New ASCE Piers & Wharves Standard

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Technical Director for Structures, Moffatt & Nichol, Long Beach, CA
Tuesday, September 25, 2018, 3:40 PM
Waterfront Facilities

• Container terminals
• Marine oil terminals
• Military terminals
• Cruise/ Ferry terminals
• Recreational piers
• Marinas
• Buildings
• Highway Bridges
• Railroad Bridges
CHAPTER 31F (SLC) MARINE OIL TERMINALS

SECTION 3101F (SLC) INTRODUCTION

WHEREF Orth Authority. The Governor-Emer Emer Stage Authority, for whose purpose the California Building Code is intended, authorizes the California State Building Authority (SLC) to regulate marine terminals, herein referred to as marine oil terminals (MOTs), in order to protect public health, safety and the environment. The authority for this regulation is contained in Sections 8700 through 8790 of the California Public Resources Code. This act defines "oil" as any kind of petroleum, liquid hydrocarbons, or petroleum products or any fraction or residuum derived therefrom, including, but not limited to, crude oil, bunker fuel, gasoline, diesel fuel, aviation fuel, oil shales, oil refuse, oil mixed with water, and liquid distillates from unprocessed natural gas. The provisions of this chapter regulate activities that affect MOTs as defined under this act, including marine terminals that transfer liquefied natural gas (LNG).

The Marine Environmental Protection Division (Division) administers this code on behalf of the SLC.

WHEREF Orth Purpose. The purpose of this code is to establish minimum engineering, inspection and maintenance criteria for MOTs, in order to prevent oil spills, and to protect public health, safety, and the environment. This code does not specifically address terminal operating or operational requirements. Relevant provisions from existing codes, industry standards, recommended practices, regulations and guidelines have been incorporated directly or through reference, as part of this code.

Where there are differing requirements between this code and the applicable code referred to herein, the choice of application shall be subject to approval of the Division.

In circumstances where new technologies are proposed, this code allows the Division to adopt, modify, or withdraw its requirements, with public notice and opportunity for public comment.

The purpose of this chapter is to provide a basis for the application of existing MOTs and design of new MOTs in California. Each provision is classified as New (N), Existing (E), or Both (E/N) and shall be applied accordingly. If no classification is indicated, the classification shall be considered to be (E/N).}

Existing (E) requirements apply to MOTs that are in operation on the date this code is adopted. For these MOTs, operation or installation of new equipment, short pipeline sections, or minor modifications of existing components shall also be subject to the existing (E) requirements.

New (N) requirements apply to:
1. A MOT or refineries or refineries that commences or commences operation with a new or modified operation manual after adoption of this code.
2. All new to structural components or systems at an existing MOT that are structurally independent of existing components or systems.
3. Addition of new (not replacements) equipment, piping, valves, components, systems, or equipment to an existing MOT. MOT.
4. Major repairs or substantially modified in-place systems.
5. Any associated major installations or modifications.

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### Codes/Standards Applicable to Port Facilities

<table>
<thead>
<tr>
<th>Facility</th>
<th>Public access</th>
<th>Code/Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container terminals</td>
<td>No</td>
<td>POLA/ POLB/ ASCE 61</td>
</tr>
<tr>
<td>Marine oil terminals</td>
<td>No</td>
<td>MOTEMS/ CBC/ ASCE 61</td>
</tr>
<tr>
<td>Military terminals</td>
<td>No</td>
<td>UFC/ ASCE 61</td>
</tr>
<tr>
<td>Cruise/ Ferry terminals</td>
<td>Yes</td>
<td>LABC/ CBC/ IBC/ ASCE 7</td>
</tr>
<tr>
<td>Recreational piers</td>
<td>Yes</td>
<td>LABC/ CBC/ IBC/ ASCE 7</td>
</tr>
<tr>
<td>Marinas</td>
<td>Yes</td>
<td>LABC/ CBC/ IBC/ ASCE 7</td>
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<tr>
<td>Buildings</td>
<td>Yes</td>
<td>LABC/ CBC/ IBC/ ASCE 7</td>
</tr>
<tr>
<td>Highway Bridges</td>
<td>No</td>
<td>AASHTO/ Caltrans Design Criteria</td>
</tr>
<tr>
<td>Railroad Bridges</td>
<td>No</td>
<td>AREMA</td>
</tr>
</tbody>
</table>
LRFD Load Combinations for Selected Codes/Standards

- MOTEMS, Chapter 31F, California Building Code, 2017
- UFC 4-152, “Design: Piers and Wharves”, 2017
- Port of Long Beach, “Wharf Design Criteria”, 2015
LRFD Load Combinations for MOTEMS

<table>
<thead>
<tr>
<th>LOAD TYPE</th>
<th>VACANT CONDITION</th>
<th>MOORING &amp; BREASTING CONDITION</th>
<th>BERTHING CONDITION</th>
<th>EARTHQUAKE CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dead Load (D)</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2 + k₁</td>
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<tr>
<td>Live Load (L)</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>1.0</td>
</tr>
<tr>
<td>Buoyancy (B)</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2 + k₁</td>
</tr>
<tr>
<td>Wind on Structure (W)</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>—</td>
</tr>
<tr>
<td>Current on Structure (C)</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Earth Pressure on the Structure (H)</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Mooring/Breasting Load (M)</td>
<td>—</td>
<td>—</td>
<td>1.6</td>
<td>—</td>
</tr>
<tr>
<td>Berthing Load (Bₜ)</td>
<td>—</td>
<td>—</td>
<td>1.6</td>
<td>—</td>
</tr>
<tr>
<td>Earthquake Load (E)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1.0</td>
</tr>
</tbody>
</table>

1. k = 0.50 (PGA) The k factor (k=0.5(PGA)) and buoyancy (B) shall be applied to the vertical dead load (D) only, and not to the inertial mass of the structure.
2. The load factor for live load (L) may be reduced to 1.3 for the maximum outrigger float load from a truck crane.
3. For Level 1 and 2 earthquake conditions with strain levels defined in Division 7, the current on structure (C) may not be required.
4. An earth pressure on the Structure factor (H) of 1.0 may be used for pile or bulkhead structures.
# LRFD Load Combinations for UFC 4-152

## Table 3-7 Load Combinations - Load and Resistance Factor Design

<table>
<thead>
<tr>
<th></th>
<th>U0</th>
<th>U1</th>
<th>U2</th>
<th>U3</th>
<th>U4</th>
<th>U5</th>
<th>U6</th>
<th>U7</th>
<th>U8</th>
<th>U9</th>
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<tbody>
<tr>
<td><strong>D</strong>a</td>
<td>1.4</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.0+k</td>
<td>1.0-k</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>(Lc+L)</td>
<td>L</td>
<td>Lu</td>
<td>-</td>
<td>1.6b</td>
<td>-</td>
<td>1.6b</td>
<td>-</td>
<td>1.6b</td>
<td>0.1</td>
<td>-</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>1.4</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>0.9</td>
<td>1.2</td>
<td>1.2</td>
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<tr>
<td><strong>Be</strong></td>
<td>-</td>
<td>-</td>
<td>1.6c</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td><strong>C</strong></td>
<td>-</td>
<td>-</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>H</strong>d</td>
<td>-</td>
<td>1.6</td>
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<td>1.6</td>
<td>1.6</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>W</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>M</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>R+S+T</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Ice</strong></td>
<td>-</td>
<td>-</td>
<td>0.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
<td>1.0</td>
<td>-</td>
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</tbody>
</table>
LRFD Load Combinations for POLB WDC

Table 3-4: Load Combinations

<table>
<thead>
<tr>
<th>Case</th>
<th>D</th>
<th>L+I&lt;sup&gt;c&lt;/sup&gt;</th>
<th>E</th>
<th>W</th>
<th>BE</th>
<th>M</th>
<th>R+S+T</th>
<th>BU</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1.20</td>
<td>1.60</td>
<td>1.60</td>
<td>1.00</td>
<td>—</td>
<td>—</td>
<td>1.20</td>
<td>1.20</td>
<td>1.20</td>
</tr>
<tr>
<td>II&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.90</td>
<td>—</td>
<td>1.60</td>
<td>1.00</td>
<td>—</td>
<td>—</td>
<td>1.20</td>
<td>1.00</td>
<td>1.20</td>
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<tr>
<td>III</td>
<td>1.20</td>
<td>1.00</td>
<td>1.60</td>
<td>1.00</td>
<td>1.60</td>
<td>—</td>
<td>—</td>
<td>1.20</td>
<td>1.20</td>
</tr>
<tr>
<td>IV</td>
<td>1.20</td>
<td>1.60</td>
<td>1.60</td>
<td>1.00</td>
<td>—</td>
<td>1.60</td>
<td>—</td>
<td>1.20</td>
<td>1.20</td>
</tr>
</tbody>
</table>

<sup>a</sup>LOAD AND RESISTANCE FACTOR DESIGN (LRFD)<sup>b</sup>
## LRFD Load Combinations Comparison

<table>
<thead>
<tr>
<th>Load Description</th>
<th>MOTEMS</th>
<th>UFC 4-152</th>
<th>POLB WDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Load on Structure</td>
<td>1.6</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Berthing + Wind</td>
<td>1.6 + 1.6</td>
<td>1.6 + 0.0</td>
<td>1.6 + 1.0</td>
</tr>
<tr>
<td>Mooring/Breasting + Wind</td>
<td>1.6 + 1.6</td>
<td>1.6 + 0.0</td>
<td>1.6 + 1.0</td>
</tr>
</tbody>
</table>
Design of Piers & Wharves

- ASCE/COPRI 61-14 Seismic Design of Piers & Wharves
- New ASCE/COPRI Design Standards for Piers & Wharves
New Design Standards Purpose and Objective

- Establishes comprehensive and consistent national Standard
- Provides a consensus-driven, single resource document
- References existing recommended practice documents
## Proposed Schedule

<table>
<thead>
<tr>
<th>Item</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft proposal discussed with ASCE</td>
<td>March 2016</td>
</tr>
<tr>
<td>Ports &amp; Harbor Committee Presentation/Approval</td>
<td>June 2106</td>
</tr>
<tr>
<td>Final proposal submitted to ASCE/COPRI</td>
<td>July 2016</td>
</tr>
<tr>
<td>COPRI Governing Board Approval</td>
<td>September 2016</td>
</tr>
<tr>
<td>Ports &amp; Harbor Sub-Committee first meeting</td>
<td>October 2016</td>
</tr>
<tr>
<td>ASCE Codes &amp; Standards Committee Approval</td>
<td>March 30, 2017</td>
</tr>
<tr>
<td>ASCE/ ANSI formal announcement for New Standards Committee</td>
<td>July 30, 2017</td>
</tr>
<tr>
<td>ASCE Call for members</td>
<td>September 2017</td>
</tr>
<tr>
<td><strong>ASCE Standards Committee kick-off meeting</strong></td>
<td>October 11, 2018</td>
</tr>
<tr>
<td>Draft Standard completed</td>
<td>Spring 2022</td>
</tr>
<tr>
<td>Publish Standard</td>
<td>Fall 2023</td>
</tr>
</tbody>
</table>
Committee Membership

- Minimum number of voting members for a Standard committee is 12
- Current number of members is 31
- Membership breakdown consists of:

<table>
<thead>
<tr>
<th>Category</th>
<th>Target Participation</th>
<th>Current Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumers</td>
<td>20-40%</td>
<td>45%</td>
</tr>
<tr>
<td>Producers</td>
<td>20-40%</td>
<td>0%</td>
</tr>
<tr>
<td>General</td>
<td>20-40%</td>
<td>45%</td>
</tr>
<tr>
<td>Regulators</td>
<td>0-15%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Join at: https://www.asce.org/codes-and-standards/standards-committee-application-form/
Next Steps

• Identify existing useful Standards and other source information

• Identify gaps and research needed from design engineers

• Identify and resolve design provisions conflicts

• Identify Working Group team members
Standards Working Groups Chapter Details

• **Group 1: Introduction to Standards**
  - Jurisdiction applicability (Federal, State, and Local)
  - Structure type
  - Use/production
  - Regulations applicability by geography

• **Group 2: Loads and Loads Combination**
  - Criteria for metocean and other environmental loads
  - Water level fluctuation and surges (sea level rise, tsunami...)
  - Mooring and breasting loads
  - Berthing loads
  - Load combinations for vacant, berthing and moored conditions
Standards Working Groups by Chapter Detail

• **Group 3: Analysis and Design**
  • Methods of structural analysis
  • Geotechnical criteria
  • Design procedures
  • Design for extreme events such as hurricanes, earthquakes, tsunami, man-made disaster
  • Design codes (steel, concrete, timber, synthetics)

• **Group 4: Sustainable Design**

• **Group 5: Marina Design**
THANK YOU!

moffattnichol.com