NFPA 30 and Factory-Built Storage Tanks

New England UST & Shop-Fabricated Storage Tank Conference
December 4, 2014 — Worcester MA
Topics Covered

- organization of NFPA 30
- provisions for ALL storage tanks
- provisions for ASTs
- provisions for USTs
- changes in 2015 edition
NFPA 30 Organization

2003 & earlier
1-3 Administrative
4 Tank Storage
5 Piping
6 Container Storage
7 Operations
8 Electrical

2008 & later
1-4 Administrative
5-8 General Reqts.
9-16 Container Storage
17-20 Operations
21-26 Tank Storage
27 Piping
28 Bulk Transfer
Bulk Storage Tanks

1-4 Administrative
5-8 General Reqts.
9-16 Container Stge.
17-20 Operations
21-26 Tank Storage
27 Piping
28 Bulk Transfer

21 Reqts. - All Tanks
22 ASTs
23 USTs
24 Storage Tank Bldgs.
25 Vaults
Scope of NFPA 30

- applies to storage, handling, use
- does not apply to
  - materials with melting point > 100°F
  - liquefied gases
  - cryogenic fluids
  - motor fuel dispensing
  - transportation
NFPA 30 does not apply retroactively, unless the authority having jurisdiction determines that a distinct hazard exists and must be rectified.
Equivalency (1.5)

- NFPA 30 does not prevent the use of systems, methods, or devices of equivalent or superior quality, effectiveness, or safety
  - equivalency must be demonstrated
Definitions  (Chapter 3)

- approved
- authority having jurisdiction
- important building
- protection for exposures
- property line “that is or can be built upon”
Applicability of General Chapters

- Chapter 4 covers definition and classification of liquids
- Chapter 6 covers methodologies used to identify, evaluate, and control fire and explosion hazards
- Chapter 7 covers electrical systems and electrical area classification
Chapter 21

- scope covers
  - fixed tanks that exceed 60 gallons
  - intermodal tanks and IBCs that exceed 793 gallons capacity connected to fixed piping
- does not cover process tanks
Chapter 21

- basic requirements
- materials of construction
- design and construction standards
- provisions for normal venting
- corrosion protection
- testing requirements
- operating requirements
- inspection & maintenance
some provisions include:

- combustible materials of construction permitted under certain conditions
- maximum operating pressures for ambient pressure tanks
- AST cannot be used underground
- UST cannot be used aboveground
Section 21.4.3

- vent must prevent vacuum or pressure that:
  - can distort the roof
  - can exceed the design pressure

- size vent per API 2000 or other approved standard
Section 21.4.3.8 &.9

- vent termination devices
Section 21.4.5

- protection from internal corrosion
  - additional metal thickness
  - approved protective coatings or linings
Section 21.5

- Testing requirements
  - All tanks must be tested before being placed in service per tank design standard
Section 21.5.2

- tightness test
  - Section 21.5.2 spells out in detail
  - for tank & for interstitial space

- 2015: if tank shipped with interstitial vacuum and vacuum is maintained, no tightness test required
Section 21.7.1

- overfill prevention procedures/systems
  - required for all tanks > 1,320 gal. storing Class I or Class II liquids
  - aboveground tanks receiving / transferring Class I liquids from pipelines or marine vessels must have written procedures
  - reference API Standard 2350
  - reference EPA rules
Section 21.7.2

- identification of tank contents
  - NFPA 704 placarding
- security is now an issue
  - fencing
Chapter 22

- Scope: Aboveground Tanks
- NFPA 30 focuses on passive protection
  - proper design and installation
  - adequate emergency venting
  - proper siting with respect to neighboring property
  - spill control
Section 22.4

- location (siting) of aboveground tanks
  - separation distance from
    - nearest important building
    - near and far sides of public way
    - property line that is or can be built upon
  - shell-to-shell spacing
Section 22.4

- factors that determine separation
  - type of tank
    - floating roof
    - weak roof-to-shell seam
    - horizontal or vertical with emergency relief vents*
  - protection for the tank itself
  - protection for exposed property

*based on maximum 2.5 psi overpressure
## Section 22.4

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Table(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I, II, IIIA stable liquids (up to 2.5 psi)</td>
<td>22.4.1.1(a) &amp; 22.4.1.1(b)</td>
</tr>
<tr>
<td>Class I, II, IIIA stable liquids (&gt;2.5 psi)</td>
<td>22.4.1.3 &amp; 22.4.1.1(b)</td>
</tr>
<tr>
<td>liquids w/ boil-over characteristics</td>
<td>22.4.1.4</td>
</tr>
<tr>
<td>unstable liquids</td>
<td>22.4.1.5 &amp; 22.4.1.1(b)</td>
</tr>
<tr>
<td>Class IIIB stable liquids</td>
<td>22.4.1.6</td>
</tr>
<tr>
<td>Tank Type</td>
<td>Protection</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>floating roof</td>
<td>for exposed property</td>
</tr>
<tr>
<td></td>
<td>None</td>
</tr>
<tr>
<td>vertical with weak roof-to-shell seam</td>
<td>approved foam or inert gas system (150’ max)</td>
</tr>
<tr>
<td></td>
<td>for exposed property</td>
</tr>
<tr>
<td></td>
<td>None</td>
</tr>
<tr>
<td>tanks with emergency relief venting,</td>
<td>approved foam or inert gas system (150” max)</td>
</tr>
<tr>
<td>2.5 psi max</td>
<td>for exposed property</td>
</tr>
<tr>
<td></td>
<td>none</td>
</tr>
<tr>
<td>protected</td>
<td>none</td>
</tr>
</tbody>
</table>
## Table 22.4.1.1 (b)

<table>
<thead>
<tr>
<th>Capacity, gal</th>
<th>Property Line, ft</th>
<th>Important Bldg. or Public Way ft (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 275</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>276 – 750</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>751 – 12,000</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>12,001 – 30,000</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>30,001 – 50,000</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>50,001 – 100,000</td>
<td>50</td>
<td>15</td>
</tr>
<tr>
<td>100,001 – 500,000</td>
<td>80</td>
<td>25</td>
</tr>
<tr>
<td>500,001 – 1,000,000</td>
<td>100</td>
<td>35</td>
</tr>
<tr>
<td>1,000,001 – 2,000,000</td>
<td>135</td>
<td>45</td>
</tr>
<tr>
<td>2,000,001 – 3,000,000</td>
<td>165</td>
<td>55</td>
</tr>
<tr>
<td>&gt; 3,000,000</td>
<td>175</td>
<td>60</td>
</tr>
</tbody>
</table>
### Table 22.4.2.1 — Shell to Shell Spacing

<table>
<thead>
<tr>
<th>Diameter, ft.</th>
<th>Floating Roof Tanks</th>
<th>Fixed Roof &amp; Horizontal Class I/II</th>
<th>Fixed Roof &amp; Horizontal Class IIIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 150</td>
<td>$\frac{1}{6} \sum$ adjacent diameters</td>
<td>$\frac{1}{6} \sum$ adjacent diameters</td>
<td>$\frac{1}{6} \sum$ adjacent diameters</td>
</tr>
<tr>
<td>150 w/ remote impounding</td>
<td>$\frac{1}{6} \sum$ adjacent diameters</td>
<td>$\frac{1}{4} \sum$ AD</td>
<td>$\frac{1}{6} \sum$ AD</td>
</tr>
<tr>
<td>open dike</td>
<td>$\frac{1}{4} \sum$ adjacent diameters</td>
<td>$\frac{1}{3} \sum$ AD</td>
<td>$\frac{1}{4} \sum$ AD</td>
</tr>
</tbody>
</table>

In no case is the separation allowed to be less than 3 ft.
Section 22.5

- tank supports and foundation
  - minimize excessive loading at supports & minimize uneven settling
  - design for earthquakes
  - supports: masonry, concrete or steel
Section 22.7

**Emergency relief venting:**
A means to automatically relieve excess pressure inside a tank *due to exposure from an external fire.*

Not intended for pressure relief from internal explosion or overpressure.
Section 22.7

- emergency relief venting
  - tanks must have **additional** venting capacity to prevent the tank from exceeding 2.5 psig if exposed to fire
  - can use floating roof, lifter roof, weak roof-to-shell seam, loose-bolt cover, or **emergency venting device**
Section 22.7

Exception: tank storing Class IIIIB liquids that:

- exceeds 12,000 gallons
- is not located within the same diked area or drainage path of tanks storing Class I or Class II liquids
Section 22.11

- spill control – tanks holding Class I, II, or IIIA liquids must have means to prevent accidental release from endangering important facilities, adjoining property, and waterways
  - remote impounding
  - diking
  - combination of remote impounding and diking
  - secondary containment-type tank
Remote Impounding

100,000 gal

1% slope for 50 ft

50 ft min

50 ft min

100,000 gal
Impounding by Diking
Section 22.11

- spill control – diking
  - 1% slope from tank to dike wall
  - dike capacity = the greatest volume of liquid that can be released from the largest tank (overflow point)

- *local or state law might require more capacity!*
Section 22.11

- secondary containment-type tank
  - prior to 2015
    - Class I: 12,000 gallons
    - Classes II & IIIA: 20,000 gallons
  - 2015 edition
    - 50,000 gallons
    - spacing per w/ Table 22.4.2.1
Chapter 23

- scope covers
  - buried tanks, i.e. backfilled
Chapter 23

- basic requirements
  - excavation
  - external corrosion protection
  - siting w/ respect to structures and property lines
    - 3 ft for Class I liquid
    - 1 ft for Classes II and III liquids
  - bedding, burial depth, and backfill
Section 4.2.2

No direct piping allowed between here and here.
Bedding & Backfill (23.5)

- noncorrosive and inert
  - compacted pea gravel or sand
- bedding depth per manufacturer
- bedding to extend 12” beyond footprint of tank
- backfill to depth of 12” above tank
  - greater if required by manufacturer
- additional cover:
  - 12” of clean earth or 4” reinforced concrete
**Vent Sizes (23.6)**

<table>
<thead>
<tr>
<th>Maximum Flow (gpm)</th>
<th>50 ft</th>
<th>100 ft</th>
<th>200 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>200</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>300</td>
<td>1.25</td>
<td>1.25</td>
<td>1.5</td>
</tr>
<tr>
<td>400</td>
<td>1.25</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>500</td>
<td>1.5</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>600</td>
<td>1.5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>700</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>800</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>900</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1000</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

For SI units, 1 in. = 25 mm; 1 ft = 0.3 m; 1 gal = 3.8 L.

*Assumes stated length of piping, plus 7 ells.*
NFPA 30A

Scope:
- retail motor fuel dispensing facilities
- fleet motor fuel dispensing facilities
- marine motor fuel dispensing facilities
- repair garages
NFPA 30A

- storage of fuels and other liquids
  - USTs per NFPA 30, Chapter 23
  - ASTs per NFPA 30, Chapter 22 and special siting requirements of 30A
- piping systems
- fuel dispensing systems
- electrical systems
- operating requirements
- vapor processing/collection systems
NFPA 30A

- special provisions for marine fueling
- special provisions for gaseous fuels
  - CNG, LNP, LPG, hydrogen
- special provisions for farms and remote sites
<table>
<thead>
<tr>
<th>Tank Type</th>
<th>Individual Tank Capacity (gal)</th>
<th>Minimum Distance (ft)</th>
<th>From the Nearest Important Building on the Same Property</th>
<th>From Nearest Fuel Dispensing Device</th>
<th>From Lot Line That Is or Can Be Built Upon</th>
<th>From the Nearest Side of Any Public Way</th>
<th>Between Tanks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanks in vaults</td>
<td>0–15,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Protected aboveground tanks</td>
<td>Less than or equal to 6,000</td>
<td>5</td>
<td>0</td>
<td>15</td>
<td>15</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>6,001–12,000</td>
<td>15</td>
<td>0</td>
<td>25</td>
<td>15</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>Fire-resistant tanks</td>
<td>0–12,000</td>
<td>25</td>
<td>25</td>
<td>50</td>
<td>25</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>Other tanks meeting the requirements of NFPA 30</td>
<td>0–12,000</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
</tbody>
</table>
Other Applications

- NFPA 31 governs fuel oil tanks for oil burning appliances
  - indoor tanks
  - outdoor tanks up to 660 gallons
- NFPA 31 governs indoor fuel tanks for stationary engines and turbines
  - generator sets
  - fire pumps
Questions??
Contact Information

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