THE CURRENT STATUS OF MOTEMS IMPLEMENTATION

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Abstract

The Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS, [Ref. 1]) became an enforceable part of the California Building Code on February 6, 2006. Engineering audits for 10 high risk oil terminals have been completed in early August; lower risk facilities must submit their audits by February 2010 or 2011, depending on their risk level. One new terminal project, within the Port of Los Angeles, is using MOTEMS for initial analysis/design. We anticipate each initial audit review will take a month or two, after which we plan to meet with operators/consultants, to discuss our findings and reach an agreement on rehabilitation timelines. A cursory initial review has shown some issues that include the lack of a comprehensive fire plan/risk analysis, the lack of linkage between seismic displacement of the wharf, and the pipeline stress analysis and also some disagreement as to the severity of specific deficiencies. As a result of these reviews and in response to questions and gaps already discovered, we plan to update MOTEMS in late 2008 with industry participation.

Post-Audit Implementation

With the submittal of the MOTEMS audit, the operator/consultant must determine the "fitness-for-purpose" of the terminal, and limit operations to whatever limitations are placed on the facility.

We have received 10 initial audits of "high" risk marine oil terminals in California; the general review plan is as follows:

1. A quick look through each submittal, making sure there are no major items missing or that the documents are grossly inadequate. If this is the case, the audit will be returned promptly to the operator with a short time requirement to complete.

2. A thorough review, except for the structural assessment, will be completed within months. We expect to meet with each operator (and consultants if desired) to discuss the submittal and sort out questions and issues. It is expected that "P1" through "P4" (Remedial Action Priorities) will be discussed, along with the initial completion dates proposed by the operator. These are open to discussion, and per MOTEMS, the completion dates must be agreed upon by the MFD and the operator.

3. The seismic and structural assessment may take longer and requires a more extensive computational verification by MFD. We expect this process to take 4-6 months for a complete review. However, for those facilities that do not meet the MOTEMS seismic requirements, the initial audit will not include a structural assessment or pipeline stress analysis. For these terminals, as the final design configuration is selected, and the new analysis/design is completed, the review will proceed.

4. Upon completion of the initial audit review, operations must remain within the specified limits (wind speed, vessel size, passing vessel distance/speed, underkeel clearance, etc.) established by the audit. This may also include a reduced impact velocity, so that the berthing system remains within its design limitations. For the case of geriatric spring systems, or timber fender piles with camels, this can be a severe restriction.

Initial Audit Comments

As 10 marine oil terminals have submitted their initial audits, there are a number of findings and issues that have surfaced.

1. The fire plan and associated risk analysis are part of the audit, and not something that is to be completed as a “deficiency” with an extended completion date. This work is to be submitted with the initial audit and should follow the outline provided in Section 8 of the MOTEMS. In addition to having a fire plan, it must be operational, with a fire water system believed to be operable, with regular drills. In one recent case, the operators believed that the almost new diesel fire pump would not work, and it was a real spill scenario that could have escalated into a major fire incident.

2. In some cases, we have noted a lack of linkage between the seismic structural analysis and the pipeline stress analysis. Both should be using the same lateral/vertical displacement values, and should be performed in concert.

3. There seems to be some misunderstanding about berthing loads, that the frictional forces, both lateral and vertical forces must be considered along with the normal force. This is clearly stated in MOTEMS, Section 3105F4.4.

4. Hazardous area violations are serious, and definitely not a “P4” violation, that can be addressed with normal maintenance within a year.

5. In some cases, we've already noted that what the operator may consider a "P4", we may consider a "P2" or P3". Other discrepancies include a "P2" or "P3" rating in the text that becomes a "P4" in the Executive Summary.

MOTEMS Upgrades

There are a number of significant upgrades to the MOTEMS that will be implemented within the next six months. A Technical Advisory Group (TAG) will be formed, to further refine these additions. Some of the non-controversial changes include:

- POLA/POLB Tsunami Study [Ref. 2]
- SF Bay Tsunami Study [Ref. 3]
- POLA/POLB Response Spectra [Ref. 4]
- Passing Vessel Forces [Ref. 5]

Other additions to a later edition of the MOTEMS (2009) will include:

- The combination of inertial and kinematic loading on piles
- A Level III earthquake and the performance requirement of "non-collapse"
- A simplified, approximate solution to determine the capacity/demand for pile supported wharves/piers [Ref.6]

This last update task is based on a project with Professor Rakesh Goel, California State University, San Luis Obispo, to establish a simplified "approximate" method to evaluate the performance of wharf/pier structures, without using the strain limits of Level I and II earthquake motion. This project is expected to be completed by late 2008, and we expect follow-on funds to continue the work with additional finite element validation. This work will provide a rapid check for the strain limits and associated damping values associated with Section 7 of the MOTEMS.

Subsequent Audits

The MOTEMS requires above water inspection/audits at a maximum of 3 year intervals, and another underwater inspection/audit at maximum intervals of 6 years, depending on the results of the initial audit. However, unless changes are made to operations, the initial mooring/berthing analyses should be sufficient, along with the initial seismic/structural assessment and pipeline stress analyses. And unless product, throughput or some other operational feature would cause a

change in the fire risk assessment, the fire plan and its implementation should not change.

However, if there are changes in vessel size, throughput volumes, different products, or anything that might change a mooring/berthing analysis, or vary the initial fire plan, these tasks must be updated, and provided for review/approval by MFD.

Record Keeping

All terminals should be reminded of Section 3102F.1.4 regarding record keeping. MOTEMS requires that chronological records/reports of annual inspections, audits, post-event inspections and documentation of equipment or structural changes must be maintained, indexed and readily available to the MFD. The operator should be very clear on this matter, and keep all related specifications, operation manuals for all equipment, specifications, inspections/audits, etc. in a location that is known to co-workers and management. In too many cases we have found that as a terminal changes ownership, there are no records of equipment specifications, mooring analyses that have already been completed, or structural drawings that are missing. The MOTEMS addresses this issue and is now regulatory.

References

1. 2007 California Building Code, CCR, Title 24, Part 2, Volume 2 of 2, Chapter 31F “Marine Oil Terminals” (MOTEMS).

2. “Tsunami Hazard Assessment for the Ports of Long Beach and Los Angeles – FINAL REPORT”, Prepared for the Ports of Long Beach and Los Angeles, by Moffatt & Nichol, April 2007.

3. Borrero, Jose, Lori Dengler, Burak Uslu, Costas Synolakis, “Numerical Modeling of Tsunami Effects at Marine Oil Terminals in San Francisco Bay”, prepared for the Marine Facilities Division of the California State Lands Commission, June 8, 2006.

4. EMI, 2006, “Port-Wide Ground Motion and Palos Verdes Fault Study, Port of Los Angeles, CA, “Final Report, EMI Project No 02-131-11”, December 2007.

5. Kriebel, David, “Mooring Loads Due to Parallel Passing Ships”, TR-6056-OCN, 30 September 2005.

6. Goel, Rakesh, DRAFT “Simplified Procedures for Seismic Analysis and Design of Piers and Wharves in Marine Oil and LNG Terminals”, June 2008, Department of Civil and Environmental Engineering, California Polytechnic State University, Report CP/SEAM-08/01.