Current Implementation of the Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS)

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MOTEMS CODE REVISIONS

- Revision 0 has been effective since February 2006.
- Revision 1 will be effective 1 January 2011.
- All MOTEMS related work must comply with the MOTEMS version in effect at the time of submittal, provided that construction begins within 1 year.
RISK CLASSIFICATION OF CALIFORNIA MOTs

- **11 “HIGH” Risk MOTs**
  (Initial Audits due August 6, 2008)

- **17 “MEDIUM” Risk MOTs**
  (Initial Audits due February 6, 2010, reviews in progress)

- **3 “LOW” Risk MOTs**
  (Initial Audits due February 6, 2011)

- **? New “HIGH” Risk MOTs**
  (Initial Audits due within 3 years of commencement of operations – MOTEMS § 3102F.3.3.1)
INITIAL AUDIT RESULTS
(High and Moderate Seismic Risk)

1. **Structural issues** - associated with ordinary operations.

2. **Seismic issues** - when subjected to the Level 2 return period earthquake.

3. **Soil failures** - liquefaction or significant slope movement associated with the Level 2 earthquake motion.
INITIAL AUDIT RESULTS –
Ordinary Operations Issues

1. Almost all terminals have **structural issues** associated with ordinary operations (Modify Terminal Operating Operating Limits):
   - Reduce Operating Wind Limits
   - Terminate Operations if Current Exceeds capacity of facility
   - Reduce Operating Impact Velocity (with device to measure compliance/non-compliance)
   - Reduce Vehicular Traffic
   - Reduce Vessel Size
   - Other?
INITIAL AUDIT RESULTS – Seismic Issues

2. Almost all terminals have **seismic issues**, when subjected to the Level 2 return period earthquake:

- Per MOTEMS, determine a rehabilitation schedule that is mutually agreed upon by MFD/CSLC and the operator.
- Continue operations and meet rehabilitation deadlines.
- Reduce oil at risk with additional valves, changes in pipeline configurations, etc.
INITIAL AUDIT RESULTS – Geotechnical Issues

3. Some terminals have liquefaction, soil failures, slope movement associated with the Level 2 earthquake motion.

- MFD/CSLC will review/request changes, on a case-by-case basis.
- Reduce oil at risk.
- Design structure to carry soil kinematic loads.
- Other?
MOTEMS REVISION 1 (Some Examples)

- Tsunami height to be added to “mean high tide”
- Slight changes to load combinations
- Retaining walls – peer review not always required
- In-ground hinge strain levels modified for Level 2 seismic performance criteria
ES 1 and 2 tables will be updated.
Simplified approximate methods to evaluate capacity/demand using “displacement ductility” approach of Prof. R. Goel.
Add allowable non-linear behavior of pipelines (Level 2 seismic demand, B31E).
Update Division 6 (Geotechnical Hazards and Foundations).
Letters to operators (high and moderate risk) informing them to start using the TOLs from their MOTEMS audits. Reviews are in progress.

MOTEMS impact velocities – long term rehabilitation to values in Table 31F-3-9, with the assessment values of Table 31F-2-5.

Velocity monitoring equipment - “interim” solution.

Operations/training in place?
If no changes, no significant degradation, initial analyses should not have to be repeated.

New analyses - if larger vessels, significant additional mass, significant structural degradation, new piping systems, etc.

Reasonable re-inspection of topsides.

Review/update of MOTEMS deficiencies and rehabilitation.
Rehabilitation Schedules

- In general, all MOTEMS upgrades should be completed within 5 years of the initial audit.

- Future audits will track completion of ES-2 deficiencies.

- MFD Engineering will track schedules and completion with the new Excel ES-1 and ES-2 tables.
Additional Questions & Comments? MOTEMS Revision 1 is on the CSLC/MFD Website

MFD Engineering website:

http://www.slc.ca.gov/Division_Pages/MFD/MFD_Home_Page.html

Thank you and enjoy PF 2010.