the agenda and provided introductory and procedural information.

4. Staff Liaison Chad Duffy provided a brief presentation covering committee member responsibilities, actions, revision cycle and the upcoming new process.

5. Chairman presented his comments.

6. The meeting minutes of June 22nd and July 5th, 2011 were reviewed and accepted.

7. The committee proceeded to review and act on the comments.

8. The Chairman appointed a task group of Jack Hillman and Keith McGuire to address two unresolved logs. Log #3 (5.2.1.2) and Log # 5 (Table 5.4). Greg Stein is to do a final review of both Log# 3 and Log 5.

9. Staff Liaison is to editorially correct the formula in Section 6.4.1.3.1.

10. Next meeting to be announced.

11. Meeting adjourned at 3:30 pm EDT

NFPA 22 –ROC Meeting
Day 2
Web Conference

April 20, 2012 – 10 AM – 11 AM EDT

Attendees:
See attached attendance sheet

NFPA Liaison:
Chad Duffy

1. The Technical Committee reconvened at 10:00 am EDT on April 20th, 2012 as Chairman Robert M. Gagnon called the meeting to order.

2. Attendance was completed.

3. The Technical Committee proceeded to act on the remaining comments.

4. Chairman Robert M. Gagnon asked if there was any unfinished business. No unfinished business required discussion.

5. Chairman Robert M. Gagnon asked if there was any new business. No new business required discussion.

6. Chairman Robert M. Gagnon called for a motion to adjourn at 10:40 am EDT. Motion passed unanimously.

Attendance Sheet for : NFPA 22 ROC MEETING 4/9/12, 4/20/12

Water Tanks

Name	Yes	No	Staying at Hotel	Days 1	2	3	4	5
Gagnon, Robert	X			X	X			
Brown, Phillip	X			X	X			
Bellew, Kevin	X			X				
Biradar, Babanna	X				X			
Campbell, John	X			X	X			
Conrady, John	X			X				
Culp, Christopher	X			X				
Curran, Sullivan		X						
Edwards, Bruce	X			X				
Esposito, Nick		X						
Fisher, Douglas	X			X	X			
Fowler, Joseph	X				X			
Fritz, Daniel	X				X			
Garber, Greg		X						
Grooms, Chris		X						
Hillman, Jack	X			X	X			
Hochhauser, David		X						
Legatos, Nicholas		X						
McGuire, Keith	X			X				
Mitchard, John	X				X			
Morgan, Bob	X			X	X			
Mow, Bill		X						
Rosenwach, Andrew	X			X				
Sornsin, Mark	X			X	X			
Stein, Gregory	X			/	X			
Brady, Andrew		X						
Isman, Kenneth	X			X	X			
John, Jeremy		X						
Kidd, Todd	X			X				
McLaughlin, Patrick		X						
Patrick, R.		X						
Sweeney, John		X						
Vandergriff, Daniel	X			X				

Attendance Sheet for : NFPA 22 ROC MEETING 4/9/12, 4/20/12

Water Tanks

Name	Yes	No	Staying at Hotel	Days 1	2	3	4	5
Duffy, Chad	☒	☐	☐	☒	☒	☐	☐	☐

Attachment #2:
Public Input

Public Input No. 38-NFPA 22-2015 [Global Input]

Type your content here ...

Proposal: **Delete the term “Standpipe” as it is not consistently used throughout the standard and is redundant with the term suction or gravity tank.**

14.2.5.1.1 **The base elbow of tanks with steel-plate tank risers, of suction tanks, or of ~~standpipes~~ gravity tanks shall have bell ends.**

14.2.8.2.3 **A rigid flanged connection or welded joint shall be permitted to be used between the discharge pipe and the bottom of a suction tank, a ~~standpipe~~ gravity tank , or the base of a steel-plate tank riser of a tank that is located on an independent tower where special approval is obtained from the authority having jurisdiction.**

16.2.1.1 **A steam-heated vertical radiator system shall be used for elevated tanks with unprotected tank risers of 3 ft (0.91 m) or more in diameter that have tower heights under 100 ft (30.5 m) *(see 13.1.2)*, ~~standpipes~~ gravity tanks, and on-grade suction tanks.**

Already proposed to be deleted see Chapter 16 proposal.

16.2.1.3 **Immersed steam coils shall be used for suction tanks and ~~standpipes~~ gravity tanks that have flat bottoms supported near ground level in situations where the tank is kept filled so that the steam coils are continuously submerged.**

Already proposed to be deleted see Chapter 16 proposal.

16.2.2.1 **Suction tanks, ~~standpipes~~, and ~~elevated~~ gravity tanks that have tank risers of 3 ft (0.91 m) or more in diameter shall not be required to have provision for heat.**

Already proposed to be deleted see Chapter 16 proposal.

16.3.6.2 **An accurate angle socket thermometer that has at least a 6 in. (152 mm) stem and that is calibrated as low as 30°F(−1.1°C) shall be permanently inserted through the plate ~~or standpipe~~ and as far from the heating unit as possible.**

16.3.8.9 **The surface water temperatures for ~~elevated~~ gravity tanks, ~~standpipes~~, and suction tanks shall be ascertained by means of a listed temperature-detecting device.**

A.16.1.3 Choice of Circulating Heaters. **To select a suitable circulating heater, first obtain from Figure 16.1.4 the lowest mean atmospheric temperature for one day that may occur at the locality in question; then determine the total heat loss from the**

tank equipment in British thermal units (kilowatts) per hour from Table 16.1.4(a) for an ~~elevated~~ gravity steel tank, from Table16.1.4(b) for an elevated wood tank, from Table 16.1.4(c) for a steel suction tank ~~or standpipe~~, or from Table 16.1.4(d) for an embankment-supported coated fabric suction tank. The heater installed should have sufficient capacity to deliver, under actual field conditions, an amount of heat that is equivalent to that lost from the tank equipment. A steam water heater should be planned with due consideration of the steam pressure available. Other heaters should be planned for the particular kind of fuel to be used.

A.16.1.4 Heat Losses. **Table 16.1.4(a) through Table 16.1.4(h)specify the heat losses from uninsulated ~~elevated~~ gravity steel tanks, elevated wood tanks, steel suction tanks ~~and standpipes~~, embankment-supported coated fabric suction tanks, insulated steel gravity tanks, and insulated steel suction tanks, respectively, for common sizes exposed to various atmospheric temperatures of 35°F to −60°F (1.7°C to −51.1°C). The losses are indicated in the British thermal units per hour (kilowatts) that are lost from the entire tank equipment when the temperature of the coldest water is safely above the freezing point, and represent the British thermal units per hour that the heating system should supply when the atmospheric temperature is within the range provided by the tables.**

A.16.2 Recommendations for Gravity Circulation Heating. **Gravity circulation allows convenient observation of the coldest water temperatures at a thermometer in the cold-water return pipe and is dependable and economical when correctly planned. Cold water received through a**

connection from the discharge pipe or from near the bottom of a suction tank ~~or standpipe~~ is heated and rises through a separate hot-water pipe into the tank. Water has its maximum density at 39.2°F (4°C). When the temperature of the water falls below 39.2°F (4°C), a water inversion occurs and the warmer water settles to the bottom of the tank while the colder water rises. Therefore, if the circulation heater is to be fully effective, sufficient heat should be provided so that the temperature of the coldest water is maintained above42°F (5.6°C) to prevent inversion. *(See Table A.16.2.)*

A.16.3.6.1 **A vertical steam radiator, as shown in FigureB.1(u), but without the open-ended pipe sleeve around the radiator heater, is reasonably well adapted to heating ~~elevated~~ gravity tanks with larger tank risers for tower heights under 100 ft(30.5 m) *(see 13.1.2)*, suction tanks, ~~and standpipes~~.**

Statement of Problem and Substantiation for Public Input

The term standpipe is not used consistently throughout the standard and should be deleted as it can be used to refer to either a suction or gravity tank.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE

Organization: LIBERTY MUTUAL INSURANCE

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 19 14:19:57 EDT 2015

Public Input No. 1-NFPA 22-2015 [Chapter 2]

Chapter 2 Referenced Publications

2.1 General.

The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam,* 2010 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2013 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* 2013 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection,* 2012 edition.

NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems,* 2011 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection,* 2013 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances,* 2013 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2011 edition.

NFPA 70® , *National Electrical Code®,* 2011 edition.

NFPA 72® , *National Fire Alarm and Signaling Code,* 2013 edition.

NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations,* 2013 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems,* 2011 edition.

2.3 Other Publications.

2.3.1 ACI Publications.

American Concrete Institute, ~~P.O. Box 9094~~ **38800 Country Club Drive** , Farmington Hills, MI ~~48333~~ **48331** **-** ~~9094~~ **3439** .

ACI 318**M** , *Building Code Requirements for Structural Concrete and Commentary*, ~~2008~~ **2014** .

ACI ~~350R~~ 350 , **Code Requirements For Environmental Engineering Concrete Structures And Commentary** , 2006**, Errata, 2015** . **(Supersedes ACI 350R)**

2.3.2 ~~ANSI~~ **IEEE** Publications.

~~American National Standards Institute, Inc., 25 West 43rd Street, 4th~~ **IEEE** **,** **3 Park Avenue** **,** **17th** Floor, New York, NY ~~10036~~ **10016-5997** .

~~ANSI SI~~ **IEEE** SI 10, **American National Standard for** ~~Use of the International System of Units (SI): The Modern Metric System, 2010~~ **Metric Practice** , 2010 **, Errata, 2013** .

2.3.3 API Publications.

American Petroleum Institute, 1220 L Street N.W., Washington, DC 20005-4070.

API ~~5LC~~ **SPEC** 5LC , *Specification for CRA Line Pipe*, 3rd ed., 1998**, reaffirmed 2015** .

2.3.4 ASHRAE Publications.

American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329-2305.

ASHRAE *Handbook* ~~of~~ **-** *Fundamentals*, ~~2009~~ **2013** .

2.3.5 ASME Publications.

~~American Society of Mechanical Engineers, Three~~ **ASME International**, **Two** Park Avenue, New York, NY 10016-5990.

ASME *Boiler and Pressure Vessel Code*, ~~"Rules for the~~ **Section VIII, Division 1,** "Rules for Construction of ~~Unfired~~ Pressure Vessels**",** ~~" 2010~~ **2015** .

2.3.6 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM ~~A 6~~ A6 /~~A 6M~~ A6M , *Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling*, ~~2011~~ **2014** .

ASTM ~~A 27~~ A27 /~~A 27M~~ A27M , *Standard Specification for Steel Castings, Carbon, for General Application*, ~~2010~~ **2013** .

ASTM ~~A 36~~ A36 /~~A 36M~~ A36M , *Standard Specification for Carbon Structural Steel*, ~~2008~~ **2014** .

ASTM ~~A 53~~ A53/ **A53M** , *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*, ~~2010~~ **2012** .

ASTM ~~A 105~~ A105 /~~A 105M~~ A105M , *Standard Specification for Carbon Steel Forgings for Piping Applications*, ~~2011~~ **2014** .

ASTM ~~A 106~~ A106 **/A106M** , *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*, ~~Rev~~ **2014** . ~~A, 2010.~~

ASTM ~~A 108~~ A108 , *Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality*, ~~2007~~ **2013** .

ASTM ~~A 131~~ A131 /~~A 131M~~ A131M , *Standard Specification for Structural Steel for Ships*, ~~2004~~ **2014** .

ASTM ~~A 139~~ A139 **/A139M** , *Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and over)*, **2004, reapproved 2010** .

ASTM ~~A 181~~ A181 /~~A 181M~~ A181M , *Standard Specification for Carbon Steel Forgings, for General-Purpose Piping*, ~~2006~~ **2014** .

ASTM ~~A 193~~ A193 **/193M** , *Standard Specification for Alloy-Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications*, ~~2012~~ **2014A** .

ASTM ~~A 283~~ A283 /~~A 283M~~ A283M , *Standard Specification for Low- and Intermediate-Tensile Strength Carbon Steel Plates*, ~~Rev~~ **2013** . ~~A, 2007.~~

ASTM ~~A 285~~ A285 /~~A 285M~~ A285M , *Standard Specification for Pressure Vessel Plates, Carbon Steel, Low- and Intermediate-Tensile Strength*, ~~2007~~ **2012** .

ASTM ~~A 307~~ A307 , *Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength*, ~~2010~~ **2014** .

ASTM ~~A 502~~ A502 , *Standard Specification for Steel Structural Rivets*, ~~2009~~ **2003, reapproved 2015** .

ASTM ~~A 516~~ A516 /~~A 516M~~ A516M , *Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service*, 2010.

ASTM ~~A 572~~ A572 /~~A 572M~~ A572M , *Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel*, ~~2007~~ **2015** .

ASTM ~~A 615~~ A615 /~~A 615M~~ A615M , *Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement*, ~~2009~~ **2015** .

ASTM ~~A 668~~ A668 /~~A 668M~~ A668M , *Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use*, ~~2009~~ **2015** .

ASTM ~~A 675~~ A675 /~~A 675M~~ A675M , *Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties*, ~~Rev~~ **2014** . ~~A, 2009.~~

ASTM ~~A 992~~ A992 /~~A 992M~~ A992M , *Standard Specification for Steel for Structural Shapes for Use in Building Framing*, 2011.

ASTM ~~A 1011~~ A1011 **/A1011M** , *Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability*, ~~2010~~ **2014** .

ASTM ~~C 578~~ C578 , *Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*, ~~2011~~ **2014A** .

ASTM ~~D 751~~ D751 , *Standard Test Methods for Coated Fabrics*, 2006**, reapproved 2011** .

ASTM ~~D 1171~~ D1171 , *Standard Test Method for Rubber Deterioration — Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)*, 2007.

ASTM ~~D 1183~~ D1183 , *Standard Test Methods for Resistance of Adhesives to Cyclic Laboratory Aging Conditions*, 2011.

ASTM ~~D 1751~~ D1751 , *Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)*, ~~2008~~ **2004, (2013 e1)** .

ASTM ~~D 2261~~ D2261 , *Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine)*, ~~2007~~ **2013** .

ASTM ~~F 1554~~ F1554 , *Standard Specification for Anchor Bolts Steel 36, 55 and 105–KSI Yield Strength*, **2007A, (2011 E1)** .

2.3.7 AWPA Publications.

American ~~Wood Preservers~~ Wood **Protection** Association, ~~7735 Old Georgetown Avenue N.W., Suite 500, Washington, DC 20036~~ **P.O. Box 361784, Birmingham, AL 35236-1784** .

Standard Specifications of the American Wood Preservers Association by the Empty-Cell Process, July 1, 2011.

2.3.8 AWS Publications.

American Welding Society, ~~550 N.W. LeJeune Road,~~ **8869 NW 36 Street, Suite #130 ,** Miami, FL ~~33126~~ **33166-6672** .

AWS A5.1**/A5.1M** , *Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding*, ~~1991~~ **2012** .

AWS D1.1**/D1.1M** , *Structural Welding Code — Steel*, ~~2010~~ **2015** .

2.3.9 AWWA Publications.

American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235.

AWWA C652, *Disinfection of Water-Storage Facilities*, ~~2002~~ **2011** .

AWWA D100, *Welded Steel Tanks for Water Storage*, 2011.

AWWA D~~/~~ **1** 02, *Coating Steel Water-Storage Tanks*, ~~2011~~ **2014** .

AWWA D103, *Factory-Coated Bolted Steel Tanks for Water Storage*, 2009**, Addenda, 2014** .

AWWA D110, *Wire- and Strand-Wound, Circular-Prestressed Concrete Water Tanks*, ~~2004~~ **2013** .

AWWA D115, *Circular-Prestressed Concrete Water Tanks with Circumferential Tendons*, 2006.

AWWA D120, *Standard for Thermosetting Fiberglass-Reinforced Plastic Tanks*, 2009.

2.3.10 NWTI Publications.

~~National Wood Tank Institute,~~ **Hall-Woolford Tank Company, Inc. ,** 5500 N. Water St., P.O. Box 2755, Philadelphia, PA 19120.

NWTI Bulletin S82, *Specifications for Tanks and Pipes*, 1982.

2.3.11 SSPC Publications.

Society for Protective Coatings, 40 24th Street, 6th Floor, Pittsburgh, PA 15222-4656.

SSPC Systems and Specifications Steel Structures Painting Manual, Volume 2, Chapter 5, 2011.

SSPC SP 6, *Joint Surface Preparation Standard Commercial Blast Cleaning*, 2007.

SSPC SP 8, *Pickling*, 2004.

SSPC SP 10, *Joint Surface Preparation Standard Near-White Blast Cleaning*, 2007.

2.3.12 U.S. Government Publications.

U.S. ~~Government Printing~~ Government **Publishing** Office, **732 North Capitol Street, NW, Washington** ~~,~~ **DC** ~~20402~~ **20401-0001** .

Title 29, Code of Federal Regulations, Part 1910 (OSHA).

Federal Standard 191 Method. Textile Test Methods, 1978.

Federal Test Method Standard 601. Ruber: Sampling and Testing, 1955.

2.3.13 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections. (Reserved)

Statement of Problem and Substantiation for Public Input

Referenced current SDO names, addresses, standard names, numbers, and editions.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2-NFPA 22-2015 [Chapter C]	

Submitter Information Verification

Submitter Full Name: Aaron Adamczyk
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jun 17 03:12:59 EDT 2015

Public Input No. 42-NFPA 22-2015 [Section No. 2.3.4]

2.3.4 ASHRAE Publications.

American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329-2305.

ASHRAE *Handbook ~~of~~ - Fundamentals*, ~~2009~~ 2013 .

Statement of Problem and Substantiation for Public Input

A superseded version of the Handbook of Fundamentals is referenced, and this comment seeks to update the reference to the most recent published version of the Handbook.

All references to the Handbook should be editorially corrected from the ASHRAE Handbook of Fundamentals to the formal reference (the ASHRAE Handbook - Fundamentals) throughout the document.

Submitter Information Verification

Submitter Full Name: STEVEN FERGUSON

Organization: ASHRAE

Street Address:

City:

State:

Zip:

Submittal Date: Tue Sep 01 14:40:51 EDT 2015

Public Input No. 3-NFPA 22-2015 [Section No. 3.3.1]

3.3. ~~1~~ 2.2 Break Tank.

A tank providing suction to a fire pump whose capacity is less than the fire protection demand (flow rate times flow duration).

Additional Proposed Changes

File Name	Description	Approved
NFPA_22_Chapter_3.docx	Reorganized section and added definitions of terms commonly used int he document.	

Statement of Problem and Substantiation for Public Input

Reorganized section and added definitions of terms used in the document such as bladder, gravity and pressure tank, standpipe and tank riser. These are terms not generally defined in Miriam Websters Dictionary and need clarification.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 10:28:29 EDT 2015

3.3 General Definitions

~~**3.3.1 Break Tank.** A tank providing suction to a fire pump whose capacity is less than the fire protection demand (flow rate times flow duration).~~

3.3.1 Holiday. A discontinuity in the coating system that includes, but is not limited to, voids, cracks, pinholes, or scratches.

~~**3.3.3 Suction Tank.** Any tank that provides water to a fire pump~~

~~**3.3.4 Tank Riser.** A large diameter shaft that surrounds and encloses the piping below an elevated gravity tank to provide a measure of insulation and protection~~

3.3.2 Tank

3.3.2.1 Bladder Tank. A type of pressure tank containing air and water separated by a flexible membrane (bladder).

3.3.2.2 Break Tank. A tank providing suction to a fire pump whose capacity is less than the fire protection demand (flow rate times flow duration).

3.3.2.3 Gravity Tank. An elevated storage tank (on a tower or hill) that utilizes elevation (head) as a source of pressure.

A.3.3.2.3 A gravity tank might be capable of providing the necessary head pressure to operate a fire suppression system or used to provide water to a fire pump.

3.3.2.4 Pressure Tank. A tank that utilizes air or some other gas under pressure as a means of expelling its contents.

3.3.2.5 Suction Tank. A tank, located in close proximity to a fire pump into which a minimal amount of head pressure is provided. ~~Any type of tank that provides water to a fire pump.~~

3.3.3 Standpipe. A ground-supported, flat-bottom, cylindrical tank having a shell height greater than its diameter.

A.3.3.3 A standpipe can be used either as a suction tank or as a gravity tank if elevated in some form (such as on a hill or building roof).

3.3.4* Tank Riser. A large diameter shaft that surrounds and encloses the piping below an elevated gravity tank to provide a measure of insulation and protection. A tank riser can also serve as the discharge pipe for the tank.

A.3.3.4 See Figure B.1(j) .

Substantiation: Reorganized section and added definitions of terms used in the document such as bladder, gravity and pressure tank, standpipe and tank riser. These are terms not generally defined in Miriam Websters Dictionary and need clarification.

Public Input No. 4-NFPA 22-2015 [Section No. 4.1]

4.1 Capacity and Elevation.

4.1.1 *

The size and elevation of ~~the tank~~ tanks shall be determined by ~~conditions at each individual property after due consideration of all factors involved~~ the required flow and duration of the attached fire protection system(s) and the pressures required .

4.1.2

~~Wherever possible, standard~~ Standard sizes of tanks shall be as specified in 5.1.3, 6.1.2, 8.1.3, and Sections 9.2 and 10.3.

4.1.3 *

For suction tanks, the net capacity shall be the number of U.S. gallons (cubic meters) between the inlet of the overflow and the level of the vortex plate.

4.1.4

A tank shall be sized so that the stored supply plus reliable automatic refill shall ~~be sufficient to~~ meet the system demand ~~placed upon it~~ for the design duration.

4.1.5

A break tank shall be sized for a minimum duration of 15 minutes with the fire pump operating at 150 percent of rated capacity.

Statement of Problem and Substantiation for Public Input

Removes unenforceable language and provides clarification of the capacity requirements for all tanks.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 11:03:29 EDT 2015

Public Input No. 5-NFPA 22-2015 [New Section after 4.1.2]

TITLE OF NEW CONTENT

Type your content here ...

4.1.2.1 Tanks other than standard size shall be approved.

Additional Proposed Changes

File Name	Description	Approved
NFPA_22_Section_4.1_Capacity_Elevation.docx		

Statement of Problem and Substantiation for Public Input

Removes unenforceable language and provides clarification of the capacity requirements for all tanks.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 11:16:52 EDT 2015

4.1 Capacity and Elevation.

4.1.1* The size and elevation of tanks shall be determined by the required fire flow and duration for the attached fire protection system(s) and the pressures required. ~~of the tank shall be determined by conditions at each individual property after due consideration of all factors involved.~~

A.4.1.1 Where tanks ~~are to~~ supply fire protection systems, ~~sprinklers~~, see separately published NFPA water based standards; such as NFPA 11, 13, 14, 15, 16, 20 and 24.~~also see NFPA 13~~.

4.1.2 ~~Wherever possible, s~~Standard sizes of tanks shall be as specified in 5.1.3, 6.1.2, 8.1.3, and Sections 9.2 and 10.3.

4.1.2.1 Tanks other than standard size shall be approved.

4.1.3* For suction tanks, the net capacity shall be the number of U.S. gallons (cubic meters) between the inlet of the over- flow and the level of the vortex plate.

A.4.1.3 Careful consideration should be given to the determination of tank capacity. In addition to the required fire flow and duration requirements of water based system standards, the permitted fluctuations of the water level sensors (See Section 14.9) 12 in. (300 mm) below normal for evaporation and closure time for the fill valve and maintaining a reasonable amount of water in the bottom of suction tanks to prevent cavitation of fire pumps should be factored into the overall tank size.

For example, assuming a suction tank supplying a standpipe system via a 1000gpm fire pump:

Standpipe system design = 1000gpm x 30 minutes = 30,000 gallons required.

Assuming a 20ft diameter suction tank, the tank would hold approximately 2349 gallons per foot of tank height ($v=3.1416\ r^2h$) 314 = $3.1416(10)^2(1) \times 7.48 = 2349$ gal.

Given a 1ft variation between the fill sensor and overflow connection 2349 gallons would have to be added to the tank capacity. Further assuming that the minimum water level should be approximately equal to the center line of the suction pipe (to prevent fire pump cavitation – see Figure A.4.1.3) then another 3948 gal should be added to the needed capacity.

Volume = $3.1416\ (10)^2\ (1.68) \times 7.48$ gal/cu.ft = 3948 gallons.

3948 + 2349 = 6297 gallons

Adding these considerations brings the total needed capacity to 36,297 gallons or a 40,000 gallon tank (based on standard tank sizes)

The dimensions in Figure A.4.1.3 are based on a 1000 gpm fire pump which requires an 8” suction line. Dimensions for other sizes of pumps and suction lines will vary slightly.

4.1.3.1 For all other tanks, the net capacity shall be the numbers of U.S. gallons (cubic meters) between the inlet of the overflow and the discharge outlet.

4.1.4 A tank shall be sized so that the stored supply plus reliable automatic refill shall ~~be sufficient to~~ meet the system demand ~~placed upon it~~ for the design duration.

4.1.5 A break tank shall be sized for a minimum duration of 15 minutes with the fire pump operating at 150 percent of rated capacity.

Substantiation: Removes unenforceable language and provides clarification of the capacity requirements for all tanks.

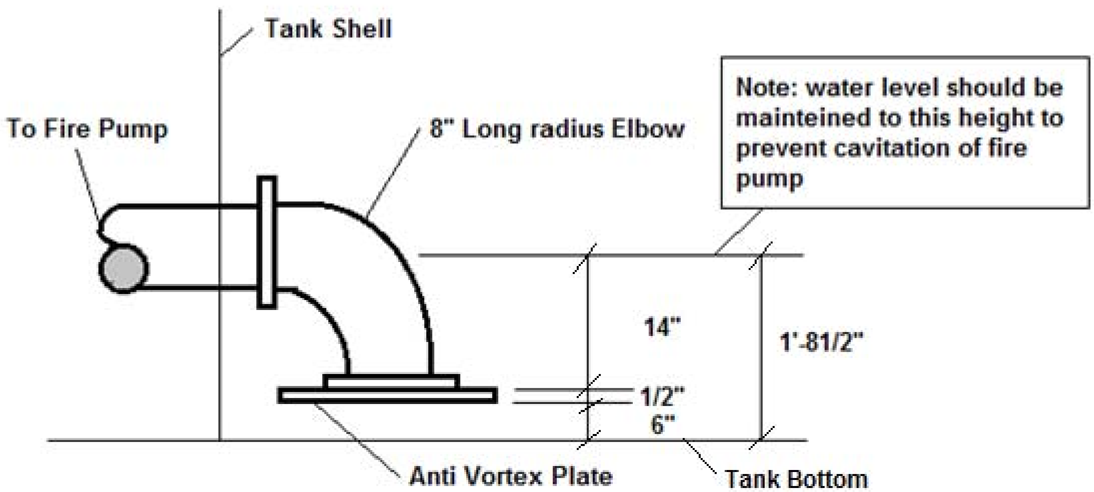

Figure A.4.1.3

Public Input No. 6-NFPA 22-2015 [Chapter 5]

Chapter 5 Welded-Steel Gravity Tanks and Suction Tanks

5.1 General.

5.1.1

This chapter shall apply to the design, fabrication, and erection of welded-steel gravity water tanks, including pump suction tanks.

5.1.2 Capacity.

5.1.2.1

The capacity of the tank shall be the number of U.S. gallons (cubic meters) available above the outlet opening.

5.1.2.2

The net capacity between the outlet opening of the discharge pipe and the inlet of the overflow shall be equal to at least the rated capacity.

5.1.2.3

The net capacity for gravity tanks with large plate tank risers shall be the number of U.S. gallons (cubic meters) between the inlet of the overflow and the designated low-water level line.

5.1.3 Standard Sizes.

5.1.3.1

The standard net capacity sizes of steel tanks shall be as follows:

(1) 5000 gal (18.93 m^3)

(2) 10,000 gal (37.85 m^3)

(3) 15,000 gal (56.78 m^3)

(4) 20,000 gal (75.70 m^3)

(5) 25,000 gal (94.63 m^3)

(6) 30,000 gal (113.55 m^3)

(7) 40,000 gal (151.40 m^3)

(8) 50,000 gal (189.25 m^3)

(9) 60,000 gal (227.10 m^3)

(10) 75,000 gal (283.88 m^3)

(11) 100,000 gal (378.50 m^3)

(12) 150,000 gal (567.75 m^3)

(13) 200,000 gal (757.00 m^3)

(14) 300,000 gal (1135.50 m^3)

(15) 500,000 gal (1892.50 m^3)

5.1.3.2

Tanks of other sizes shall be permitted.

5.1.4 Form.

Steel tanks shall be permitted to be of any form desired, provided they conform to all requirements of this standard.

5.2 Materials.

5.2.1 Plates, Shapes, and Tubular Columns.

5.2.1.1 Plates.

Plate materials shall be of open-hearth, electric furnace, or basic oxygen process steel that conforms to AWWA D100 and one of the following ASTM specifications:

(1) ASTM A 36/A 36M

(2) ASTM A 283/A 283M, Grades A, B, C, and D

5.2.1.2

Where plates of thicknesses greater than ¾ in. (19.1 mm) are used, ASTM A 283, Grade D, shall not be used. ASTM A 131, Grades A, B, and C; or ASTM A 516, Grades 55 and 60, shall be used as alternatives.

5.2.1.3 Basis of Furnishing Plates.

Plates shall be furnished, based on weight, with permissible underrun and overrun in accordance with the tolerance table for plates ordered to weight in ASTM A 20.

5.2.1.4 Shapes.

Structural materials shall be open-hearth, electric furnace, or basic oxygen process steel that conforms to ASTM A 36, or ASTM A 131, Grades A, B, and D, or ASTM A 992/A 992M.

5.2.1.5

Copper-bearing steel that contains approximately 0.20 percent copper shall be permitted to be used. In all other respects, steel shall conform to the specifications of 5.2.1.1, 5.2.1.3, and 5.2.1.4.

5.2.2 Bolts, Anchor Bolts, and Rods.

5.2.2.1

Bolts and anchor bolts shall conform to AWWA D100.

5.2.2.2

ASTM A 36 shall be considered an acceptable alternative material for anchor bolts. Rods shall be open-hearth, electric furnace, or basic oxygen process steel that conforms to ASTM A 36.

5.2.3* Forgings.

5.2.3.1

Steel used for forgings shall be made only by the open-hearth process.

5.2.3.2

Forgings shall conform to the following ASTM specifications:

(1) ASTM A 105

(2) ASTM A 668 Class D

(3) ASTM A 181, Class 70

5.2.4 Castings.

Castings shall conform to ASTM A 27, Grade 60-30 full annealed.

5.2.5 Reinforcing Steel.

Reinforcing steel shall comply with ASTM A 615, Grade 40 or Grade 60.

5.2.6 Filler Metal Electrodes.

5.2.6.1

Manual, shielded metal arc welding electrodes shall conform to the requirements of AWS A5.1.

5.2.6.2

Electrodes shall be of any E60XX or E70XX classification that is suitable for the electric current characteristics, the position of welding, and other conditions of intended use.

5.2.6.3

Electrodes for other welding processes shall be in accordance with applicable AWS specifications for filler metal.

5.3 Earthquake Load.

5.3.1

Tanks shall meet the requirements for resistance to earthquake damage in accordance with the earthquake design provisions of AWWA D100.

5.3.2

For seismic anchor-bolt loading, the following formula shall be used:

$$T_s = \frac{4M_s}{ND} - \frac{W'}{N}$$

where:

T_S = seismic bolt tension (lb)

M_S = seismic overturning moment (ft lb)

W' = weight of tank shell and portion of roof carried by shell (lb)

N = number of anchor bolts

D = tank diameter (ft)

5.4 Unit Stresses.

The maximum stresses in pounds per square inch (megapascals) that are produced by the loads specified in Sections 4.12 and 5.3, or any combination of them, shall not exceed the values in Table 5.4.

Table 5.4 Maximum Stresses

	psi	MPa
Tension: On net section, rolled steel	15,000	103.43
Tension:		
Anchor Bolts†		
Mild steel		
ASTM A 36 or ASTM F 1554–36	15,000	103.43
ASTM F 1554–55 (weldable)	18,750	129.29
High-strength steel		
ASTM A 193–B7		
1 ¼ in. ≤ diameter ≤ 2 ½ in.	31,250	215.48
2 ½ in. ≤ diameter ≤ 4 in.	28,750	198.24
ASTM F 1554–105		
1 ¼ in. ≤ diameter ≤ 3 in.	31,250	215.48
Tension: Cast steel		
Bending:		
Tension on extreme fibers, except column base plates	15,000*	103.43
Column base plates	20,000	137.90
Compression on extreme fibers of rolled sections, and plate girders and built-up members for values as follows:		
$\frac{ld}{bt}$ not in excess of 600	15,000	103.43
$\frac{ld}{bt}$ in excess of 600	9,000,000 / $\frac{ld}{bt}$	62,055 / $\frac{ld}{bt}$
where *l* is the unsupported length; *d* is the depth of the member; *b* is the width; and *t* is the thickness of its compression flange; all in in. (mm); except that *l* shall be assumed to be twice the length of the compression flange of a cantilever beam not fully stayed at its outer end against translation or rotation.		
Pins, extreme fiber	22,500	155.15
Cast steel	11,250	77.57

*For materials with F_y = 36,000 psi, the allowable stress may be taken as 18,000 psi.

†On area based on diameter at root of threads.

5.5 Design Details.

5.5.1 Minimum Thickness.

5.5.1.1

Except for cylindrical shell plates in contact with water in accordance with 5.5.1.6, the minimum thickness of any part of the structure shall be ³⁄₁₆ in. (4.8 mm) for parts not in contact with water contents and ¼ in. (6.4 mm) for parts in contact with water contents.

5.5.1.2

The controlling thickness of rolled shapes for the purposes of the foregoing stipulations shall be taken as the mean thickness of the flanges, regardless of web thickness.

5.5.1.3

The minimum thickness of tubular columns and struts shall be ¼ in. (6.4 mm).

5.5.1.4

Round or square bars used for wind bracing shall have a minimum diameter or width of ¾ in. (19.1 mm).

5.5.1.5

Bars of other shapes, if used, shall have a total area at least equal to a ¾ in. (19.1 mm) round bar.

5.5.1.5.1

Roof plates for suction tanks with cone roofs shall be permitted to be 0.1792 in. (7 gauge) sheet.

5.5.1.6

Cylindrical shell plates in contact with water shall have minimum thicknesses as specified in accordance with Table 5.5.1.6.

Table 5.5.1.6 Minimum Thickness of Cylindrical Shell Plates

	Diameter							
	<50 ft	**<15.2 m**	**50 ft–120 ft**	**15.2 m–35.6 m**	**120 ft–200 ft**	**35.6 m–61 m**	**>200 ft**	**>61 m**
Bottom rings	¼ in.	6.4 mm	¼ in.	6.4 mm	5/16 in.	7.9 mm	⅜ in.	9.5 mm
Upper rings	3/16 in.	4.8 mm	¼ in.	6.4 mm	5/16 in.	7.9 mm	⅜ in.	9.5 mm

5.5.2 Thickness for Corrosion.

5.5.2.1

If interior bracing is required to support the water content, 1/16 in. (1.6 mm) additional thickness shall be added to the calculated sections.

5.5.2.2

Except for hermetically sealed tubular sections, the sections shall be open to facilitate cleaning and painting.

5.5.2.2.1

Tubular sections used for columns on elevated legged tanks shall be hermetically sealed to prevent internal corrosion.

5.5.2.3

The plates of tanks that are to contain salt or alkaline water shall be 1/16 in. (1.6 mm) thicker than calculated.

5.5.3 Thickness of Tank Plates.

5.5.3.1

Tank plates shall be designed on the basis of the following maximum membrane tensile stresses, which shall be reduced for the joint efficiencies set forth in AWWA D100.

5.5.3.2*

Plate surfaces that are susceptible to complete stress analysis shall be designed on the basis of a maximum membrane tensile stress of 15,000 psi (103.43 MPa).

5.5.3.3

Plate surfaces that are not susceptible to complete stress analysis shall also be designed on the basis of a maximum membrane tensile stress of 15,000 psi (103.43 MPa) after making reasonable allowances for such loads and stresses that cannot be accurately determined.

5.5.3.3.1

The maximum membrane tensile stress shall in no case exceed 11,000 psi (75.85 MPa) when calculated, assuming that the concentrated reactions of supporting members are uniformly distributed between such reactions.

5.5.3.3.2

Therefore, the lowest cylindrical courses of tanks with suspended bottoms and the suspended bottoms themselves shall be designed for a maximum membrane tensile stress of 11,000 psi (75.85 MPa), reduced for the joint efficiencies.

5.5.3.4

As an alternative to 5.5.3.1 and 5.5.3.2, tank shell plates for suction tanks shall be permitted to be designed on the basis of the stresses, material selection, and inspection set forth in Section 14 of AWWA D100, provided all requirements of Section 14 of the standard are met.

5.5.3.5

Where compressive stresses exist, the selected plate thickness shall comply with the allowable local buckling stresses in accordance with AWWA D100.

5.5.4 Thickness of Flat Bottoms.

5.5.4.1

The thickness of plates in flat bottoms shall be not less than those given in Table 5.5.4.1(a) and Table 5.5.4.1(b).

Table 5.5.4.1(a) Thickness of Bottom Plates for Flat-Bottom Tanks (in inches)

Type of Support	Length (ft)	Depth of Water											
		10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	22 ft	24 ft	26 ft	28 ft	30 ft	40 ft
	12	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	3/8
Steel or concrete beams	14	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	3/8	3/8	7/16
	16	5/16	5/16	5/16	5/16	5/16	5/16	3/8	3/8	3/8	3/8	3/8	7/16
	18	5/16	5/16	5/16	5/16	3/8	3/8	3/8	3/8	7/16	7/16	7/16	1/2
	20	5/16	5/16	3/8	3/8	3/8	7/16	7/16	7/16	7/16	1/2	1/2	9/16
	24	3/8	3/8	7/16	7/16	7/16	1/2	1/2	1/2	9/16	9/16	9/16	11/16
Concrete slab or earth grade		1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4

Table 5.5.4.1(b) Thickness of Bottom Plates for Flat-Bottom Tanks (in millimeters)

Type of Support	Length (m)	Depth of Water											
		3.1 m	3.7 m	4.3 m	4.9 m	5.5 m	6.1 m	6.8 m	7.3 m	7.9 m	8.5 m	9.1 m	12.2 m
Steel or concrete beams	3.7	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	9.5
	4.3	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	9.5	9.5	11.1
	4.9	7.9	7.9	7.9	7.9	7.9	7.9	9.5	9.5	9.5	9.5	9.5	11.1
	5.5	7.9	7.9	7.9	7.9	9.5	9.5	9.5	9.5	11.1	11.1	11.1	12.7
	6.1	7.9	7.9	9.5	9.5	9.5	11.1	11.1	11.1	11.1	12.7	12.7	14.3
	7.3	9.5	9.5	11.1	11.1	11.1	12.7	12.7	12.7	14.3	14.3	14.3	17.5
Concrete slab or earth grade		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4

5.5.4.2

Any corrosion allowance specified shall be added to the value from the table.

5.5.5 Accessibility of Bottoms.

Grillages shall be designed so that the tank bottom and beams are accessible for inspection and painting.

5.5.6 Net Sections.

Net sections shall be used in calculating the tensile stress in plates and members.

5.5.7 Load Location.

5.5.7.1

When calculating the thickness of plates that are stressed by the weight or pressure of the tank contents, the pressure at the lower edge of each ring shall be assumed to act undiminished on the entire area of the ring.

5.5.8 Opening Reinforcement.

5.5.8.1

All openings of more than 4 in. (102 mm) in diameter that are located in the shell, suspended bottom, larger steel plate tank riser, or tubular support shall be reinforced.

5.5.8.2

The reinforcement shall be either the flange of a fitting, an additional ring of metal, excess plate metal above that actually required, or a combination of these methods.

5.5.8.3

The opening diameter shall be considered to be the maximum dimension of the hole cut in the plate perpendicular to the direction of maximum stress.

5.5.8.3.1

Excess plate metal used for joint efficiency shall not meet the requirements for opening reinforcement if the center of the opening is within one opening diameter of any plate seam or point of support attachment.

5.5.8.4

Welding shall be provided to transmit the full net strength of the reinforcing ring or flange to the plate.

5.5.8.4.1

In computing the net reinforcing area of a fitting, such as a boilermaker's flange or a manhole saddle that has a neck, the material in the neck shall be considered as part of the reinforcement for a distance, measured from the surface of the parent plate or from the surface of an intervening reinforcement plate, that is equal to four times the thickness of the material in the neck.

5.5.9 Roof Supports.

The supports for tank roofs that do not contain water shall be designed in accordance with the steel construction specifications of the American Institute of Steel Construction.

5.5.9.1

Rafters that are in contact with a steel roof, have a slope of less than 2 in. in 12 in. (51 mm in 305 mm), and consist of beam or channel shapes less than 15 in. (381 mm) deep shall be considered to be adequately braced in the lateral position by friction between the roof plate and the top flange.

5.5.9.2

The maximum slenderness ratio, L/r, for columns that support the roof shall be 175. The spacing between rafters, as measured along the tank circumference, shall not exceed 2π ft (0.61π m).

5.5.10 Welded Joints.

The types of joints used and their design shall conform to AWWA D100.

5.6 Workmanship.

5.6.1 Plate Edges.

The plate edges to be welded shall be universal mill edges or shall be prepared by shearing, machining, chipping, or mechanically guided oxygen cutting. Where the edges of plates are oxygen cut, the surface obtained shall be uniform and smooth and shall be cleaned of slag accumulations before welding.

5.6.1.1

Edges of irregular contour shall be permitted to be prepared by manually guided oxygen cutting.

5.6.2 Rolling.

For elevated tanks plates shall be cold-rolled to suit the curvature of the tank and the erection procedure in accordance with Table 5.6.2.

Table 5.6.2 Plate Dimensions

Plate Thickness	Minimum Diameter for Plates Not Rolled
< ⅜ in. (9.5 mm)	40 ft (12.2 m)
⅜ in. to < ½ in. (9.5 mm to < 12.7 mm)	60 ft (18.3 m)
½ in. to < ⅝ in. (12.7 mm to < 15.9 mm)	120 ft (36.6 m)
⅝ in. (15.9 mm) and heavier	Must be rolled for all diameters

5.6.3 Double-Curved Plates.

Plates that are curved in two directions shall be pressed cold or hot or shall be dished with a mortar and pestle die by repeated applications.

5.6.4 Milling Columns.

The ends of columns shall be milled to provide a satisfactory bearing unless the design provides sufficient welding to resist the total calculated loads.

5.6.5 Fitting Roofs.

5.6.5.1

The roof shall fit tightly to the top of the shell to eliminate any gap between the roof and the shell.

5.6.5.2

Where a spider is used, it shall not obstruct the flow of water into the overflow inlet.

5.6.6 Preventing Ice Damage.

During the construction, the contractor shall keep the tank, structure, and building roofs free of ice caused by leakage until the tank equipment is made watertight.

5.6.7 Coating for Bottom Plates on Soil or Concrete.

5.6.7.1*

The underside of all bottom plates shall be protected against corrosion by one of the methods required by 5.6.7.1.1 through 5.6.7.1.3.

5.6.7.1.1

Two coats of paint shall be applied after the bottom has been completely welded. When the underside of the tank bottom surface is painted and lime (optional) is added to the base material on the tank underside, the compatibility of the paint and the lime shall be checked with the paint supplier.

5.6.7.1.2

The sand pad, including pH range of the lime sand mix, sulfate content, and chloride content, shall meet the requirements of AWWA D100.

5.6.7.1.3

Where permitted by environmental authorities, an oiled sand cushion shall be permitted to be used. The sand shall be coated but shall not be running with excess oil.

5.6.7.2*

Where the tank bottom is placed on oiled sand, the sand shall be saturated to a depth of 4 in. (102 mm) with a suitable petroleum-base oil.

5.6.8

Tanks shall meet the erection tolerance requirements of AWWA D100.

5.7 Accessories.

5.7.1 Connections.

Connections shall be provided on the tank for the necessary pipes, braces, frost-casting, and walkway supports.

5.7.2 Roof Anchorage.

Each roof plate shall be securely fastened to the top of the tank.

5.7.3 Roof Hatch.

5.7.3.1

An easily accessible roof hatch or roof door having a minimum opening dimension of 24 in. (610 mm) shall be provided in the roof.

5.7.3.2

The hatch cover shall be built of steel plate with a minimum thickness of 3⁄16 in. (4.8 mm).

5.7.3.3

The hatch opening shall have a curb that is a minimum of 4 in. (102 mm) high, and the cover shall have a minimum downward overlap of 2 in. (51 mm).

5.7.3.4

A catch shall be provided to keep the cover closed.

5.7.3.5

A second roof hatch shall be placed 180 degrees from the primary roof hatch.

5.7.4 Ladders — General.

5.7.4.1

Outside and inside steel ladders that are arranged for convenient passage from one to the other and through the primary roof hatch shall be provided.

5.7.4.2

Ladders shall not interfere with the opening of the hatch cover and shall not incline outward from the vertical at any point.

5.7.4.3

For pedestal-supported tanks, the ladder shall be placed inside an access tube that extends through the center of the tank.

5.7.5 Outside Fixed Shell and Roof Ladder.

5.7.5.1

The outside tank ladder of suction tanks and multiple-column-supported gravity tanks shall be fixed a minimum of 7 in. (178 mm) between the tank side and the centerline of rungs and shall be rigidly bolted or welded to brackets that are spaced a maximum of 12 ft (3.7 m) apart and that are welded to the tank plates.

5.7.5.2

The bottom bracket shall be located a maximum of 6 ft (1.8 m) above the base of the tank cylinder, and the ladder shall extend up the tank shell and radially along the roof, with the top bracket located within approximately 2 ft (0.61 m) of the roof hatch.

5.7.5.3

There shall be a minimum 1 ft (0.3 m) clearance at the sides and front of the ladder at the balcony.

5.7.5.4

All ladders shall be equipped with a cage, a rigid notched rail, or other listed ladder safety device.

5.7.6 Inside Ladder.

5.7.6.1

The inside fixed ladder provided for passage between the roof hatch and tank bottom shall not be rigidly connected to the bottom plates.

5.7.6.2

A ladder shall extend from the top to the bottom of the inside of the large steel tank riser pipes and shall be secured to the shell plates by brackets that are spaced a maximum of 12 ft (3.7 m) apart.

5.7.6.2.1

The upper bracket shall be located at the top of the tank riser.

5.7.6.3

All ladders over 20 ft (6.1 m) high shall be equipped with a cage, a rigid notched rail, or other listed ladder safety device.

5.7.7 Ladder Bars and Rungs.

5.7.7.1

Ladder side bars shall be not less than 2 in. × ½ in. (51 mm × 12.7 mm) or 2 ½ in. × ⅜ in. (64 mm × 9.5 mm).

5.7.7.2

Side bars shall be spaced at least 16 in. (406 mm) apart. Rungs shall be of at least ¾ in. (19.1 mm) round or square steel and shall be spaced 12 in. (305 mm) on their centers.

5.7.7.3

The rungs shall be firmly welded to the side bars.

5.7.7.4

Ladders and connections shall be designed to support a concentrated load of 350 lb (159 kg).

5.7.8 Painting Inaccessible Parts.

5.7.8.1

Except for the underside of the floor on ground-supported flat-bottom tanks, faying surfaces of bolted connections that prohibit coatings, and contact surfaces of unsealed roof lap joints, parts that are inaccessible after fabrication, but that are subject to corrosion, shall be protected by paint before assembly.

5.7.8.1.1

This requirement shall not apply to the overlapping surfaces of single-welded lap joints above the high waterline.

5.7.9 Painting.

5.7.9.1

All interior surfaces of steel tanks that are exposed to water immersion or the vapor phase zone above the high water level shall be cleaned by near-white blasting in accordance with SSPC SP 10 and shall be primed in accordance with the requirements for "Inside Paint System No. 1" in AWWA D102.

5.7.9.2

All exterior surfaces and inside dry surfaces (pedestal tanks) shall be cleaned by commercial blasting in accordance with SSPC SP 6 and shall be coated in accordance with the requirements of AWWA D102.

5.7.9.3

The appropriate primers for other interior and exterior paint systems shall be permitted to be used, provided permission is first obtained from the authority having jurisdiction.

5.7.9.4

After construction, all weld seams, unprimed surfaces, or any areas where the primer (if preprimed) has been damaged shall be blast-cleaned and patch-primed with the coating system primer.

5.7.9.5

All finish coat painting for interior surfaces shall be in accordance with the requirements of AWWA D102.

5.7.9.5.1*

Wax coating systems shall not be permitted.

5.7.9.6

Finish coat painting for all exterior surfaces shall be in accordance with the requirements of AWWA D102.

5.7.10* Painting Application.

All painting shall be applied in accordance with the appropriate requirements of *SSPC Systems and Specifications Steel Structures Painting Manual*, Chapter 5.

5.7.11

The painting and priming systems described in 5.7.9 through 5.7.10 shall be lead free.

Additional Proposed Changes

File Name	Description	Approved
NFPA_22_Chapter_5.docx		

Statement of Problem and Substantiation for Public Input

Deleted requirements that are redundant to AWWA D-100 and referenced AWWA D-100 as the construction document. Items particular to fire water storage tanks remains in this chapter. Clarifies construction requirements for tanks in one document.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 12:47:46 EDT 2015

Chapter 5 Welded-Steel Gravity Tanks and Suction Tanks

5.1 General.

5.1.1 This chapter shall apply to the design, fabrication, and erection of welded-steel gravity water tanks, including pump suction tanks.

5.1.2 Capacity.

5.1.2.1 The capacity of the tank shall be the number of U.S. gallons (cubic meters) available above the outlet opening.

5.1.2.2 The net capacity between the outlet opening of the discharge pipe and the inlet of the overflow shall be equal to at least the rated capacity.

5.1.2.3 The net capacity for gravity tanks with large plate tank risers shall be the number of U.S. gallons (cubic meters) be- tween the inlet of the overflow and the designated low-water level line.

5.1.3 Standard Sizes.

5.1.3.1 The standard net capacity sizes of steel tanks shall be as follows:

(1) 5000 gal (18.93 m^3)
(2) 10,000 gal (37.85 m^3)
(3) 15,000 gal (56.78 m^3)
(4) 20,000 gal (75.70 m^3)
(5) 25,000 gal (94.63 m^3)
(6) 30,000 gal (113.55 m^3)
(7) 40,000 gal (151.40 m^3)
(8) 50,000 gal (189.25 m^3)
(9) 60,000 gal (227.10 m^3)
(10) 75,000 gal (283.88 m^3)
(11) 100,000 gal (378.50 m^3)
(12) 150,000 gal (567.75 m^3)
(13) 200,000 gal (757.00 m^3)
(14) 300,000 gal (1135.50 m^3)
(15) 500,000 gal (1892.50 m^3)

5.1.3.2 Tanks of other sizes shall be permitted.

5.1.4 Form. Steel tanks shall be permitted to be of any form desired, provided they conform to all requirements of this standard.

5.2 Materials.

~~**5.2.1 Plates, Shapes, and Tubular Columns.**~~

5.2.1 All tank materials, fabrication, construction and welding shall be in accordance with AWWA D-100.

5.2.2 All tank and tower foundations, steel tank towers, pipe connections and fittings, valve enclosures and frost protection, tank heating and acceptance test requirements shall be in accordance with this standard.

~~**Plates.** Plate materials shall be of open-hearth, electric furnace, or basic oxygen process steel that conforms to AWWA D100 and one of the following ASTM specifications:~~

~~(1) ASTM A 36/A 36M~~
~~(2) ASTM A 283/A 283M, Grades A, B, C, and D~~

~~**5.2.1.2** Where plates of thicknesses greater than 3/4 in. (19.1 mm) are used, ASTM A 283, Grade D, shall not be used. ASTM A 131, Grades A, B, and C; or ASTM A 516, Grades 55 and 60, shall be used as alternatives.~~

~~**5.2.1.3 Basis of Furnishing Plates.** Plates shall be furnished, based on weight, with permissible underrun and overrun in accordance with the tolerance table for plates ordered to weight~~

5.2.1.4 Shapes. Structural materials shall be open-hearth, electric furnace, or basic oxygen process steel that conforms to ASTM A 36, or ASTM A 131, Grades A, B, and D, or ASTM A992/A 992M.

5.2.1.5 Copper-bearing steel that contains approximately
0.20 percent copper shall be permitted to be used. In all other respects, steel shall conform to the specifications of 5.2.1.1,5.2.1.3, and 5.2.1.4.

5.2.2 Bolts, Anchor Bolts, and Rods.

5.2.2.1 Bolts and anchor bolts shall conform to AWWA D100.

5.2.2.2 ASTM A 36 shall be considered an acceptable alternative material for anchor bolts. Rods shall be open-hearth, electric furnace, or basic oxygen process steel that conforms to ASTM A 36.

5.2.3* Forgings.

5.2.3.1 Steel used for forgings shall be made only by the open-hearth process.

5.2.3.2 Forgings shall conform to the following ASTM specifications:

(1) ASTM A 105
(2) ASTM A 668 Class D (3) ASTM A 181, Class 70

5.2.4 Castings. Castings shall conform to ASTM A 27, Grade 60-30 full annealed.

5.2.5 Reinforcing Steel. Reinforcing steel shall comply with ASTM A 615, Grade 40 or Grade 60.

5.2.6 Filler Metal Electrodes.

5.2.6.1 Manual, shielded metal arc welding electrodes shall conform to the requirements of AWS A5.1.

5.2.6.2 Electrodes shall be of any E60XX or E70XX classification that is suitable for the electric current characteristics, the position of welding, and other conditions of intended use.

5.2.6.3 Electrodes for other welding processes shall be in accordance with applicable AWS specifications for filler metal.

5.3 Earthquake Load.

5.3.1 Tanks shall meet the requirements for resistance to earthquake damage in accordance with the earthquake design provisions of AWWA D100.

5.3.2 For seismic anchor-bolt loading, the following formula shall be used:

$$T = 4M_s - W'$$

specified in Sections 4.12 and 5.3, or any combination of them, shall not exceed the values in Table 5.4.

5.5 Design Details.

5.5.1 Minimum Thickness.

5.5.1.1 Except for cylindrical shell plates in contact with water in accordance with 5.5.1.6, the minimum thickness of any part of the structure shall be 3⁄16 in. (4.8 mm) for parts not in contact with water contents and 1⁄4 in. (6.4 mm) for parts in contact with water contents.

5.5.1.2 The controlling thickness of rolled shapes for the purposes of the foregoing stipulations shall be taken as the mean thickness of the flanges, regardless of web thickness.

5.5.1.3 The minimum thickness of tubular columns and struts shall be 1⁄4 in. (6.4 mm).

5.5.1.4 Round or square bars used for wind bracing shall have a minimum diameter or width of 3⁄4 in. (19.1 mm).

5.5.1.5 Bars of other shapes, if used, shall have a total area at least equal to a 3⁄4 in. (19.1 mm) round bar.

5.5.1.5.1 Roof plates for suction tanks with cone roofs shall be permitted to be 0.1792 in. (7 gauge) sheet.

5.5.1.6 Cylindrical shell plates in contact with water shall have minimum thicknesses as specified in accordance with Table 5.5.1.6.

5.5.2 Thickness for Corrosion.

5.5.2.1 If interior bracing is required to support the water content, 1⁄16 in. (1.6 mm) additional thickness shall be added to the calculated sections.

5.5.2.2 Except for hermetically sealed tubular sections, the sections shall be open to facilitate cleaning and painting.

5.5.2.2.1 Tubular sections used for columns on elevated legged tanks shall be hermetically sealed to prevent internal corrosion.

5.5.2.3 The plates of tanks that are to contain salt or alkaline water shall be 1⁄16 in. (1.6 mm) thicker than calculated.

5.5.3 Thickness of Tank Plates.

5.5.3.1 Tank plates shall be designed on the basis of the following maximum membrane tensile stresses, which shall be reduced for the joint efficiencies set forth in AWWA D100.

5.5.3.2* Plate surfaces that are susceptible to complete stress analysis shall be designed on the basis of a maximum membrane tensile stress of 15,000 psi (103.43 MPa).

5.5.3.3 Plate surfaces that are not susceptible to complete stress analysis shall also be designed on the basis of a maximum
membrane tensile stress of 15,000 psi (103.43 MPa) aftermaking reasonable allowances for such loads and stresses that cannot be accurately determined.

T_S = seismic bolt tension (lb)
M_S = seismic overturning moment (ft lb)
W' = weight of tank shell and portion of roof carried by shell (lb)
N = number of anchor bolts
D = tank diameter (ft)

5.4 Unit Stresses. The maximum stresses in pounds per square inch (megapascals) that are produced by the loads

5.5.3.3.1 The maximum membrane tensile stress shall in no case exceed 11,000 psi (75.85 MPa) when calculated, assuming that the concentrated reactions of supporting members are uniformly distributed between such reactions.

5.5.3.3.2 Therefore, the lowest cylindrical courses of tanks with suspended bottoms and the suspended bottoms them- selves shall be designed for a maximum membrane tensile stress of 11,000 psi (75.85 MPa), reduced for the joint efficiencies.

Table 5.4 Maximum Stresses

5.5.3.4 As an alternative to 5.5.3.1 and 5.5.3.2, tank shell plates for suction tanks shall be permitted to be designed on the basis of the stresses, material selection, and inspection set forth in Sec- tion 14 of AWWA D100, provided all requirements of Section 14 of the standard are met.

5.5.3.5 Where compressive stresses exist, the selected plate thickness shall comply with the allowable local buckling stresses in accordance with AWWA D100.

5.5.4 Thickness of Flat Bottoms.

5.5.4.1 The thickness of plates in flat bottoms shall be not less than those given in Table 5.5.4.1(a) and Table 5.5.4.1(b).

5.5.4.2 Any corrosion allowance specified shall be added to the value from the table.

5.5.5 Accessibility of Bottoms. Grillages shall be designed so that the tank bottom and beams are accessible for inspection and painting.

5.5.6 Net Sections. Net sections shall be used in calculating the tensile stress in plates and members.

5.5.7 Load Location.

5.5.7.1 When calculating the thickness of plates that are stressed by the weight or pressure of the tank contents, the pressure at the lower edge of each ring shall be assumed to act undiminished on the entire area of the ring.

5.5.8 Opening Reinforcement.

5.5.8.1 All openings of more than 4 in. (102 mm) in diameter that are located in the shell, suspended bottom, larger steel plate tank riser, or tubular support shall be reinforced.

5.5.8.2 The reinforcement shall be either the flange of a fit- ting, an additional ring of metal, excess plate metal above that actually required, or a combination of these methods.

5.5.8.3 The opening diameter shall be considered to be the maximum dimension of the hole cut in the plate perpendicular to the direction of maximum stress.

5.5.8.3.1 Excess plate metal used for joint efficiency shall not meet the requirements for opening reinforcement if the center of the opening is within one opening diameter of any plate seam or point of support attachment.

5.5.8.4 Welding shall be provided to transmit the full net strength of the reinforcing ring or flange to the plate.

5.5.8.4.1 In computing the net reinforcing area of a fitting, such as a boilermaker's flange or a manhole saddle that has a neck, the material in the neck shall be considered as part of the reinforcement for a distance, measured from the surface of the parent plate or from the surface of an intervening reinforcement plate, that is equal to four times the thickness of the material in the neck.

5.5.9 Roof Supports. The supports for tank roofs that do not contain water shall be designed in accordance with the steel construction specifications of the American Institute of Steel Construction.

5.5.9.1 Rafters that are in contact with a steel roof, have a slope of less than 2 in. in 12 in. (51 mm in 305 mm), and consist of beam or channel shapes less than 15 in. (381 mm) deep shall be considered to be adequately braced in the lateral position by friction between the roof plate and the top flange.

Table 5.5.4.1(a) Thickness of Bottom Plates for Flat-Bottom Tanks (in inches)

5.5.9.2 The maximum slenderness ratio, L/r, for columns that support the roof shall be 175. The spacing between rafters, as measured along the tank circumference, shall not exceed 2π ft (0.61π m).

5.5.10 Welded Joints. The types of joints used and their de- sign shall conform to AWWA D100.

5.6 Workmanship.

5.6.1 Plate Edges. The plate edges to be welded shall be uni- versal mill edges or shall be prepared by shearing, machining, chipping, or mechanically guided oxygen cutting. Where the edges of plates are oxygen cut, the surface obtained shall be uniform and smooth and shall be cleaned of slag accumula- tions before welding.

5.6.1.1 Edges of irregular contour shall be permitted to be prepared by manually guided oxygen cutting.

5.6.2 Rolling. For elevated tanks plates shall be cold-rolled to suit the curvature of the tank and the erection procedure in accordance with Table 5.6.2.

Table 5.6.2 Plate Dimensions

5.6.7.1.2 The sand pad, including pH range of the lime sand mix, sulfate content, and chloride content, shall meet the requirements of AWWA D100.

5.6.7.1.3 Where permitted by environmental authorities, an oiled sand cushion shall be permitted to be used. The sand shall be coated but shall not be running with excess oil.

5.6.7.2* Where the tank bottom is placed on oiled sand, the sand shall be saturated to a depth of 4 in. (102 mm) with a suitable petroleum-base oil.

5.6.8 Tanks shall meet the erection tolerance requirements of AWWA D100.

5.7 Accessories.

5.7.1 Connections. Connections shall be provided on the tank for the necessary pipes, braces, frost-casting, and walkway supports.

5.7.2 Roof Anchorage. Each roof plate shall be securely fas-tened to the top of the tank.

5.7.3 Roof Hatch.

5.7.3.1 An easily accessible roof hatch or roof door having a minimum

~~opening dimension of 24 in. (610 mm) shall be provided in the roof.~~

~~**5.7.3.2** The hatch cover shall be built of steel plate with a minimum thickness of 3⁄16 in. (4.8 mm).~~

~~**5.7.3.3** The hatch opening shall have a curb that is a mini- mum of 4 in. (102 mm) high, and the cover shall have a mini- mum downward overlap of 2 in. (51 mm).~~

~~**5.6.3 Double-Curved Plates.** Plates that are curved in two directions shall be pressed cold or hot or shall be dished with a mortar and pestle die by repeated applications.~~

~~**5.6.4 Milling Columns.** The ends of columns shall be milled to provide a satisfactory bearing unless the design provides sufficient welding to resist the total calculated loads.~~

~~**5.6.5 Fitting Roofs.**~~

~~**5.6.5.1** The roof shall fit tightly to the top of the shell to eliminate any gap between the roof and the shell.~~

~~**5.6.5.2** Where a spider is used, it shall not obstruct the flow of water into the overflow inlet.~~

5.3 ~~6.6~~ Preventing Ice Damage. During ~~the~~ construction, the contractor shall keep the tank, structure, and building roofs free of ice caused by leakage until the tank equipment is made watertight.

5.4 ~~6.7~~ Coating for Bottom Plates on Soil or Concrete.

5.4 ~~6.7~~.1* The underside of all bottom plates shall be protected against corrosion by one of the methods required by 5.6.7.1.1 through 5.6.7.1.3.

5.4~~6.7~~.1.1 Two coats of paint shall be applied after the bottom has been completely welded. When the underside of the tank bottom surface is painted and lime (optional) is added to the base material on the tank underside, the compatibility of the paint and the lime shall be checked with the paint supplier.

5.4~~6.7~~.1.2 The sand pad, including pH range of the lime sand mix, sulfate content, and chloride content, shall meet the re- quirements of AWWA D100.

5.4~~6.7~~.1.3 Where permitted by environmental authorities, an oiled sand cushion shall be permitted to be used. The sand shall be coated but shall not be running with excess oil.

5.4~~6.7~~.2* Where the tank bottom is placed on oiled sand, the sand shall be saturated to a depth of 4 in. (102 mm) with a suitable petroleum-base oil.

~~**5.6.8** Tanks shall meet the erection tolerance requirements of AWWA~~

~~D100.~~

~~**5.7 Accessories.**~~

~~**5.7.1 Connections.** Connections shall be provided on the tank for the necessary pipes, braces, frost-casting, and walkway supports.~~

~~**5.7.2 Roof Anchorage.** Each roof plate shall be securely fas- tened to the top of the tank.~~

~~**5.7.3 Roof Hatch.**~~

~~**5.7.3.1** An easily accessible roof hatch or roof door having a minimum opening dimension of 24 in. (610 mm) shall be provided in the roof.~~

~~**5.7.3.2** The hatch cover shall be built of steel plate with a minimum thickness of 3⁄16 in. (4.8 mm).~~

~~**5.7.3.3** The hatch opening shall have a curb that is a mini- mum of 4 in. (102 mm) high, and the cover shall have a mini- mum downward overlap of 2 in. (51 mm).~~

~~**5.7.3.4** A catch shall be provided to keep the cover closed.~~

~~**5.7.3.5** A second roof hatch shall be placed 180 degrees from the primary roof hatch.~~

~~**5.7.4 Ladders — General.**~~

~~**5.7.4.1** Outside and inside steel ladders that are arranged for convenient passage from one to the other and through the primary roof hatch shall be provided.~~

~~**5.7.4.2** Ladders shall not interfere with the opening of the hatch cover and shall not incline outward from the vertical at any point.~~

~~**5.7.4.3** For pedestal supported tanks, the ladder shall be placed inside an access tube that extends through the center of the tank.~~

~~**5.7.5 Outside Fixed Shell and Roof Ladder.**~~

~~**5.7.5.1** The outside tank ladder of suction tanks and multiple- column-supported gravity tanks shall be fixed a minimum of 7 in. (178 mm) between the tank side and the centerline of rungs and shall be rigidly bolted or welded to brackets that are spaced a maximum of 12 ft (3.7 m) apart and that are welded to the tank plates.~~

~~**5.7.5.2** The bottom bracket shall be located a maximum of 6 ft (1.8 m) above the base of the tank cylinder, and the ladder shall extend up the tank shell and radially along the roof, with the top bracket located within approximately 2 ft (0.61 m) of the roof hatch.~~

~~**5.7.5.3** There shall be a minimum 1 ft (0.3 m) clearance at the sides and front of the ladder at the balcony~~

~~**5.7.5.4** All ladders shall be equipped with a cage, a rigid notched rail, or other listed ladder safety device.~~

~~**5.7.6 Inside Ladder.**~~

~~**5.7.6.1** The inside fixed ladder provided for passage between the roof hatch and tank bottom shall not be rigidly connected to the bottom plates.~~

~~**5.7.6.2** A ladder shall extend from the top to the bottom of the inside of the large steel tank riser pipes and shall be se- cured to the shell plates by brackets that are spaced a maxi- mum of 12 ft (3.7 m) apart.~~

~~**5.7.6.2.1** The upper bracket shall be located at the top of the tank riser.~~

~~**5.7.6.3** All ladders over 20 ft (6.1 m) high shall be equipped with a cage, a rigid notched rail, or other listed ladder safety device.~~

~~**5.7.7 Ladder Bars and Rungs.**~~

~~**5.7.7.1** Ladder side bars shall be not less than 2 in. × 1⁄2 in. (51 mm × 12.7 mm) or 2 1⁄2 in. × 3⁄8 in. (64 mm × 9.5 mm).~~

~~**5.7.7.2** Side bars shall be spaced at least 16 in. (406 mm) apart. Rungs shall be of at least 3⁄4 in. (19.1 mm) round or square steel and shall be spaced 12 in. (305 mm) on their centers.~~

~~**5.7.7.3** The rungs shall be firmly welded to the side bars.~~

~~**5.7.7.4** Ladders and connections shall be designed to sup- port a concentrated load of 350 lb (159 kg).~~

5.5~~7.8~~ Painting Inaccessible Parts.

5.5~~7.8~~.1 Except for the underside of the floor on ground- supported flat-bottom tanks, faying surfaces of bolted connections that prohibit coatings, and contact surfaces of unsealed roof lap joints, parts that are inaccessible after fabrication, but that are subject to corrosion, shall be protected by paint be- fore assembly.

5.57.8.1.1 This requirement shall not apply to the overlapping surfaces of single-welded lap joints above the high waterline.

5.67.9 Painting.

5.67.9.1 All interior surfaces of steel tanks that are exposed to water immersion or the vapor phase zone above the high water level shall be cleaned by near-white blasting in accordance with SSPC SP 10 and shall be primed in accordance with the requirements for "Inside Paint System No. 1" in AWWA D102.

5.67.9.2 All exterior surfaces and inside dry surfaces (pedestal tanks) shall be cleaned by commercial blasting in accordance with SSPC SP 6 and shall be coated in accordance with the requirements of AWWA D102.

5.67.9.3 The appropriate primers for other interior and exterior paint systems shall be permitted to be used, provided permission is first obtained from the authority having jurisdiction.

5.67.9.4 After construction, all weld seams, unprimed surfaces, or any areas where the primer (if preprimed) has been damaged shall be blast-cleaned and patch-primed with the coating system primer.

5.67.9.5 All finish coat painting for interior surfaces shall be in accordance with the requirements of AWWA D102.

5.67.9.5.1* Wax coating systems shall not be permitted.

5.67.9.6 Finish coat painting for all exterior surfaces shall be in accordance with the requirements of AWWA D102.

5.7.10* Painting Application. All painting shall be applied in accordance with the appropriate requirements of *SSPC Systems and Specifications Steel Structures Painting Manual*, Chapter 5.

5.7.11 The painting and priming systems described in ~~5.7.9 through 5.7.10~~ this section shall be lead free.

Substantiation: Deleted requirements that are redundant to AWWA D-100 and referenced AWWA D-100 as the construction document. Items particular to fire water storage tanks remains in this chapter. Clarifies construction requirements for tanks in one document.

Public Input No. 7-NFPA 22-2015 [Chapter 6]

Chapter 6 Factory-Coated, Bolted Steel Tanks

6.1 General.

6.1.1*

This chapter shall apply to the design, fabrication, and erection of bolted steel water tanks, including pump suction tanks with factory-applied coatings.

6.1.2 Standard Capacity.

The standard capacity of bolted tanks varies with the number of panels added to the diameter and ranges from 4000 gal to approximately 500,000 gal (15.1 m^3 to approximately 1900 m^3) net capacity.

6.1.2.1

Tanks of other capacities shall be permitted.

6.1.3 Form.

6.1.3.1

Bolted tanks shall be cylindrical.

6.1.3.2

All joints, including vertical, horizontal, shell-to-roof, and shell-to-bottom plates or sheets, shall be field bolted.

6.1.3.3

Coatings shall be factory applied.

6.1.3.4

Bolt holes shall be shop-punched or drilled for field assembly.

6.1.3.5

Joints that are in contact with water and weather-tight joints shall be sealed.

6.2 Plate and Sheet Materials.

6.2.1

Plate and sheet materials shall be of open-hearth, electric furnace, or basic oxygen process steel that conforms to any of the following:

(1) ASTM A 36

(2) ASTM A 283, Grade C or Grade D

(3) ASTM A 1011

(4) ASTM A 572, Grade 42 or Grade 50

6.2.2

Plates and sheets shall be furnished on the basis of weight, with permissible underrun and overrun in accordance with the tolerance table for plates ordered to weight in ASTM A 6.

6.2.3 Structural Shapes.

6.2.3.1

Hot-rolled structural shapes shall conform to ASTM A 36 or ASTM A 992/A 992M.

6.2.3.2

Aluminum shapes shall be permitted to be used for portions of the tank that are not in contact with water and shall follow the design criteria in Appendix A of AWWA D103.

6.2.4 Tubular Columns.

6.2.4.1

Steel pipe shall be permitted to be used for tubular columns or other structural members, provided it complies with ASTM A 53, Type E or Type S, Grade B; ASTM A 139, Grade B; and API 5LC, Grade B; and provided the minimum wall thickness of any such material complies with the design requirements and the minimum thickness requirement of this standard.

6.2.4.2

The allowable underrun shall be subtracted from the nominal wall thickness when calculating the minimum pipe wall thickness.

6.2.4.3

Tubular sections shall not be flattened to form end connections.

6.2.5 Bolts, Anchor Bolts, and Nuts.

Bolts, anchor bolts, and nuts shall conform to AWWA D103 and Section 12.4.

6.2.6* Forgings.

Steel used for forging shall be made only by the open-hearth process. Forgings shall conform to the following ASTM specifications:

(1) ASTM A 105

(2) ASTM A 668

6.2.7 Filler Metal Electrodes.

6.2.7.1

Manual, shielded metal arc welding electrodes shall conform to the requirements of AWS A5.1.

6.2.7.2

Electrodes shall be of any E60XX or E70XX classification suitable for the electric current characteristics, the position of welding, and other conditions of intended use.

6.2.7.3

Electrodes for other welding processes shall be in accordance with applicable AWS specifications for filler metal.

6.2.8 Gasket.

6.2.8.1

Gasket material shall be of adequate tensile strength and resilience to obtain a leakproof seal at all seams and joints.

6.2.8.2

Gasket material shall be resistant to weather and ozone exposure and shall be in accordance with ASTM D 1171. Physical requirements shall conform to AWWA D103.

6.2.8.3

Gasket material shall be capable of resisting chlorination exposure in accordance with AWWA C652.

6.2.9 Sealant.

6.2.9.1

Sealants shall be supplied by the tank manufacturer. Sealants shall remain flexible over a temperature range of -40°F to 170°F (-40°C to 76.7°C).

6.2.9.2

Resistance to hardening and cracking shall be required. The sealant shall be solid with no plasticizers or extenders to cause shrinkage.

6.2.9.3

The sealant shall resist ozone and ultraviolet light and shall not swell or degrade under normal water storage conditions. In addition, the sealant shall be capable of resisting chlorination exposure in accordance with AWWA C652.

6.3 Earthquake Load.

6.3.1

Tanks shall meet requirements for resistance to earthquake damage in accordance with the earthquake design provisions of AWWA D103. For seismic anchor-bolt loading,

$$T_s = \frac{4M_s}{ND} - \frac{W'}{N}$$

where:

T_S = seismic bolt tension (lb)

M_S = seismic overturning moment (ft lb)

W' = weight of tank shell and portion of roof carried by shell (lb)

N = number of anchor bolts

D = tank diameter (ft)

6.3.2 Unit Stress of Shell Plates.

The maximum stresses in pounds per square inch (megapascals) that are produced by the design loads in Section 4.13 shall not exceed the requirements of AWWA D103.

6.4 Design Details.

6.4.1 Minimum Steel Thickness.

Steel plates or sheets shall meet the minimum design criteria in accordance with AWWA D103, as well as any additional requirements outlined in 6.4.1.1 through 6.4.1.4.

6.4.1.1

Roof sheets shall have a minimum thickness of 0.094 in. (2.4 mm).

6.4.1.1.1

Sheets on roofs having a slope of 1 in 2.75 or greater for which the tank diameter does not exceed 35 ft (10.7 m) shall be permitted to utilize a minimum thickness of 0.070 in. (1.8 mm), provided a suitable walkway is provided from the ladder to all appurtenances including, but not limited to, the roof hatch(es), roof vent(s), and controls for the water level and temperature.

6.4.1.2

Floor sheets shall have a minimum thickness of 0.105 in. (2.7 mm), provided the tank floor is supported on a granular base, on crushed stone, or on a concrete slab.

6.4.1.3

The minimum thickness of the first full height shell plate and starter ring (if applicable) shall be 0.1875 in. (4.8 mm).

6.4.1.3.1

This minimum thickness shall be permitted to be reduced, provided the design meets the following criteria:

(1) *Tension on the Net Section.* The tensile stress on the net section of a bolted connection shall not exceed the lesser of the values determined by the following formulas:

$$f_t = 0.5F_y\left(1.0 - 0.9r + \frac{3rd}{s}\right) \leq 0.5F_y$$

$$f_t = \frac{1}{3}F_u$$

where:

f_t = allowable tensile stress (psi)

F_y = published yield strength of the sheet material (psi)

r = force transmitted by the bolt or bolts at the section considered, divided by the tensile force in the member at that section; if r is less than 0.2, it can be taken equal to zero.

d = diameter of the bolt (in.)

s = spacing of the bolts perpendicular to the line of stress (in.)

F_u = ultimate strength of the sheet material (psi)

(2) *Shell Thickness.* The thickness of cylindrical shell plates stressed by the pressure of the tank contents shall be calculated by the following formula:

$$t = \frac{2.6\ HDSG}{f_t(S-d)}$$

where:

t = shell plate thickness (in.)

H = height of liquid from the top capacity line to the point of overflow to the bottom of the shell course being designed (ft)

D = tank diameter (ft)

S = bolt spacing in line perpendicular to line of stress (in.)

G = specific gravity of liquid (1.0 for water)

f_t = allowable tensile stress (psi)

d = bolt-hole diameter (in.)

6.4.1.4

The minimum thickness of the upper rings of shell plates shall be 0.105 in. (2.7 mm).

6.4.1.4.1

This minimum thickness shall be permitted to be reduced to no less than 0.094 in. (2.4 mm), provided that the design meets the criteria of 6.4.1.3.1.

6.5 Fabrication.

6.5.1

Parts shall be fabricated in accordance with AWWA D103 practices and tolerances.

6.5.2

Welding shall be limited to the shop installation of nozzles, vents, manway connections, and subassemblies. Field welding shall not be permitted.

6.5.3

Coatings shall be applied in accordance with AWWA D103.

6.5.4

All tank components shall be given a mark number for ease of assembly.

6.5.5*

All coated parts shall be protected from damage during shipment.

6.6 Erection.

6.6.1

Bolted tanks shall be erected in accordance with the manufacturers' drawings, instructions, and AWWA D103 procedures to facilitate inspection for leaks.

6.6.1.1

Bolted steel floor plates shall be positioned directly on a minimum 4 mil (102 μm) polyethylene base that is arranged to allow waterflow from the center of the tank to the perimeter of the tank.

6.6.1.2

The polyethylene sheets shall be placed over the sloped base and shall be lapped a minimum of 18 in. (457 mm) on top of one another (the higher sheet overlapping the adjacent sheet) to allow drainage from the underside of the tank.

6.6.1.3

Polyethylene sheeting shall not be required for tanks with concrete slabs that also serve as the tank floor, provided the provisions of Section 17.1 have been met.

6.6.2

The erector shall exercise care to properly install all parts of the tank including, but not limited to, gaskets and sealants.

6.6.3

Care in handling coated parts shall be exercised.

6.6.3.1

Any sections that experience damage to the factory-applied coatings shall be repaired or replaced in accordance with the manufacturers' instructions.

6.6.3.2

Damaged parts shall be replaced.

Additional Proposed Changes

File Name	Description	Approved
NFPA_22_Chapter_6.docx		

Statement of Problem and Substantiation for Public Input

Deleted requirements that are redundant to AWWA D-103 and referenced AWWA D-103 as the construction document. Items particular to fire water storage tanks remains in this chapter. Clarifies construction requirements for tanks in one document.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:

Submittal Date: Fri Jun 19 12:50:49 EDT 2015

Chapter 6 Factory-Coated, Bolted Steel Tanks

6.1 General.

6.1.1* This chapter shall apply to the design, fabrication, and erection of bolted steel water tanks, including pump suction tanks with factory-applied coatings.

6.1.2 Standard Capacity. The standard capacity of bolted tanks varies with the number of panels added to the diameter and ranges from 4000 gal to approximately 500,000 gal (15.1 m^3 to approximately 1900 m^3) net capacity.

6.1.2.1 Tanks of other capacities shall be permitted.

6.1.3 Form.

6.1.3.1 Bolted tanks shall be cylindrical.

6.1.3.2 All joints, including vertical, horizontal, shell-to-roof, and shell-to-bottom plates or sheets, shall be field bolted.

6.1.3.3 Coatings shall be factory applied.

6.1.3.4 Bolt holes shall be shop-punched or drilled for field assembly.

6.1.3.5 Joints that are in contact with water and weather-tight joints shall be sealed.

6.2 Materials, Fabrication and Installation. ~~Plate and Sheet Materials~~.

6.2.1 All design, materials, fabrication and installation shall be in accordance with AWWA D-103.

6.2.2 All tank and tower foundations, steel tank towers, pipe connections and fittings, valve enclosures and frost protection, tank heating and acceptance test requirements shall be in accordance with this standard.
~~Plate and sheet materials shall be of open-hearth, elec- tric furnace, or basic oxygen process steel that conforms to any of the following:~~

~~(1) ASTM A 36~~
~~(2) ASTM A 283, Grade C or Grade D (3) ASTM A 1011~~
~~(4) ASTM A 572, Grade 42 or Grade 50~~

6.2.2 Plates and sheets shall be furnished on the basis of weight, with permissible underrun and overrun in accordance with the tolerance table for plates ordered to weight in ASTM A 6.

6.2.3 Structural Shapes.

6.2.3.1 Hot-rolled structural shapes shall conform to ASTM A 36 or ASTM A 992/A 992M.

6.2.3.2 Aluminum shapes shall be permitted to be used for portions of the tank that are not in contact with water and shall follow the design criteria in Appendix A of AWWA D103.

6.2.4 Tubular Columns.

6.2.4.1 Steel pipe shall be permitted to be used for tubular col- umns or other structural members, provided it complies with ASTM A 53, Type E or Type S, Grade B; ASTM A 139, Grade B; and API 5LC, Grade B; and provided the minimum wall thick- ness of any such material complies with the design requirements and the minimum thickness requirement of this standard

6.2.4.2 The allowable underrun shall be subtracted from the nominal wall thickness when calculating the minimum pipe wall thickness.

6.2.4.3 Tubular sections shall not be flattened to form end connections.

6.2.5 Bolts, Anchor Bolts, and Nuts. Bolts, anchor bolts, and nuts shall conform to AWWA D103 and Section 12.4.

6.2.6* Forgings. Steel used for forging shall be made only by the open-hearth process. Forgings shall conform to the follow- ing ASTM specifications:

(1) ASTM A 105 (2) ASTM A 668

6.2.7 Filler Metal Electrodes.

6.2.7.1 Manual, shielded metal arc welding electrodes shall conform to the requirements of AWS A5.1.

6.2.7.2 Electrodes shall be of any E60XX or E70XX classifica- tion suitable for the electric current characteristics, the posi- tion of welding, and other conditions of intended use.

6.2.7.3 Electrodes for other welding processes shall be in ac- cordance with applicable AWS specifications for filler metal.

6.2.8 Gasket.

6.2.8.1 Gasket material shall be of adequate tensile strength and resilience to obtain a leakproof seal at all seams and joints.

6.2.8.2 Gasket material shall be resistant to weather and ozone exposure and shall be in accordance with ASTM D1171. Physical requirements shall conform to AWWA D103.

6.2.9 Sealant.

6.2.9.1 Sealants shall be supplied by the tank manufacturer. Sealants shall remain flexible over a temperature range -40°F to 170°F (-40°C to 76.7°C).

6.2.9.2 Resistance to hardening and cracking shall be re- quired. The sealant shall be solid with no plasticizers or ex- tenders to cause shrinkage.

6.2.9.3 The sealant shall resist ozone and ultraviolet light and shall not swell or degrade under normal water storage condi- tions. In addition, the sealant shall be capable of resisting chlorination exposure in accordance with AWWA C652.

6.3 Earthquake Load.

6.3.1 Tanks shall meet requirements for resistance to earth- quake damage in accordance with the earthquake design pro- visions of AWWA D103. For seismic anchor-bolt loading

6.3.2 Unit Stress of Shell Plates. The maximum stresses in pounds per square inch (megapascals) that are produced by the design loads in Section 4.13 shall not exceed the require- ments of AWWA D103.

6.4 Design Details.

6.4.1 Minimum Steel Thickness. Steel plates or sheets shall meet the minimum design criteria in accordance with AWWA D103, as well as any additional requirements outlined in 6.4.1.1 through 6.4.1.4.

6.4.1.1 Roof sheets shall have a minimum thickness of 0.094 in. (2.4 mm).

6.4.1.1.1 Sheets on roofs having a slope of 1 in 2.75 or greater for which the tank diameter does not exceed 35 ft (10.7 m) shall be permitted to utilize a minimum thickness of 0.070 in. (1.8 mm), provided a suitable walkway is provided from the ladder to all appurtenances including, but not limited to, the roof hatch(es), roof vent(s), and controls for the water level and temperature.

6.4.1.2 Floor sheets shall have a minimum thickness of 0.105 in. (2.7 mm), provided the tank floor is supported on a granular base, on crushed stone, or on a concrete slab.

6.4.1.3 The minimum thickness of the first full height shell plate and starter ring (if applicable) shall be 0.1875 in. (4.8 mm).

6.4.1.3.1 This minimum thickness shall be permitted to be reduced,

~~provided the design meets the following criteria:~~

> ~~(1) *Tension on the Net Section.* The tensile stress on the net sec- tion of a bolted connection shall not exceed the lesser of the values determined by the following formulas~~

~~**6.4.1.4** The minimum thickness of the upper rings of shell plates shall be 0.105 in. (2.7 mm).~~

~~**6.4.1.4.1** This minimum thickness shall be permitted to be reduced to no less than 0.094 in. (2.4 mm), provided that the design meets the criteria of 6.4.1.3.1.~~

~~**6.5 Fabrication.**~~

~~**6.5.1** Parts shall be fabricated in accordance with AWWA D103 practices and tolerances.~~

~~**6.5.2** Welding shall be limited to the shop installation of nozzles, vents, manway connections, and subassemblies. Field welding shall not be permitted.~~

~~**6.5.3** Coatings shall be applied in accordance with AWWA D103.~~

~~**6.5.4** All tank components shall be given a mark number for ease of assembly.~~

~~**6.5.5*** All coated parts shall be protected from damage during shipment.~~

~~**6.6 Erection.**~~

~~**6.6.1** Bolted tanks shall be erected in accordance with the manufacturers' drawings, instructions, and AWWA D103 pro- cedures to facilitate inspection for leaks.~~

~~**6.6.1.1** Bolted steel floor plates shall be positioned directly on a minimum 4 mil (102 µm) polyethylene base that is ar- ranged to allow waterflow from the center of the tank to the perimeter of the tank.~~

~~**6.6.1.2** The polyethylene sheets shall be placed over the sloped base and shall be lapped a minimum of 18 in. (457 mm) on top of one another (the higher sheet overlap- ping the adjacent sheet) to allow drainage from the underside of the tank.~~

~~**6.6.1.3** Polyethylene sheeting shall not be required for tanks with concrete slabs that also serve as the tank floor, provided the provisions of Section17.1 have been met.~~

~~**6.6.2** The erector shall exercise care to properly install all parts of the tank including, but not limited to, gaskets and sealants.~~

~~**6.6.3** Care in handling coated parts shall be exercised.~~

~~**6.6.3.1** Any sections that experience damage to the factory- applied coatings shall be repaired or replaced in accordance with the manufacturers' instructions.~~

~~**6.6.3.2** Damaged parts shall be replaced.~~

Substantiation: Deleted requirements that are redundant to AWWA D-103 and referenced AWWA D-103 as the construction document. Items particular to fire water storage tanks remains in this chapter. Clarifies construction requirements for tanks in one document.

Public Input No. 8-NFPA 22-2015 [Section No. 14.1.5]

14.1.5 Precautions During Repairs.

The authority having jurisdiction shall be notified well in advance when the tank is to be drained. The precautions required by 14.1.5.1 through 14.1.5.5 shall be observed.

14.1.5.1

Work shall be planned carefully to enable its completion in the shortest possible time.

14.1.5.2

Where available, a second, reasonably reliable water supply with constant suitable pressure and volume, usually public water, shall be connected to the system.

14.1.5.3

Where such a supply is not available, the fire pump shall be started and kept running to maintain suitable pressure in the system.

14.1.5.4

Additional portable fire extinguishers shall be placed in buildings where protection is impaired, and extra, well-instructed watch personnel shall be continuously on duty.

14.1.5.5

The members of the private fire brigade, as well as the public fire department, shall be familiar with conditions that affect repairs.

Additional Proposed Changes

File Name	Description	Approved
NFPA_22_Section_14.1.5.docx		

Statement of Problem and Substantiation for Public Input

Removes unenforceable language and references a formal impairment procedure for situations where a tank is impaired.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 12:53:29 EDT 2015

14.1.5 Precautions During Repairs. The authority having jurisdiction shall be notified well in advance when the tank is to be drained for repairs. ~~The precautions required by 14.1.5.1 through 14.1.5.5 shall be observed.~~

14.1.5.1 Whenever an in-service tank is drained for repairs, the impairment procedures in NFPA 25 shall be followed. ~~Work shall be planned carefully to enable its completion in the shortest possible time.~~

~~**14.1.5.2** Where available, a second, reasonably reliable water supply with constant suitable pressure and volume, usually public water, shall be connected to the system.~~

~~**14.1.5.3** Where such a supply is not available, the fire pump shall be started and kept running to maintain suitable pressure in the system.~~

~~**14.1.5.4** Additional portable fire extinguishers shall be placed in buildings where protection is impaired, and extra, well-instructed watch personnel shall be continuously on duty.~~

~~**14.1.5.5** The members of the private fire brigade, as well as the public fire department, shall be familiar with conditions that affect repairs.~~

Substantiation: Removes unenforceable language and references a formal impairment procedure for situations where a tank is impaired.

Public Input No. 9-NFPA 22-2015 [New Section after 14.1.7]

~~14.1.7* Connections for Use Other Than for Fire Protection.~~ **~~The authority having jurisdiction shall be consulted before the tank is designed where water for other than fire protection purposes is to be drawn from the tank.~~**

14.1.7* ~~3.8~~ Connections for Use Other Than for Fire Protection.

A.14.1.7 ~~8.1~~ **The use of an elevated tank, in part, for purposes other than fire protection, is not advised. Frequent circulation of the water results in an accumulation of sediment that can obstruct the piping of sprinklers, and a fluctuating water level hastens decaying of wood and corrosion of steel.**

14.1.7 ~~3.8~~.1 **Connections for ~~a~~ use other than fire protection shall not be made.**

14.1.7 ~~3.8~~.2 **Where acceptable to the authority having jurisdiction , ~~unavoidable~~ connections for other than fire protection shall be permitted.**

14.1.7* ~~8~~.2.1 **Pipe used for other than fire protection purposes shall be entirely separate from fire-service pipes and shall extend to an elevation inside the tank ~~below~~ above that required ~~which an adequate quantity of water is constantly available~~ for fire protection.**

A.14.1.7.2.1 **See Figure A.14.1.7.2.1.**

Figure A.14.1.7.2.1 Dual Purpose Tank

14.1.7.3 **Connections shall be rigidly made to the tank bottom, and a standard expansion joint, where needed, shall be provided in each such pipe that is located below, and entirely independent of, the tank.**

14.1.7.4 ~~8.2.3~~ **Pipe inside the tank shall be braced near the top and at points not over 25 ft (7.6 m) apart.**

14.1.7.5 ~~8.2.4~~* **Where an expansion joint exists, it shall be of the standard type, shall be located below the tank, and shall be without connection to the tank plates.**

14.1.7.6 8.3* At Roofs and Floors. **Where a pipe used for other than fire protection purposes intersects with a building roof or a water- proof or concrete floor, the intersection shall be watertight.**

TITLE OF NEW CONTENT

Type your content here ...

Additional Proposed Changes

File Name	Description	Approved
NFPA_22_Section_14.1.7.docx		

Statement of Problem and Substantiation for Public Input

Consolidates requirements for connections for use other than fire protection which were conflicting and removes unenforceable language.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:

City:
State:
Zip:
Submittal Date: Fri Jun 19 12:57:40 EDT 2015

14.1.7* ~~**Connections for Use Other Than for Fire Protection.** The authority having jurisdiction shall be consulted before the tank is designed where water for other than fire protection purposes is to be drawn from the tank.~~

14.1.7*~~3.8~~ Connections for Use Other Than for Fire Protection.

A.14.1.7 ~~**8.1**~~ The use of an elevated tank, in part, for purposes other than fire protection, is not advised. Frequent circulation of the water results in an accumulation of sediment that can obstruct the piping of sprinklers, and a fluctuating water level hastens decaying of wood and corrosion of steel.

14.1.7 ~~**3.8**~~**.1** Connections for ~~a~~ use other than fire protection shall not be made.

14.1.7 ~~**3.8**~~**.2** Where acceptable to the authority having jurisdiction, ~~unavoidable~~ connections for other than fire protection shall be permitted.

14.1.7* ~~**8**~~**.2.1** Pipe used for other than fire protection purposes shall be entirely separate from fire-service pipes and shall extend to an elevation inside the tank ~~below~~ above that required ~~which an adequate quantity of water is constantly available~~ for fire protection.

A.14.1.7.2.1 See Figure A.14.1.7.2.1.

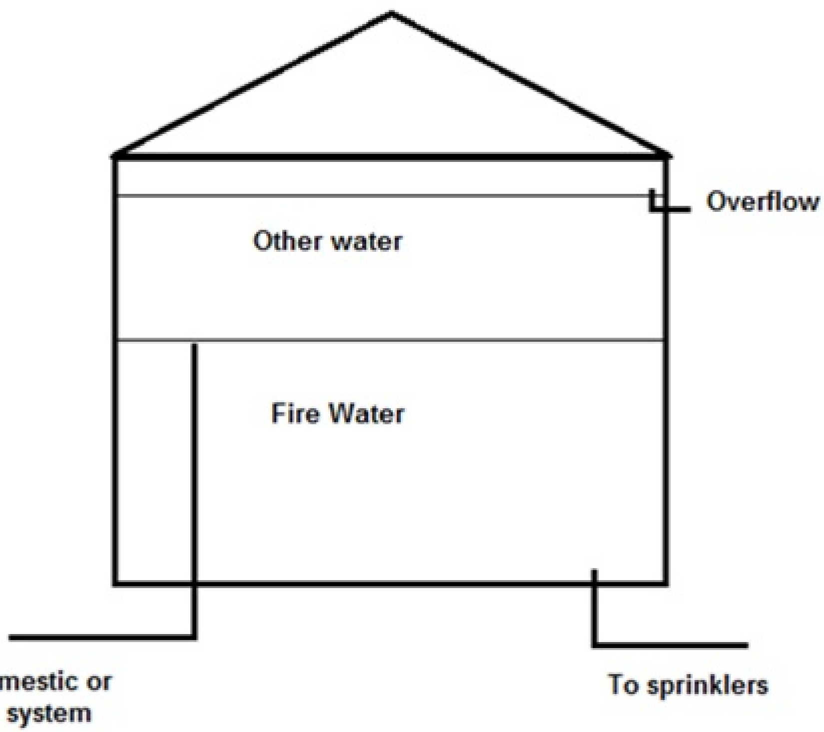

Figure A.14.1.7.2.1 Dual Purpose Tank

14.1.7.3 Connections shall be rigidly made to the tank bottom, and a standard expansion joint, where needed, shall be provided in each such pipe that is located below, and entirely independent of, the tank.

14.1.7.4 ~~8.2.3~~ Pipe inside the tank shall be braced near the top and at points not over 25 ft (7.6 m) apart.

14.1.7.5 ~~8.2.4~~* Where an expansion joint exists, it shall be of the standard type, shall be located below the tank, and shall be without connection to the tank plates.

14.1.7.6 8.3* At Roofs and Floors. Where a pipe used for other than fire protection purposes intersects with a building roof or a water- proof or concrete floor, the intersection shall be watertight.

Substantiation: Consolidates requirements for connections for use other than fire protection which were conflicting and removes unenforceable language.

Public Input No. 10-NFPA 22-2015 [Section No. 14.1.12]

14.1.12 Steel Pipe.

14.1.12.1

Steel pipe shall conform to ASTM A 53, Type E, Type F, Type S, Grade A, or Grade B, manufactured by the open-hearth, electric furnace, or basic oxygen process, or it shall conform to ASTM A 106, Grade A or Grade B.

14.1.12.2

Paragraphs 14.1.12.2.1 through 14.1.12.2.3 shall apply to steel pipe that is in contact with storage water.

14.1.12.2.1

Steel pipe smaller than 2 in. (50 mm) shall not be used.

14.1.12.2.2

Steel pipe of 2 in. to 5 in. (50 mm to 125 mm) ~~to 5 in. (125 mm)~~ _ shall be ~~extra-strong weight~~ schedule 80 .

14.1.12.2.3

All steel pipe 6 in. (150 mm) and larger shall be ~~standard weight~~ schedule 40 .

Statement of Problem and Substantiation for Public Input

Editorial

Submitter Information Verification

Submitter Full Name: DAVID HAGUE

Organization: LIBERTY MUTUAL INSURANCE

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 19 13:00:59 EDT 2015

Public Input No. 11-NFPA 22-2015 [Section No. 14.2.2]

14.2.2 Size.

14.2.2.1

The conditions at each plant shall determine the size of the discharge pipe that is needed.

14.2.2.2

The size shall not be less than 6 in. (150 mm) for tanks up to and including a 25,000 gal (94.63 m^3) capacity and shall not be less than 8 in. (200 mm) for capacities of 30,000 gal to 100,000 gal (113.55 m^3 to 378.50 m^3) inclusive, or 10 in. (250 mm) for greater capacities.

14.2.2.3

Pipe that is smaller than specified in 14.2.2.2 [not less than 6 in. (150 mm)] shall be permitted in some cases where conditions are favorable and large flows of water are not needed.

14.2.2.3.1

Larger pipe shall be required where deemed necessary because of the location and arrangement of piping, height of buildings, or other conditions.

14.2.2.3.2

In all cases, approval of the pipe sizes shall be obtained from the authority having jurisdiction.

Statement of Problem and Substantiation for Public Input

Editorial, not all water tanks are located at a plant and clarifies that Section 14.2.2.2 is referring to the discharge pipe.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:05:06 EDT 2015

Public Input No. 12-NFPA 22-2015 [New Section after 14.2.11]

TITLE OF NEW CONTENT

Type your content here ...

14.2.11.4* For suction tanks where the discharge pipe is not used as a fill connection, a check valve is not required.

A.14.2.11.4 See Section 14.4.1.1.

Statement of Problem and Substantiation for Public Input

For suction tanks, the fire pump discharge pipe always has a check valve installed. Another check valve serves no purpose in such an arrangement unless the discharge pipe serves as a fill connection.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:08:02 EDT 2015

Public Input No. 13-NFPA 22-2015 [Section No. 14.2.12]

14.2.12 Controlling Valves.

14.2.12.1

A listed gate valve shall be placed in the discharge pipe on ~~the yard~~ each side of the check valve and on the discharge side of the check valve, shall be located between the check valve and any connection of the tank discharge to other piping.

14.2.12.1.1

The listed gate valve shall be permitted to be equipped with an indicating post.

14.2.12.2

Where yard room for an indicator post is not available, a listed outside screw and yoke (OS&Y) gate valve that is of similar arrangement, but that is located inside the valve pit or room, shall be used.

14.2.12.3

~~A listed indicating control valve shall be placed in the discharge pipe on the tank side of the check valve.~~

~~14.2.12.3.1~~

Where the tank is on an independent tower, the valve shall be placed in the pit with the check valve, preferably on the yard side of the base elbow.

14.2.12. ~~3.2~~ 4

Where a tank is used as a suction source for a fire pump, the listed indicating control valve shall be of the OS&Y type.

14.2.12. ~~3.3~~ 5

Where the tank is located over a building, the valve shall be placed under the roof near the point where the discharge pipe enters the building.

14.2.12. ~~3.4~~ 6

For suction tanks, the valve shall ~~be as close to the tank as possible~~ not be located within 10 pipe diameters of the fire pump suction flange .

Statement of Problem and Substantiation for Public Input

Consolidates the location requirements for a gate valve in the discharge pipe and removes unenforceable language.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:09:47 EDT 2015

Public Input No. 14-NFPA 22-2015 [Section No. 14.3.2]

14.3.2 General Design.

14.3.2.1

The expansion joint design shall be selected such that ~~the joint operates reliably over years without attention and shall be of adequate strength to resist the~~ it resists the stresses and corrosion to which it is subjected.

14.3.2.2

One or both of the two parts that slide, one on the other, shall be of brass or other ~~noncorrodible~~ noncorrosive metal ~~of ample strength and resistance~~ to resist wear.

Statement of Problem and Substantiation for Public Input

clarifies intent and removes unenforceable language.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE

Organization: LIBERTY MUTUAL INSURANCE

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 19 13:16:46 EDT 2015

Public Input No. 15-NFPA 22-2015 [Section No. 14.3.4.2]

14.3.4.2

Provisions shall be made for a packing space ~~of adequate size~~ .

Statement of Problem and Substantiation for Public Input

removes unenforceable language

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:20:54 EDT 2015

Public Input No. 16-NFPA 22-2015 [Section No. 14.3.5]

14.3.5 Gland.

The adjustable gland shall be of brass or iron and shall be connected to the body casting, ~~preferably~~ with four standard bolts of at least ⅝ in. (15.9 mm) ~~and~~ diameter and of ~~sufficient~~ a length to allow full adjustment.

Statement of Problem and Substantiation for Public Input

removes unenforceable language

Submitter Information Verification

Submitter Full Name: DAVID HAGUE

Organization: LIBERTY MUTUAL INSURANCE

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 19 13:21:44 EDT 2015

Public Input No. 17-NFPA 22-2015 [Section No. 14.3.7]

14.3.7 Packing.

14.3.7.1

The packing shall consist ~~of asbestos wicking~~ of approved wicking material that is saturated with ~~rape~~ rapeseed oil and graphite or ~~an equally suitable~~ other approved material.

14.3.7.2

Packing at least 2 in. (51 mm) deep and ½ in. (12.7 mm) thick shall be provided in the packing space.

Statement of Problem and Substantiation for Public Input

Removes requirement for the installation of asbestos wicking material and removes unenforceable language.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:22:44 EDT 2015

Public Input No. 18-NFPA 22-2015 [Section No. 14.3.8]

Moved to section 14. ~~3.8 Connections for Use Other Than for Fire Protection. 14.3.8.~~

1

~~Connections for a use other than fire protection shall not be made.~~

~~14.3.8.2~~

~~Where unavoidable connections for other than fire protection shall be permitted, connections shall be rigidly made to the tank bottom, and a standard expansion joint, where needed, shall be provided in each such pipe that is located below, and entirely independent of, the tank.~~

.7

Statement of Problem and Substantiation for Public Input

Consolidated with Section 14.1.7. There is no need for multiple sections dealing with connections for use other than fire protection.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE

Organization: LIBERTY MUTUAL INSURANCE

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 19 13:25:15 EDT 2015

Public Input No. 40-NFPA 22-2015 [Section No. 14.5.1]

~~14.5.1 – Application.~~

~~Break tanks shall be used for one or more of the following reasons:~~

(1) ~~As a backflow prevention device between the city water supply and the fire pump suction~~

(2) ~~To eliminate pressure fluctuations in the city water supply and provide a steady suction pressure to the fire pump~~

(3) ~~To augment the city water supply when the volume of water available from the city is inadequate for the fire protection demand~~

Statement of Problem and Substantiation for Public Input

The purpose for the break tank does not belong in the requirements of NFPA 22. Many people want to use break tanks, but for purposes not mentioned here. For example, a building owner might not have the room for a full-size tank and a break tank might fit better. Another example is a situation where a change of use in the building requires more water, but an existing tank can be turned into a break tank rather than installation of a whole new tank.

Rather than create an exhaustive list, the committee should just move this into the annex for examples of why people use break tanks. See our related Public Input that puts this information in the annex.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 41-NFPA 22-2015 [New Section after A.14.2.13.2]	

Submitter Information Verification

Submitter Full Name: Kenneth Isman

Organization: University of Maryland

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jul 10 12:38:58 EDT 2015

Public Input No. 19-NFPA 22-2015 [Section No. 14.6.1]

14.6.1 Size.

The overflow pipe shall ~~be of adequate capacity for the operating conditions and shall be of not~~ have a capacity greater than the fill connection but not less than 3 in. (75 mm) throughout.

Statement of Problem and Substantiation for Public Input

Clarifies intent and removes unenforceable language.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:27:26 EDT 2015

Public Input No. 20-NFPA 22-2015 [Section No. 14.6.4.2.1]

14.6.4.2.1

Inside overflow pipes shall be braced ~~by substantial~~ with clamps to tank and tank riser plates at points not over 25 ft (7.6 m) apart.

Statement of Problem and Substantiation for Public Input

Clarifies intent and removes unenforceable language.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE

Organization: LIBERTY MUTUAL INSURANCE

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 19 13:29:37 EDT 2015

Public Input No. 21-NFPA 22-2015 [Section No. 14.7.4.1]

14.7.4.1

A drain pipe of at least 2 in. (50 mm) that is fitted with a controlling valve and a ½ in. (13 mm) drip valve shall be connected into the tank discharge pipe near its base and ~~, where possible,~~ on the tank side of all valves.

Statement of Problem and Substantiation for Public Input

Removes unenforceable language

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:30:54 EDT 2015

Public Input No. 22-NFPA 22-2015 [Section No. 14.7.4.5]

14.7.4.5 *

Where a circulation-tank heater is located near the base of the tank riser, the drain pipe shall ~~, if possible,~~ be connected from the cold-water return pipe between the cold-water valve and the heater in order to permit flushing water from the tank through the hot-water pipe heater and drain for clean-out purposes.

Statement of Problem and Substantiation for Public Input

removes unenforceable language

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:31:47 EDT 2015

Public Input No. 23-NFPA 22-2015 [Section No. 14.9.1]

14.9.1

Provisions shall be made for the installation of sensors in accordance with *NFPA 72* for two critical water temperatures ~~and~~ , two critical water levels and two critical air pressure readings (for pressure tanls only) .

Statement of Problem and Substantiation for Public Input

Clarifies intent

Submitter Information Verification

Submitter Full Name: DAVID HAGUE

Organization: LIBERTY MUTUAL INSURANCE

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 19 13:35:19 EDT 2015

Public Input No. 25-NFPA 22-2015 [New Section after 14.9.2]

TITLE OF NEW CONTENT

Type your content here ...from annex Section A.14.9.2:

~~A.~~ **14.9.2** Where supervision is required, supervision shall be provided as follows: ~~I~~ ~~t is not the intent of this standard to require the electronic supervision of tanks; however, where such supervision is required in accordance with~~ ~~*NFPA 72*~~ ~~, the following alarms should be required:~~

(1) Water temperature below 40°F (4.4°C)

(2) Return of water temperature to 40°F (4.4°C)

(3) Water level 3 in. (76.2 mm) (pressure tanks) or ~~5~~ 12 in. (300 ~~127~~ mm) (all other tanks) below normal

(4) Return of water level to normal

(5) Pressure in pressure tank 10 psi (0.48 kPa) below normal

(6) Pressure in pressure tank 10 psi (0.48 kPa) above normal

Statement of Problem and Substantiation for Public Input

clarifies intent

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:38:52 EDT 2015

Public Input No. 24-NFPA 22-2015 [Section No. 14.9.2]

delete entire seciton 14.9.2 ~~Pressure Tanks~~

.

~~In addition to the requirements of 14.9.1 , pressure tanks shall be provided with connections for the installation of high- and low-water pressure supervisory signals in accordance with *NFPA 72* .~~

Statement of Problem and Substantiation for Public Input

See new proposed section 14.9.2 for supervision requirements.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE

Organization: LIBERTY MUTUAL INSURANCE

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 19 13:36:36 EDT 2015

Public Input No. 26-NFPA 22-2015 [Sections 16.1.3, 16.1.4]

Sections 16.1.3, 16.1.4

16.1.3 *

The method of heating ~~that is used shall conform to 16.2.1 , 16.2.2 , or 16.2.3 , based~~ shall conform to this chapter and shall be based on the type of tank and its geographical location.

16.1.4 *

The method of heating ~~that is used~~ shall employ one of the heaters described in 16.3.1 through 16.3.~~7~~ 11 , and shall ~~have a capacity in kilowatts (British thermal units) per hour~~ be sized , in accordance with Figure 16.1.4 and Table 16.1.4(a) through ~~Table~~ 16.1.4(h)~~, as appropriate, for the determination of heater capacity~~ .

Figure 16.1.4 Isothermal Lines — Lowest One-Day Mean Temperature (°F).

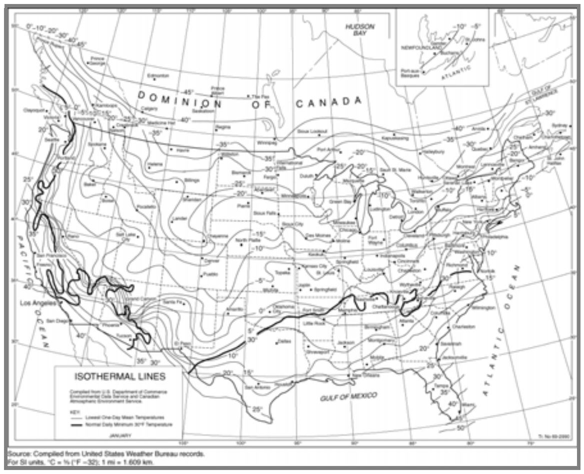

Table 16.1.4(a) Thousands of British Thermal Units Lost per Hour from Uninsulated Elevated Steel Tanks Based on Minimum Water Temperature of 42°F (5.6°C) and a Wind Velocity of 12 mph (19.3 km/hr)

Atmospheric Temperature (°F)	Heat (Btu/hr) Loss per Square Foot Tank Radiating Surface	Square Feet of Tank Surface*									Add Btu per Lineal Foot Uninsulated Steel Tank Riser	
		1210	1325	1550	1800	2370	2845	3705	4470	5240		
		Btu Lost per Hour (thousands)									3 ft diam	4 ft diam
35	32.3	40	43	51	59	77	92	120	145	168	50	69
30	46.1	56	62	72	83	110	132	171	207	242	144	192
25	61.5	75	82	96	111	146	175	228	275	323	255	340
20	77.2	94	103	120	139	183	220	287	346	405	380	506
15	93.6	114	125	146	169	222	267	347	419	491	519	692
10	110.9	135	147	172	200	263	316	411	496	582	670	893
5	128.9	156	171	200	233	306	367	478	577	676	820	1092
0	148.5	180	197	231	268	352	423	551	664	779	982	1309
-5	168.7	205	224	262	304	400	480	626	755	884	1152	1536
-10	190.7	231	253	296	344	452	543	707	853	1000	1329	1771
-15	213.2	258	283	331	384	506	607	790	954	1118	1515	2020
-20	236.8	287	314	368	427	562	674	878	1059	1241	1718	2291
-25	262.3	318	348	407	473	622	747	972	1173	1375	1926	2568
-30	288.1	349	382	447	519	683	820	1068	1288	1510	2145	2860
-35	316.0	383	419	490	569	749	900	1171	1413	1656	2381	3174
-40	344.0	417	456	534	620	816	979	1275	1538	1803	2620	3494
-50	405.6	491	538	629	731	962	1154	1503	1814	2126	3139	4186
-60	470.8	570	624	730	848	1116	1340	1745	2105	2467	3702	4936

Notes:

1. For SI units, 1 ft = 0.3048 m; 1 ft^2 = 0.0929 m^2; 1 Btu/hr = 0.293 W; 1 Btu/ft^2 = 11.356 kJ/m^2; °C = 5⁄9 (°F -32); 1000 gal = 3.785 m^3.

2. Heat loss for a given capacity with a different tank radiating surface from that shown in the table shall be obtained by multiplying the radiating surface by the tabulated heat loss per square foot for the atmospheric temperature involved. The minimum radiation surface area shall be the wetted tank steel surface area plus the top water surface area and the bottom water surface area. For tanks with large steel-plate tank risers, the heat loss from the tank riser shall be added to that from the tank. The tank riser heat loss per linear foot shall be as tabulated above.

3. See Table 16.1.4(b) for wood tanks and Table 16.1.4(c) for steel standpipes. To determine the capacity of heater needed, use the minimum mean atmospheric temperature for one day from Figure 16.1.4, and note the corresponding heat loss from the table.

*These values represent square feet of tank radiating surfaces used for each capacity to compute the heat loss values and are typical for tanks with D/4 ellipsoidal roofs and bottoms.

Table 16.1.4(b) Thousands of British Thermal Units Lost per Hour from Elevated Wood Tanks Based on Minimum Water Temperature of 42°F (5.6°C) and a Wind Velocity of 12 mph (19.3 km/hr)

Atmospheric Temperature (°F)	Tank Capacities (thousands of U.S. gallons)								
	10	15	20	25	30	40	50	75	100
35	8	10	11	13	14	19	21	28	33
30	11	14	16	19	21	27	31	40	49
25	15	20	21	25	28	36	42	54	65
20	19	25	27	32	35	46	54	69	83
15	24	31	34	39	44	57	66	85	102
10	28	36	40	46	51	68	78	100	121
5	33	43	47	54	60	78	92	117	142
0	38	49	53	62	69	90	106	135	164
-5	43	56	61	71	79	103	120	154	187
-10	49	63	69	80	89	116	136	174	211
-15	54	71	77	89	100	130	153	195	236
-20	61	79	86	99	111	145	169	217	262
-25	68	87	95	110	123	160	188	240	291
-30	74	96	104	121	135	176	206	264	319
-35	81	105	115	133	148	193	226	289	350
-40	88	114	125	144	162	210	246	317	382
-50	104	135	147	170	190	246	290	372	450
-60	122	157	171	197	222	266	307	407	490

Notes:

(1) For SI units, 1 Btu/hr = 0.293 W; °C = ⅝ (°F -32); 1000 gal = 3.785 m^3.

(2) See Table 16.1.4(a) for elevated steel tanks and Table 16.1.4(c) for steel standpipes. To determine the capacity of heater needed, use the minimum mean atmospheric temperature for one day from Figure 16.1.4, and note the corresponding heat loss from the table.

Table 16.1.4(c) Thousands of British Thermal Units Lost per Hour from Uninsulated Steel Suction Tanks and Standpipes Based on Minimum Water Temperature of 42°F (5.6°C) and a Wind Velocity of 12 mph (19.3 km/hr)

Atmospheric Temperature (°F)	Heat (Btu/hr) Loss per Square Foot Tank Radiating Surface	Square Feet of Tank Surface*									
		2610	3030	3505	4175	4795	5360	6375	7355	9650	11,740
		Btu Lost per Hour (thousands)									
35	32.3	85	98	114	135	155	175	206	238	312	380
30	46.1	121	140	162	193	222	248	294	340	445	542

Atmospheric Temperature (°F)	Heat (Btu/hr) Loss per Square Foot Tank Radiating Surface	Square Feet of Tank Surface*									
		2610	3030	3505	4175	4795	5360	6375	7355	9650	11,740
		Btu Lost per Hour (thousands)									
25	61.5	161	187	216	257	295	330	393	453	594	722
20	77.2	202	234	271	323	371	414	493	568	745	907
15	93.6	245	284	329	391	449	502	597	689	904	1099
10	110.9	290	337	389	463	532	595	707	816	1071	1302
5	128.9	337	391	452	539	619	691	822	949	1244	1514
0	148.5	388	450	521	620	713	796	947	1093	1434	1744
-5	168.7	441	512	592	705	809	905	1076	1241	1628	1981
-10	190.7	498	578	669	797	915	1023	1216	1403	1841	2239
-15	213.2	557	646	748	891	1023	1143	1360	1569	2058	2503
-20	236.8	619	718	830	989	1136	1270	1510	1742	2286	2781
-25	262.3	685	795	920	1096	1258	1406	1673	1930	2532	3080
-30	288.1	752	873	1010	1203	1382	1545	1837	2119	2781	3383
-35	316.0	825	958	1108	1320	1516	1694	2015	2325	3050	3710
-40	344.0	898	1043	1206	1437	1650	1844	2193	2531	3320	4039
-50	405.6	1059	1229	1422	1694	1945	2175	2586	2984	3915	4762
-60	470.8	1229	1427	1651	1966	2258	2524	3002	3463	4544	5528

Notes:

1. For SI units, 1 ft = 0.3048 m; 1 ft^2 = 0.0929 m^2; 1 Btu/hr = 0.293 W; 1 Btu/ft^2 = 11.356 kJ/m^2; °C = ⅝ (°F -32); 1000 gal = 3.785 m^3.

2. Heat loss for a given capacity with a different radiating surface from that shown in the table shall be obtained by multiplying the radiating surface by the tabulated heat loss per square feet for the atmospheric temperature involved. The minimum radiation surface area shall be the wetted surface exposed to atmosphere plus the top water surface area. No heat loss shall be calculated for tank bottoms resting on grade.

3. See Table 16.1.4(b) for wood tanks and Table 16.1.4(a) for elevated steel tanks. To determine the capacity of heater needed, use the minimum mean atmospheric temperature for one day from Figure 16.1.4, and note the corresponding heat loss from the table.

*These values represent square feet of radiating surface used for each capacity to compute the tabulated heat loss values and are typical for cone roof reservoirs on grade.

Table 16.1.4(d) Thousands of British Thermal Units Lost per Hour from Embankment-Supported Coated Fabric Suction Tanks Based on Minimum Water Temperature of 42°F (5.6°C) and a Wind Velocity of 12 mph (19.3 km/hr)

Atmospheric Temperature (°F)	Heat Loss per Square Foot Tank Radiating Surface (Btu/hr)	Tank Capacities (thousands of U.S. gallons)							
		100	200	300	400	500	600	800	1000
		Exposed Tank Surface (ft^3)							
		2746	4409	6037	7604	9139	10,630	13,572	16,435
		Btu Lost per Hour (thousands)							
35	22.2	61	98	134	168	202	235	300	363
30	28.5	78	126	173	217	261	304	389	470
25	35.1	96	155	212	266	320	372	476	576
20	41.5	114	183	251	315	379	441	564	682
15	48.0	132	212	290	364	438	510	652	789

Atmospheric Temperature (°F)	Heat Loss per Square Foot Tank Radiating Surface (Btu/hr)	Tank Capacities (thousands of U.S. gallons)							
		100	200	300	400	500	600	800	1000
		Exposed Tank Surface (ft^3)							
		2746	4409	6037	7604	9139	10,630	13,572	16,435
		Btu Lost per Hour (thousands)							
10	54.5	149	241	329	413	497	579	740	896
5	61.0	167	269	369	463	557	648	828	1003
0	67.5	185	298	408	512	616	717	916	1109
-5	73.9	203	326	447	561	675	786	1004	1216
-10	80.4	220	355	486	610	734	855	1092	1322
-15	86.8	238	384	525	659	793	924	1180	1429
-20	93.3	256	412	564	708	852	992	1268	1536
-25	99.9	273	441	604	758	912	1061	1356	1642
-30	106.2	291	469	643	807	971	1130	1444	1749
-40	119.3	327	526	721	905	1089	1268	1620	1962
-50	131.9	362	584	799	1003	1207	1406	1796	2175
-60	145.1	397	641	878	1102	1326	1544	1972	2389

Notes:

1. For SI units, 1 ft = 0.3048 m; 1 ft^2 = 0.0929 m^2; 1 Btu/hr = 0.293 W; 1 Btu/ft^2 = 11.356 kJ/m^2; °C = ⁵⁄₉ (°F -32); 1000 gal = 3.785 m^3.

2. Heat loss for a given capacity with a different radiating surface from that shown in the table shall be obtained by multiplying the radiating surface by the tabulated heat loss per square feet for the atmospheric temperature involved. The minimum radiation surface area shall be the wetted surface exposed to atmosphere plus the top water surface area. No heat loss shall be calculated for tank bottoms resting on grade.

3. To determine the capacity of heater needed, use the minimum mean atmospheric temperature for one day from Figure 16.1.4, and note the corresponding heat loss from the table.

Table 16.1.4(e) Heat Loss from Insulated Steel Gravity Tanks (English Units) (thousands of British thermal units lost per hour when the temperature of the coldest water is 42°F; mean water temperature is 54°F)

Atmospheric Temperature (°F)	Heat Loss per Square Foot Tank Surface (Btu/hr)	Tank Capacity (thousands of U.S. gallons)							Add Btu per Lineal Foot Uninsulated Steel Tank Riser	
		50 (1800)*	75 (2370)	100 (2845)	150 (3705)	200 (4470)	250 (5240)	300 (5905)	3 ft diam	4 ft diam
15	3.90	7.02	9.24	11.10	14.45	17.43	20.4	23.0	36.8	49.0
10	4.40	7.92	10.43	12.52	16.30	19.67	23.1	26.0	41.5	55.3
5	4.90	8.82	11.61	13.94	18.15	21.9	25.7	28.9	40.2	61.6
0	5.40	9.72	12.79	15.36	20.0	24.1	28.3	31.9	50.9	67.9
-5	5.90	10.62	13.98	16.79	21.9	23.4	30.9	34.8	55.6	74.1
-10	6.40	11.52	15.17	18.21	23.1	28.6	33.5	37.8	60.3	80.4
-15	6.90	12.42	16.35	19.36	25.6	30.8	36.2	40.1	65.0	86.7
-20	7.40	13.32	17.54	21.1	27.4	33.1	38.8	43.1	69.7	93.0
-25	7.90	14.22	18.72	22.5	29.3	35.3	41.4	46.6	74.5	99.3
-30	8.40	15.12	19.91	23.9	31.1	37.5	44.0	49.6	79.2	105.6

Atmospheric Temperature (°F)	Heat Loss per Square Foot Tank Surface (Btu/hr)	Tank Capacity (thousands of U.S. gallons)							Add Btu per Lineal Foot Uninsulated Steel Tank Riser	
		50 (1800)*	75 (2370)	100 (2845)	150 (3705)	200 (4470)	250 (5240)	300 (5905)	3 ft diam	4 ft diam
-35	8.90	16.02	21.1	25.3	33.0	39.8	46.6	52.6	83.9	111.8
-40	9.40	16.92	22.3	26.7	34.8	42.0	49.3	55.5	88.6	118.1
-50	10.40	18.72	24.6	28.6	38.5	46.5	54.5	61.4	98.0	130.7

Note: Insulation of the tanks is based on an *R* factor of 10 hr-ft^2 -°F/Btu.

*Values in parentheses represent square feet of tank surface used for each capacity to compute the tabulated heat loss values and are typical for tanks with D/4 ellipsoidal roofs and bottoms.

Table 16.1.4(f) Heat Loss from Insulated Steel Gravity Tanks (Metric Units) (kilowatts lost when the temperature of the coldest water is 5.6°C; mean water temperature is 12.2°C)

Atmospheric Temperature (°C)	Heat Loss Tank Surface per Square Meter (W)	Tank Capacity (m^3)							Add W/Lineal Meter Uninsulated Steel Tank Riser	
		189 (167)*	284 (220)	379 (264)	568 (344)	757 (415)	946 (437)	1136 (549)	0.9 m diam	1.2 m diam
-10	12.61	2.11	2.77	3.33	4.34	5.23	6.14	6.92	36.1	47.6
-12	13.75	2.30	3.03	3.63	4.73	5.71	6.70	7.55	39.3	51.8
-15	15.45	2.58	3.40	4.08	5.32	6.41	7.53	8.48	44.2	58.3
-18	17.16	2.87	3.77	4.53	5.90	7.12	8.36	9.42	49.1	64.7
-21	18.86	3.15	4.15	4.98	6.49	7.83	9.19	10.36	53.9	71.1
-23	20.00	3.34	4.40	5.28	6.88	8.30	9.74	10.98	57.2	75.4
-26	21.70	3.62	4.77	5.73	7.47	9.01	10.57	11.92	62.1	81.8
-29	23.41	3.91	5.15	6.18	8.05	9.71	11.40	12.85	66.9	88.3
-32	25.11	4.19	5.52	6.63	8.64	10.42	12.23	13.79	71.8	94.7
-34	26.25	4.38	5.78	6.93	9.03	10.89	12.78	14.41	75.0	99.0
-37	27.95	4.67	6.15	7.38	9.62	11.60	13.61	15.35	79.9	105.4
-40	29.66	4.95	6.52	7.83	10.20	12.31	14.44	16.26	84.8	111.8
-45	32.50	5.43	7.15	8.58	11.18	13.49	15.83	17.84	92.9	122.5

Note: Insulation of tanks is based on an *R* factor of 1.76 m -°C/W.

*Values in parentheses represent square meters of tank surface used for each capacity to compute the tabulated heat loss values and are typical for tanks with D/4 ellipsoidal roofs and bottoms.

Table 16.1.4(g) Heat Loss from Suction Tanks, Walls and Roof Insulated (English Units) (thousands of British thermal units lost per hour when the temperature of the coldest water is 42°F; mean water temperature is 54°F)

Atmospheric Temperature (°F)	Heat Loss per Square Foot Tank Surface (Btu/hr)	Tank Capacity (thousands of U.S. gallons)								
		100 (2610)*	150 (3505)	200 (4175)	250 (4795)	300 (5360)	400 (6375)	500 (7355)	750 (9650)	1000 (11740)
15	3.90	10.2	13.7	16.3	18.7	20.9	24.9	23.7	37.6	45.8
10	4.40	11.5	15.4	18.4	21.1	23.6	28.1	32.4	42.5	51.7

Atmospheric Temperature (°F)	Heat Loss per Square Foot Tank Surface (Btu/hr)	Tank Capacity (thousands of U.S. gallons)								
		100 (2610)*	150 (3505)	200 (4175)	250 (4795)	300 (5360)	400 (6375)	500 (7355)	750 (9650)	1000 (11740)
5	4.90	12.8	17.2	20.5	23.5	26.3	31.2	36.0	47.3	57.5
0	5.40	14.1	18.9	22.5	25.9	28.9	34.4	39.7	52.1	63.4
-5	5.90	15.4	20.7	24.6	28.3	31.6	37.6	43.4	56.9	69.3
-10	6.40	16.7	22.4	26.7	30.7	34.3	40.8	47.1	61.8	75.1
-15	6.90	18.0	24.2	28.8	33.1	37.0	44.0	50.7	66.6	81.0
-20	7.40	19.3	25.9	30.9	35.5	39.7	47.2	54.4	71.4	86.9
-25	7.90	20.6	27.7	33.0	37.9	42.3	50.4	58.1	76.2	92.7
-30	8.40	21.9	29.4	35.1	40.3	45.0	53.6	61.8	81.1	93.6
-35	8.90	23.2	31.2	37.2	42.7	47.7	56.7	65.5	85.9	104.5
-40	9.40	24.5	32.9	39.2	45.1	50.4	59.9	69.1	90.7	110.4
-50	10.40	27.1	36.5	43.4	49.9	55.7	66.3	76.5	100.4	122.1

Note: Insulation of tanks is based on an *R* factor of 10 hr-ft^2 -°F/Btu.

*Heat admitted to tank water from the ground not included; values in parentheses represent square feet of surface used for each capacity to compute the tabulated heat loss values.

Table 16.1.4(h) Heat Loss from Suction Tanks, Walls and Roof Insulated (Metric Units) (kilowatts lost when the temperature of the coldest water is 5.6°C; mean water temperature is 12.2°C)

Atmospheric Temperature (°C)	Heat Loss per Square Meter Tank Surface (W)	Tank Capacity (m^3)								
		379 (243)*	568 (326)	757 (388)	946 (445)	1136 (498)	1514 (592)	1893 (683)	2839 (897)	3785 (1091)
-10	12.61	3.06	4.11	4.89	5.61	6.28	7.47	8.61	11.31	13.76
-12	13.75	3.34	4.48	5.34	6.12	6.85	8.14	9.39	12.33	15.00
-15	15.45	3.75	5.04	5.99	6.88	7.69	9.15	10.55	13.86	16.86
-18	17.16	4.17	5.59	6.66	7.64	8.55	10.16	11.72	15.39	18.72
-21	18.86	4.58	6.15	7.32	8.39	9.39	11.17	12.88	16.92	20.60
-23	20.00	4.86	6.52	7.76	8.90	9.96	11.84	13.66	17.94	21.80
-26	21.70	5.27	7.07	8.42	9.66	10.81	12.85	14.82	19.46	23.70
-29	23.41	5.69	7.63	9.08	10.42	11.66	13.86	15.99	21.00	25.50
-32	25.11	6.10	8.19	9.74	11.17	12.50	14.87	17.15	22.50	27.40
-34	26.25	6.38	8.56	10.18	11.68	13.07	15.54	17.93	23.50	28.60
-37	27.95	6.79	9.11	10.84	12.44	13.92	16.55	19.09	25.10	30.50
-40	29.66	7.21	9.67	11.51	13.20	14.77	17.56	20.30	26.60	32.40
-45	32.50	7.90	10.60	12.61	14.46	16.18	19.24	22.20	29.20	35.50

Note: Insulation of tanks is based on an *R* factor of 1.76 m -°C/W.

*Heat admitted to tank water from the ground not included; values in parentheses represent square feet of surface used for each capacity to compute the tabulated heat loss values.

The *R* value of insulation is determined by its thickness and insulating qualities. An *R* factor of 10 or more is obtained by applying 1 ½ in. (38 mm) of polyurethane foam, 2 ½ in. (64 mm) of glass fiberboard, or 4 in. (100 mm) of cellular glass board.

For other *R* values, Heat loss = Tabulated value × (10)/*R* or Heat loss metric = Tabulated value × (176)/*R*.

16.1.4.1

The heater shall be plainly marked with a plate or cast lettering that indicates the kilowatt (British thermal unit) per hour input, type of heater, and the manufacturer's name.

16.1.4.2

The allowable working pressure of the heater shall not be less than the maximum filling pressure sustained when the tank is being filled.

Statement of Problem and Substantiation for Public Input

Clarifies intent and removes unenforceable language.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE

Organization: LIBERTY MUTUAL INSURANCE

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 19 13:44:18 EDT 2015

Public Input No. 27-NFPA 22-2015 [Section No. 16.2]

16.2 * Heating Requirements.

16.2.1 *

If tanks are located where the lowest mean temperature for one day is less than 5°F (-15°C), as shown in Figure 16.1.4 , a gravity circulation method of heating elevated tanks, or water storage tanks that are installed on or below grade, shall be employed for special situations, as covered in 16.2.1.1 or 16.2.1.2 .

16.2.1.1

A steam-heated vertical radiator system shall be used for elevated tanks with unprotected tank risers of 3 ft (0.91 m) or more in diameter that have tower heights under 100 ft (30.5 m) *(see 13.1.2)* , standpipes, and on-grade suction tanks.

16.2.1.2

A steam-heated vertical radiator system also shall be used for tower heights over 100 ft (30.5 m).

16.2.1.2.1

An open-ended pipe sleeve similar to that shown in Figure B.1(u) shall be used.

16.2.1.3

Immersed steam coils shall be used for suction tanks and standpipes that have flat bottoms supported near ground level in situations where the tank is kept filled so that the steam coils are continuously submerged.

16.2.2

Where the lowest mean temperature for one day is 5°F (-15°C) or above, as shown in Figure 16.1.4 , and only intermittent heating is required for elevated tanks with unprotected tank risers of less than 3 ft (0.91 m) in diameter, heating shall be by means of water circulation or immersed steam coils, or by blowing steam from a supply that is directed into the water.

16.2.2.1

Suction tanks, standpipes, and elevated tanks that have tank risers of 3 ft (0.91 m) or more in diameter shall not be required to have provision for heat.

16.2.3

Where the lowest mean temperature for one day is above 15°F (-9.4°C), as shown in Figure 16.1.4 , the method of heating tanks with frostproof tank risers of less than 3 ft (0.91 m) in diameter shall be a steam loop or steam radiator, or thermostatically controlled electric strip heaters shall be placed inside the frostproof casing.

Tanks shall be provided with heating systems in accordance with Table 16.2(a), (b) & (c).

Insert new Table here

Table 16.2(a) Heating Systems for Tanks Located Where the LMT <5°F

	Gravity Circulating Method	Steam Heated Vertical Radiator	Immersed S
Elevated Tanks	X		
Tanks on Grade	X		
Tanks Below Grade	X		
Elevated Tanks (unprotected riser)		X	
Standpipe		X	X
On Grade Suction Tank		X	X
Embankment-Supported Coated Fabric Suction Tank			

Table 16.2(b) Heating Systems for Tanks Located Where the LMT >/= 5°F

	Gravity Circulating Method	Steam Heated Vertical Radiator	Immersed S
Elevated Tanks w/ unprotected risers <3ft in diameter	X		X
Elevated Tanks with risers >3ft. In diameter	No requirements for heating	No requirements for heating	No requirem
Standpipes	No requirements for heating	No requirements for heating	No requirem
Suction tanks	No requirements for heating	No requirements for heating	No requirem

Table 16.2(c) Heating Systems for Tanks Located where the LMT >15°F

	Steam Loop	Steam radiator	Electric Str

Tanks w/ Frostproof Tank Risers <3ft in diameter	X	X	X

Statement of Problem and Substantiation for Public Input

Heating requirements for tanks have been placed in a table format for clarification.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:47:59 EDT 2015

Public Input No. 28-NFPA 22-2015 [Section No. 16.3.1.5]

16.3.1.5

Such heaters shall be ~~well~~ insulated, unless ~~it is desired to use~~ the heat loss is used for heating the valve pit or other housing.

Statement of Problem and Substantiation for Public Input

Clarifies intent and removes unenforceable language

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:51:47 EDT 2015

Public Input No. 29-NFPA 22-2015 [Section No. 16.3.1.7.5]

16.3.1.7.5

A ¾ in. (~~19 mm~~ 20 mm) nominal pipe or larger bypass with a globe valve that is normally kept shut shall be provided around the trap.

Statement of Problem and Substantiation for Public Input

Used "soft" metric converation. editorial.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:53:19 EDT 2015

Public Input No. 30-NFPA 22-2015 [Sections 16.3.2.1, 16.3.2.2]

Sections 16.3.2.1, 16.3.2.2

16.3.2.1

A gas-fired water heater ~~of sufficient strength to resist the~~ rated for the system water pressure shall be permitted to be used.

16.3.2.2

The heater shall be ~~of a type~~ listed ~~by a recognized testing laboratory~~ and shall have a permanent marking that indicates the input ratings in British thermal units (kilowatts).

Statement of Problem and Substantiation for Public Input

clarifies intent and removes unenforceable language

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:54:31 EDT 2015

Public Input No. 31-NFPA 22-2015 [Sections 16.3.3.1, 16.3.3.2]

Sections 16.3.3.1, 16.3.3.2

16.3.3.1

An oil-fired water heater of sufficient strength to resist the water pressure shall be permitted to be used.

16.3.3.2

The heater shall be of a type that is listed by a recognized testing laboratory and shall have a permanent marking that indicates the input rating in British thermal units (kilowatts).

Statement of Problem and Substantiation for Public Input

Clarifies intent and removes unenforceable language.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 13:58:58 EDT 2015

Public Input No. 32-NFPA 22-2015 [Section No. 16.3.4.1]

16.3.4.1

A coal-burning water heater ~~of sufficient strength to resist the~~ rated for the system water pressure shall be used.

Statement of Problem and Substantiation for Public Input

removes unenforceable language.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE

Organization: LIBERTY MUTUAL INSURANCE

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 19 14:01:29 EDT 2015

Public Input No. 33-NFPA 22-2015 [Section No. 16.3.5.1]

16.3.5.1

An electric water heater ~~of sufficient strength to resist the~~ rated for the system water pressure shall be permitted to be used.

Statement of Problem and Substantiation for Public Input

Removes unenforceable language.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 14:02:39 EDT 2015

Public Input No. 34-NFPA 22-2015 [New Section after 16.3.10.2]

TITLE OF NEW CONTENT

Type your content here ...

Statement of Problem and Substantiation for Public Input

. Immersion heaters have been used in industry for some time with good results when properly monitored and supervised. Section 14.9 provides guidance on the proper supervision of all heating systems paving the way for the use of immersion heaters. Immersion heaters due to their size and capacity will be limited to smaller tanks only since for very large tanks their physical size and subsequent cost will become a limiting factor.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE

Organization: LIBERTY MUTUAL INSURANCE

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 19 14:08:47 EDT 2015

Public Input No. 37-NFPA 22-2015 [Sections 16.5.3, 16.5.4, 16.5.5, 16.5.6, 16.5.7]

Sections 16.5.3, 16.5.4, 16.5.5, 16.5.6, 16.5.7

16.5.3

A fitting for the water-recirculation line shall be located in the bottom of the tank diagonally opposite from the concrete sump that contains the inlet/outlet for the tank. *[See Figure B.1(g) for a typical installation.]*

16.5.4

The heater shall have a British thermal unit (kilowatt) per hour capacity in accordance with Figure 16.1.4 and Table 16.1.4(d) for determination of heater capacity.

16.5.5

When the ambient air temperature drops below 42°F (5.6°C), a thermostat shall activate a pump that draws water from the tank through the inlet/discharge and pumps the water back into the tank through the recirculation fitting.

16.5.6

When the temperature of the water flowing through the inlet/discharge line in the pump house drops below 44°F (6.7°C), a second thermostat shall activate a heat exchanger/heater.

16.5.7

The heat exchanger/heater shall be located in a valve pit. *[See Figure B.1(g) for a typical installation.]*

Statement of Problem and Substantiation for Public Input

removes unenforceable language.

Submitter Information Verification

Submitter Full Name: DAVID HAGUE
Organization: LIBERTY MUTUAL INSURANCE
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 19 14:15:08 EDT 2015

Public Input No. 41-NFPA 22-2015 [New Section after A.14.2.13.2]

A.14.5 **Break tanks have been known to be used for one or more of the following reasons:**

(1) As a backflow prevention device between the city water supply and the fire pump suction

(2) To eliminate pressure fluctuations in the city water supply and provide a steady suction pressure to the fire pump

(3) To augment the city water supply when the volume of water available from the city is inadequate for the fire protection demand

(4) To serve in situations where the building owner does not have room for a tank to meet the full demand of the fire protection system

Statement of Problem and Substantiation for Public Input

This information comes from existing text 14.5.1, but is better located in the annex than the body of the standard. It has been altered to fit better in the annex and to add another typical example of why break tanks are used. See my Public Input to delete section 14.5.1 for more information.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 40-NFPA 22-2015 [Section No. 14.5.1]	

Submitter Information Verification

Submitter Full Name: Kenneth Isman
Organization: University of Maryland
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jul 10 12:46:35 EDT 2015

Public Input No. 2-NFPA 22-2015 [Chapter C]

Annex C Informational References

C.1 Referenced Publications.

The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

C.1.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2013 edition.

NFPA 72 ®, *National Fire Alarm and Signaling Code*, 2013 edition.

NFPA 1144, *Standard for Reducing Structure Ignition Hazards from Wildland Fire*, 2013 edition.

C.1.2 Other Publications.

C.1.2.1 ASME Publications.

~~American Society of Mechanical Engineers, Three~~ **ASME International** , **Two** Park Avenue, New York, NY 10016-5990.

ASME *Boiler and Pressure Vessel Code*, ~~1998~~ **2015** .

C.1.2.2 AWWA Publications.

American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235.

AWWA D100, *Welded Steel Tanks for Water Storage*, ~~1996~~ **2011** .

AWWA D103, *Factory-Coated Bolted Steel Tanks for Water Storage*, ~~1997~~ **2009, Addenda, 2014** .

C.2 Informational References. (Reserved)

C.3 References for Extracts in Informational Sections. (Reserved)

Statement of Problem and Substantiation for Public Input

Referenced current SDO names, addresses, standard names, numbers, and editions.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1-NFPA 22-2015 [Chapter 2]	Referenced current SDO names, addresses, standard names, numbers, and editions.

Submitter Information Verification

Submitter Full Name: Aaron Adamczyk
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jun 17 20:31:00 EDT 2015

Attachment #3:
Committee Roster

Address List No Phone

04/07/2016
Chad Duffy
WAT-AAA

Water Tanks

Robert M. Gagnon **SE** 4/1/1994
Chair **WAT-AAA**
Gagnon Engineering
2660 Daisy Road
Woodbine, MD 21797

Phillip A. Brown **IM** 7/24/1997
Secretary **WAT-AAA**
American Fire Sprinkler Association, Inc.
12750 Merit Drive, Suite 350
Dallas, TX 75251
Alternate: R. Greg Patrick

Kevin P. Bellew **L** 10/18/2011
Principal **WAT-AAA**
Sprinkler Fitters & Apprentices Local 696
41-43 East Willow Street
Millburn, NJ 07041
United Assn. of Journeymen & Apprentices of the Plumbing & Pipe Fitting Industry
Alternate: Gary Koenig

Babanna Biradar **SE** 3/2/2010
Principal **WAT-AAA**
Bechtel India Pvt Ltd
Knowledge Park
244 245, Udyog Vihar Phase IV
Gurgaon, Haryana, 122015 India

Chris L. Butts **SE** 10/23/2013
Principal **WAT-AAA**
Lindbergh & Associates LLC
2170 Ashley Phosphate Road, Suite 504
Charleston, SC 29406

John D. Campbell **SE** 10/27/2009
Principal **WAT-AAA**
NRG Fire Consulting
732 Spring Crest Court
Fenton, MO 63026-3920

John R. Conrady **SE** 10/4/2001
Principal **WAT-AAA**
460 Lokey Lane
Wilsonville, AL 35186
Alternate: Linda Conrady

Christopher Culp **SE** 10/27/2009
Principal **WAT-AAA**
Fire Dynamics
Division of Henderson Engineers, Inc.
8345 Lenexa Drive
Lenexa, KS 66214-1654

Sullivan D. Curran **M** 7/28/2006
Principal **WAT-AAA**
Fiberglass Tank & Pipe Institute
14323 Heatherfield
Houston, TX 77079-7407
Fiberglass Tank & Pipe Institute

Douglas W. Fisher **SE** 10/1/1999
Principal **WAT-AAA**
Fisher Engineering, Inc.
10475 Medlock Bridge Road, Suite 520
Johns Creek, GA 30097-4437
Alternate: Jeremy W. John

Joseph R. Fowler **IM** 8/2/2010
Principal **WAT-AAA**
S.A. Comunale Company, Inc.
2900 Newpark Drive
Barberton, OH 44203

Daniel M. Fritz **I** 3/1/2011
Principal **WAT-AAA**
XL Insurance America, Inc.
190 South LaSalle Street, Suite 950
Chicago, IL 60603

Greg Garber **M** 3/2/2010
Principal **WAT-AAA**
Pittsburg Tank & Tower Inc.
521 Bushnell Road
Virginia Beach, VA 23451-7115

Andrew M. Henning **E** 04/08/2015
Principal **WAT-AAA**
CAL FIRE, Office of the State Fire Marshal
1131 “S” Street
Sacramento, CA 95811-6524
Alternate: Christine Fowler

Address List No Phone

04/07/2016
Chad Duffy
WAT-AAA

Water Tanks

Jack Hillman **M** 1/10/2002
Principal **WAT-AAA**
Hall-Woolford Tank Company, Inc.
PO Box 2755
Philadelphia, PA 19120

David Hochhauser **IM** 4/1/1993
Principal **WAT-AAA**
Isseks Brothers Incorporated
298 Broome Street
New York, NY 10002

Kevin J. Kelly **IM** 12/08/2015
Principal **WAT-AAA**
Victaulic
4901 Kesslersville Road
Easton, PA 18040-6714
National Fire Sprinkler Association
Alternate: Roland A. Asp

Todd M. Kidd **I** 10/4/2001
Principal **WAT-AAA**
Liberty Mutual Insurance Companies
520 Mainsail Road
Salisbury, NC 28146-1402
Alternate: Skip Donnell

Nicholas A. Legatos **M** 1/1/1992
Principal **WAT-AAA**
Preload Incorporated
60 Commerce Drive
Hauppauge, NY 11788-3929
American Concrete Institute

Keith McGuire **M** 1/1/1996
Principal **WAT-AAA**
CST Storage
PO Box 996
Parsons, KS 67357
Alternate: John J. Sweeney

John M. Mitchard **I** 7/22/1999
Principal **WAT-AAA**
Nuclear Service Organization
1201 North Market Street, Suite 1100
Wilmington, DE 19801
Alternate: Andrew J. Brady

Bob D. Morgan **E** 10/27/2009
Principal **WAT-AAA**
Fort Worth Fire Department
1000 Throckmorton Street
Fort Worth, TX 76102

Bill Mow **M** 10/1/1999
Principal **WAT-AAA**
Amfuel
PO Box 887
Magnolia, AR 71753

Leonard J. Ramo **SE** 08/17/2015
Principal **WAT-AAA**
Telgian Corporation
900 Circle 75 Parkway SE
Suite 680
Atlanta, GA 30339-3084
Alternate: Daniel S. Vandergriff

Andrew Rosenwach **M** 4/1/1993
Principal **WAT-AAA**
Rosenwach Tank Company, Inc.
40-25 Crescent Street
Long Island City, NY 11101
National Wood Tank Institute

Daniel Sanchez **E** 10/29/2012
Principal **WAT-AAA**
City of Los Angeles
Building & Safety
201 North Figueroa Street, Suite 400
Los Angeles, CA 90012

Mark A. Sornsin **SE** 3/2/2010
Principal **WAT-AAA**
Karges-Faulconbridge, Inc.
2280 45th Street South
Fargo, ND 58104

Gregory R. Stein **SE** 10/4/2001
Principal **WAT-AAA**
Tank Industry Consultants
7740 West New York Street
Indianapolis, IN 46214
Alternate: Patrick Jon Brown

Owen Stevens **M** 08/11/2014
Principal **WAT-AAA**
Fiber Tech Corporation
7201 Lockport Place
Lorton, VA 22079-1524

Douglas Wilson **E** 03/03/2014
Principal **WAT-AAA**
City of San Diego
1222 First Avenue, MS 401
San Diego, CA 92101

Roland A. Asp **IM** 03/07/2013
Alternate **WAT-AAA**
National Fire Sprinkler Association, Inc.
40 Jon Barrett Road
Patterson, NY 12563-2164
Principal: Kevin J. Kelly

Andrew J. Brady **I** 8/9/2011
Alternate **WAT-AAA**
Nuclear Service Organization
1201 North Market Street, Suite 1100
Wilmington, DE 19801
Principal: John M. Mitchard

Patrick Jon Brown **SE** 10/29/2012
Alternate **WAT-AAA**
Tank Industry Consultants
7740 West New York Street
Indianapolis, IN 46214
Principal: Gregory R. Stein

Linda Conrady **SE** 10/29/2012
Alternate **WAT-AAA**
Conrady Consultant Services
460 Lokey Lane
Wilsonville, AL 35186
Principal: John R. Conrady

Skip Donnell **I** 03/03/2014
Alternate **WAT-AAA**
Liberty Mutual Insurance Company
3350 Carly Lane
Indianapolis, IN 46235-9146
Principal: Todd M. Kidd

Christine Fowler **E** 08/17/2015
Alternate **WAT-AAA**
CAL FIRE, Office of the State Fire Marshal
1131 “S” Street
Sacramento, CA 95811-6524
Principal: Andrew M. Henning

Jeremy W. John **SE** 8/5/2009
Alternate **WAT-AAA**
Fisher Engineering, Inc.
10475 Medlock Bridge Road, Suite 520
Johns Creek, GA 30097
Principal: Douglas W. Fisher

Gary Koenig **L** 10/29/2012
Alternate **WAT-AAA**
Sprinkler Fitters Local Union 696
41-43 East Willow Street
Millburn, NJ 07041
United Assn. of Journeymen & Apprentices of the Plumbing & Pipe Fitting Industry
Principal: Kevin P. Bellew

R. Greg Patrick **IM** 8/5/2009
Alternate **WAT-AAA**
Treasure Valley Fire Protection, Inc.
2731 South Saturn Way
Boise, ID 83709-2856
American Fire Sprinkler Association
Principal: Phillip A. Brown

John J. Sweeney **M** 1/15/1999
Alternate **WAT-AAA**
Smith Engineered Storage Products Company
345 Harvestore Drive
Dekalb, IL 60115
Principal: Keith McGuire

Daniel S. Vandergriff **SE** 10/18/2011
Alternate **WAT-AAA**
Telgian Corporation
12250 Weber Hill Road, Suite 230
St. Louis, MO 63127
Principal: Leonard J. Ramo

Chad Duffy 4/18/2011
Staff Liaison **WAT-AAA**
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471