

LIQUIFIED NATURAL GAS MARINE TERMINAL ENGINEERING AND MAINTENANCE STANDARDS (LNGTEMS)



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MARINE FACILITIES DIVISION CALIFORNIA STATE LANDS COMMISSION

- ◆ From the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990:
 - “The commission shall adopt rules, regulations, guidelines and commission leasing policies for reviewing the location, type, character, performance standards, size and operation of all existing and proposed marine terminals within the state, whether or not on lands leased from the commission, and all other marine facilities on land under lease from the commission to minimize the possibilities of a discharge of oil.” (Sect. 8755 (a))



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- ◆ From the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990:
 - “The commission shall periodically review and accordingly modify its rules, regulations, guidelines and commission leasing policies to ensure that all operators of marine terminals within the state and marine facilities under the commission’s jurisdiction always provide the best achievable protection of the public health and safety, and the environment...” (Pub. Res. Code Sect. 8756)



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- ◆ From the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990:

Oil is defined as “any kind of petroleum, liquid hydrocarbons or petroleum products or any fraction or residues therefrom, crude oil, bunker fuel... liquid distillates from unprocessed natural gas.”



MARINE OIL TERMINAL ENGINEERING AND MAINTENANCE STANDARDS (MOTEMS)

- ◆ **Standards Completed and on the web
(www.slc.ca.gov.gov/Division_Pages/MFD)**
- ◆ **Defines Specific Engineering Criteria for Both
Existing and New MOTs**
- ◆ **Meets SLC mandate to protect the environment
and ensure safe operations at marine oil terminals.**
- ◆ **MOTEMS – Effective February 6, 2006, initial audits
due August 2008, Chapter 31 of the California
Building Code.**



LNG MARINE TERMINAL ENGINEERING AND MAINTENANCE STANDARDS (LNGTEMS)

- ◆ **Funded by the California State Lands Commission, FY 2004 - 2008.**
- ◆ **Project officially started on April 19, 2005.**
- ◆ **Need for standards for California, as well as for the rest of the US.**



LNG MARINE TERMINAL ENGINEERING AND MAINTENANCE STANDARDS (LNGTEMS)

FOUR POSSIBLE CONFIGURATIONS:

- ◆ Deep water offshore mooring (LNG vessel + FSRU + riser/plem/pipelines)
- ◆ Conventional wharf/pier type, within a port
- ◆ Offshore and moored adjacent to an existing oil platform (mooring, platform requalification, riser/plem/pipelines)
- ◆ Gravity Based Structure (GBS) in relatively shallow water

RISK LEVELS CONSISTENT WITH LOCATION



LNG MARINE TERMINAL ENGINEERING AND MAINTENANCE STANDARDS (LNGTEMS)

HAZARDS AND POTENTIAL LEAK ISSUES DIFFERENT FROM THOSE OF OIL TERMINALS OR PLATFORMS

- ◆ **DISTANCE TO LFL OR LFL/2**
- ◆ **DISTANCE TO VARIOUS THERMAL RADIATION LEVELS**
- ◆ **EFFECTS OF CRYOGENIC BEHAVIOR OF STRUCTURAL MATERIALS.**
- ◆ **CASCADING OF EVENTS FOLLOWING A RUPTURE/SPILL.**
- ◆ **RISK DETERMINED SCENARIOS AND RESULTING LOADS (THERMAL, BLAST, CRYOGENIC, ETC.)**



LNGTEMS STANDARDS

- ◆ **STRUCTURAL PERFORMANCE CRITERIA AND ANALYSES**
- ◆ **MOORING CRITERIA AND ANALYSES**
- ◆ **PIPELINE & PIPELINE SUPPORTS CRITERIA**
- ◆ **MECHANICAL/ELECTRICAL EQUIPMENT**
- ◆ **MOUNTED EQUIPMENT/MOORING HARDWARE**
- ◆ **INSPECTION AND MAINTENANCE REQUIREMENTS**



LNGTEMS STANDARDS (Continued)

- ◆ **GEOTECHNICAL CRITERIA**
 - ◆ **FIRE DETECTION/SUPPRESSION SYSTEMS**
 - ◆ **DISPERSION & RADIATION CRITERIA AND ANALYSES**
 - ◆ **GENERAL DESCRIPTION OF REQUIREMENTS FOR A RISK ASSESSMENT.**
- OTHER ISSUES/COMPONENTS NECESSARY FOR THE TRANSFER OF LNG**



LNGTEMS TEAM

- ◆ **Primary contractor: Halcrow HPA, Oakland, CA**
- ◆ **Sub-contractors:**
 - ◆ **Aker Kvaerner, Houston, TX**
 - ◆ **EnergO Engineering, Houston, TX**
 - ◆ **Others to be determined.**
 - ◆ **ALL WORK PERFORMED UNDER THE DIRECTION OF MFD ENGINEERING.**



LNGTEMS PROGRESS

- ◆ **OFFSHORE PLATFORMS** – Major issues resolved, incorporating comments from the MMS.
- ◆ **FLOATING (FSRU) TYPE** – No major issues, similar to API RPs for offshore floating production units.
- ◆ **WHARF/PIER CONFIGURATIONS** – Similar to the MOTEMS
- ◆ **GRAVITY-BASED STRUCTURES** – Minimal effort/guidance



LNGTEMS PROGRESS

◆ CURRENTLY BEING REVIEWED:

Mechanical

Piping

Fire detection/suppression

Electrical

MOST OF THESE COMPONENTS WILL HAVE COMMON REQUIREMENTS, NOT DEPENDENT ON CONFIGURATION.



LNGTEMS PROGRESS

Terminals Visited

- ◆ **Costa Azul, Mexico**
- ◆ **Trunkline, Lake Charles, LA**
- ◆ **Eco Electrica, Puerto Rico**
- ◆ **Planned: Tokyo, Japan**



LNGTEMS REFERENCES

Hierarchy Issues

- ◆ NFPA 59A
- ◆ API RP 2A AND NEW API RP 2FB AND DRAFT API RP (Structural Integrity Management)
- ◆ MEXICAN LNG CODE
- ◆ VARIOUS DnV GUIDELINES
- ◆ EN 1473 CODE
- ◆ CFRs



LNGTEMS PROGRESS

Example Topic (Offshore Platforms)

TOPIC	GUIDANCE	LNG GUIDANCE	PROPOSED	AGREED
Seismic	API RP 2A	NFPA 59A refers	ISO 19901-2	Use ISO 19901 w/
Spectra	ISO 19901-2	to ASCE 7		2 spectral shapes
shape				



WHAT'S NEXT

- ◆ **COMPLETE INITIAL DRAFT – JANUARY 2008**
- ◆ **ENGINEERING WORKSHOP IN HOUSTON, FEBRUARY 2008**
- ◆ **MODIFIED DRAFT MID 2008**
- ◆ **FINAL DRAFT FOR MFD ENGINEERING REVIEW AND INTEGRATION – JULY 2008**
- ◆ **LNGTEMS READY FOR REGULATIONS – FIRST QUARTER, 2009 (Approx. 100-150 pages).**



LNGTEMS CONCLUSIONS

- ◆ Will include four configurations
- ◆ Standards similar to the MOTEMS
- ◆ Workshops will include industry, regulators and consultants
- ◆ Code will be specific about hierarchy and guidance.