

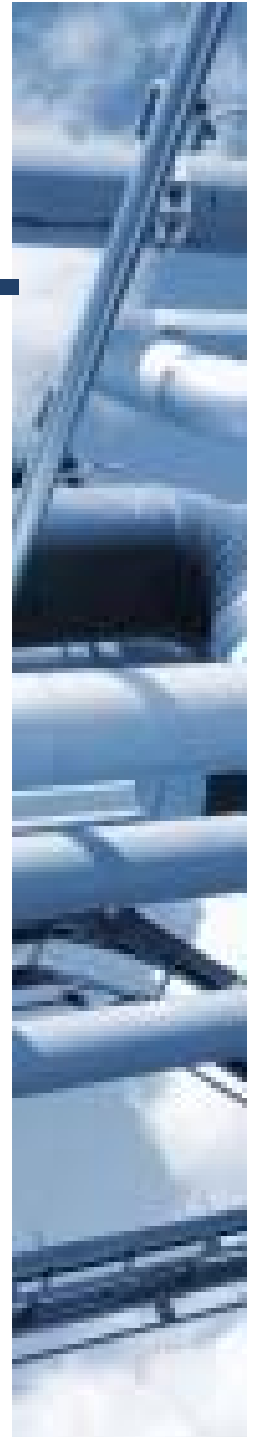
PSM • RMP • CalARP
Regulatory Framework Update
& Implementation Strategies
with Focus on Oil and Gas Facilities

John M. Johnson

Risk Management Professionals
U.S. (877) 532-0806 ♦ www.RMPCorp.com

Risk Management Professionals

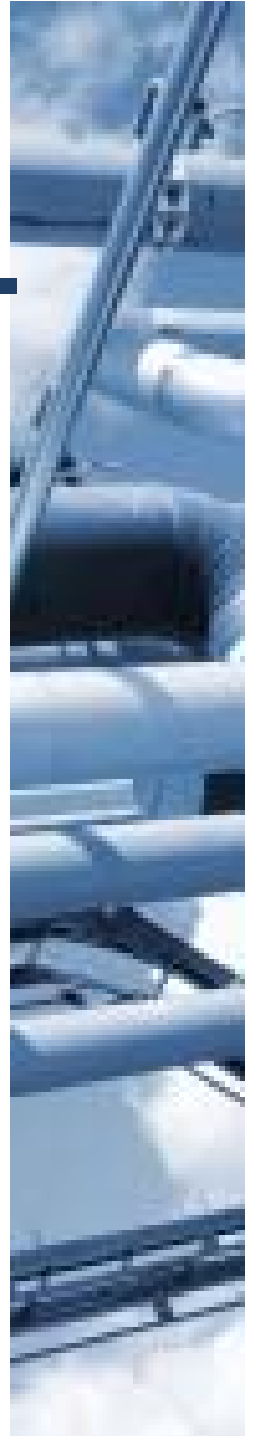
- Key Services
 - Process Safety & Risk Management
 - Process Hazard Analysis (**PHA**)
 - What-If? Studies
 - Hazard & Operability (**HAZOP**) Studies
 - Layer of Protection Analysis (**LOPA**)
 - Safeguard Protection Analysis (**SPA**)
 - Safety Integrity Level (**SIL**) Assessment
 - SIL Verification
 - Process Safety Management (**PSM**)
 - Risk Management Program (**RMP**)
 - California Accidental Release Prevention (**CalARP**) Program
 - Inherently Safer Systems (**ISS**) & Hierarchy of Hazard Control Analysis (**HCA**)
 - Safety & Environmental Management Systems (**SEMS**)
 - Damage Mechanism Review (**DMR**)
 - **Safety Case**
 - ERP Development & Emergency Preparedness Training (**NIMS**-Compatible)
 - **Risk-Graph** and **Bow-tie** Analysis
 - **QRA** Services – **FTA** & **ETA**
- Background
 - Services to Process Industries, Utilities, & Government Since 1995
 - International w/US Focus
- Qualifications
 - Extensive Experience
 - Two Decades of Risk-Based Applications
 - Engineering, Safety, Security, and Emergency Response Backgrounds
- Locations
 - HQ: Irvine, CA
 - Houston ♦ Norfolk ♦ Walnut Creek
- Contact
 - info@RMPCorp.com
 - www.RMPCorp.com
 - U.S. (877) 532-0806



John M. Johnson

Risk Management Professionals

- Chemical Engineering - University of California, Riverside
- HAZOP / LOPA Study Facilitator
 - Petroleum Refineries
 - Ammonia Refrigeration
 - Cogeneration Facilities
 - General Chemical Manufacturing
- Dispersion Modeling
- CalARP / RMP / PSM Program Development and Auditing
- Webinar / Presentation Speaker on HAZOP/LOPA Guidance



Key Topics

- Expansion/Modernization Initiatives Overview
- Addressing Key Elements of CalARP & CalPSM-R Regulatory Expansion/Modernization Efforts (with Implementation Tips)
- General Implementation Strategies & Resources
- Questions

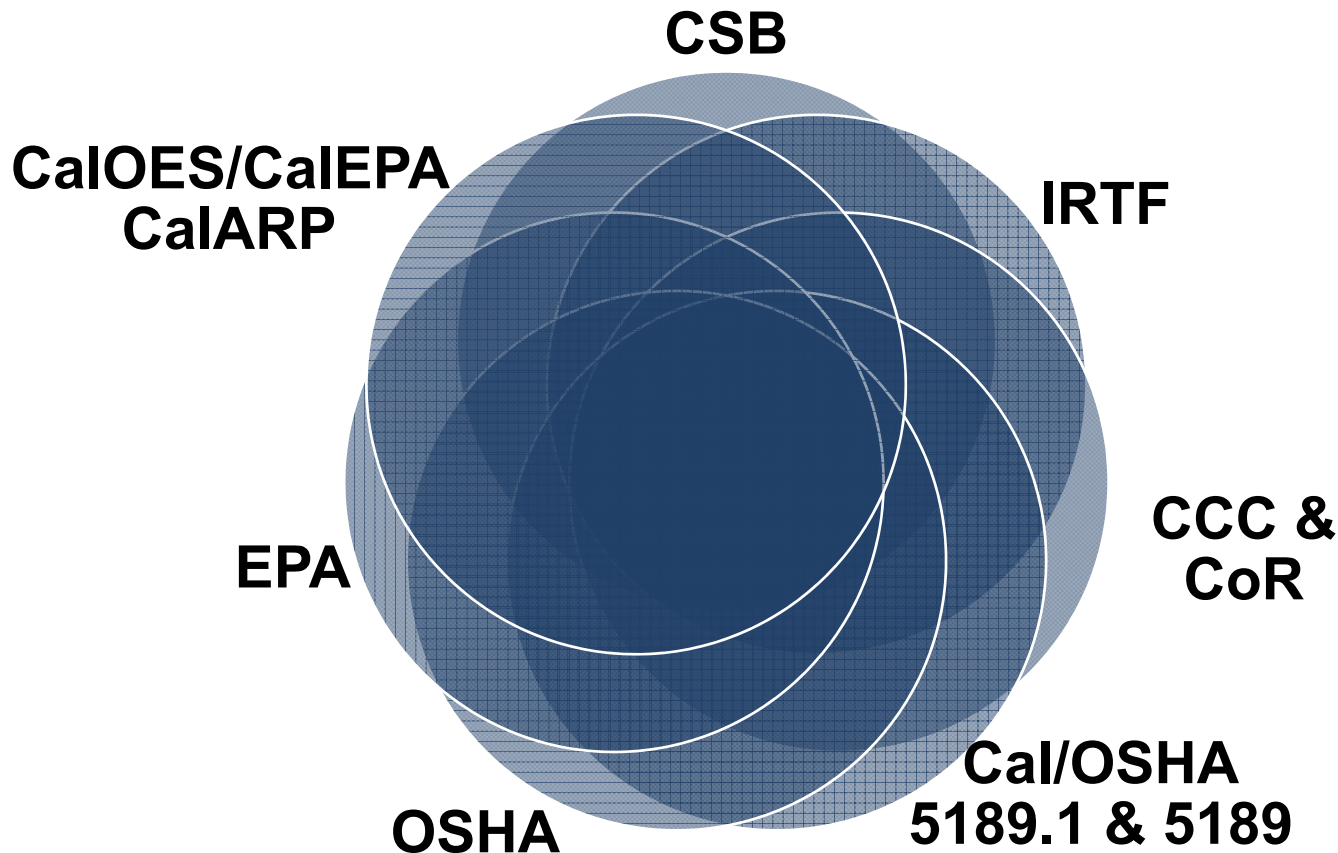


Overview of SMS Program Expansion/Modernization Initiatives



Key Modernization Activities (Onshore Facilities)

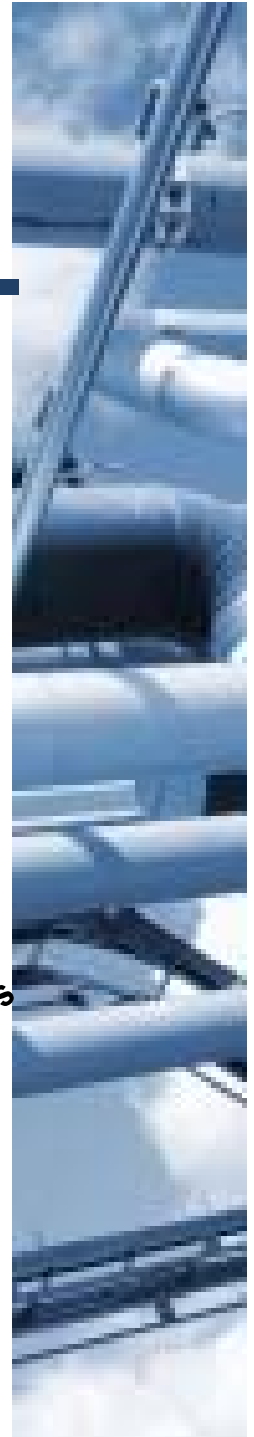
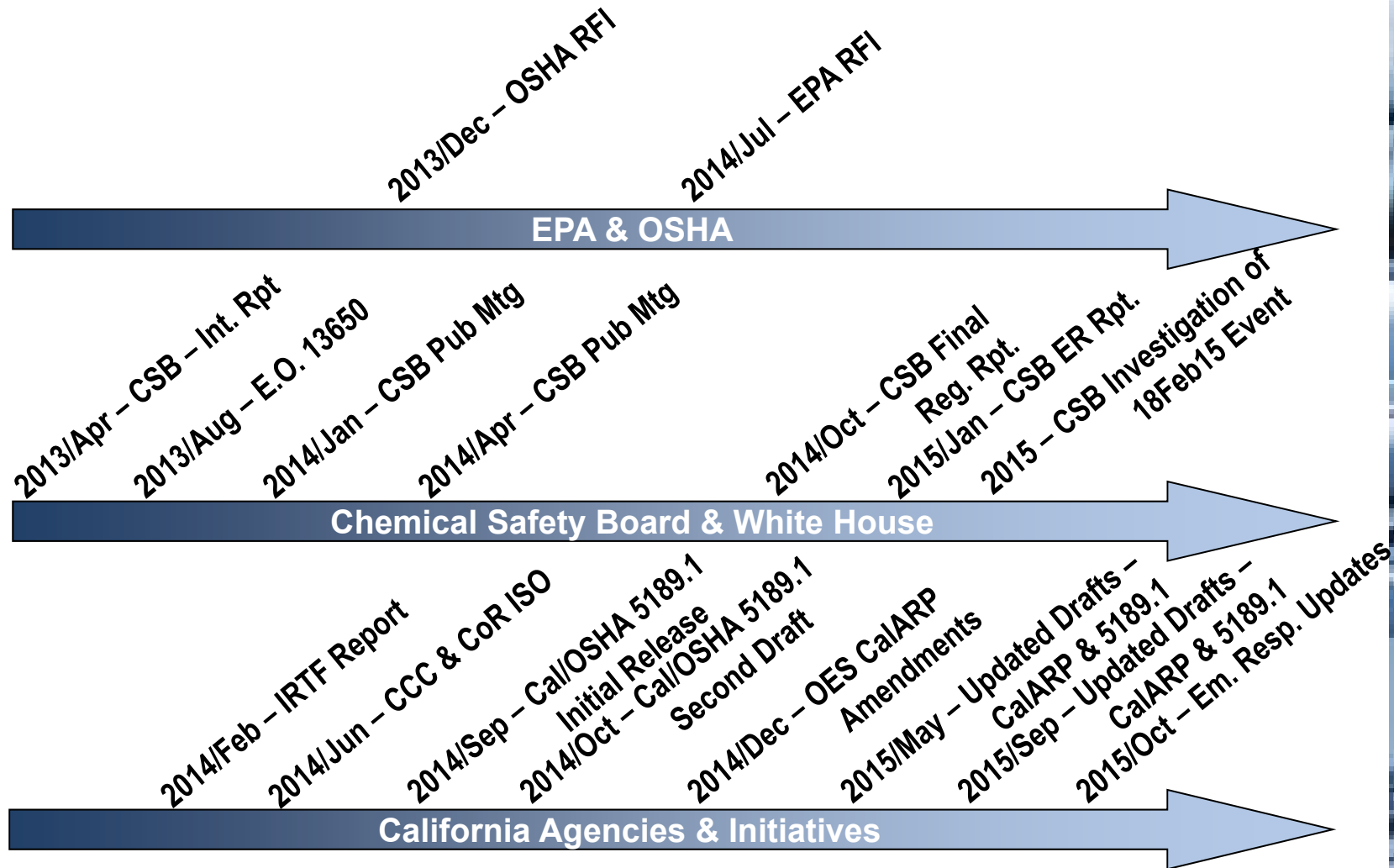
www.RMPCorp.com/SMS_Regulatory_Updates/



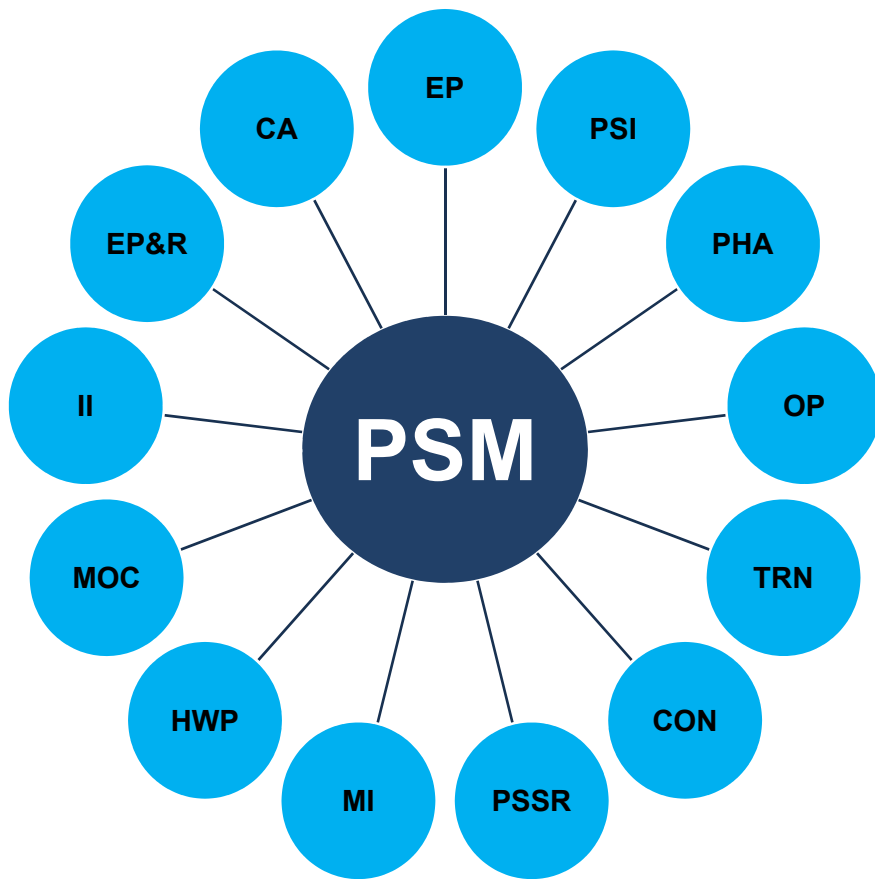
CaIOES: California Office of Emergency Services; Ca/OSHA: California Occupational Safety & Health Administration; CSB: Chemical Safety Board; EPA: United States Environmental Protection Agency; IRTF: Interagency Refinery Task Force; OSHA: U.S. Occupational Safety & Health Administration; CalEPA: California Environmental Protection Agency; CCC: Contra Costa County; CoR: City of Richmond



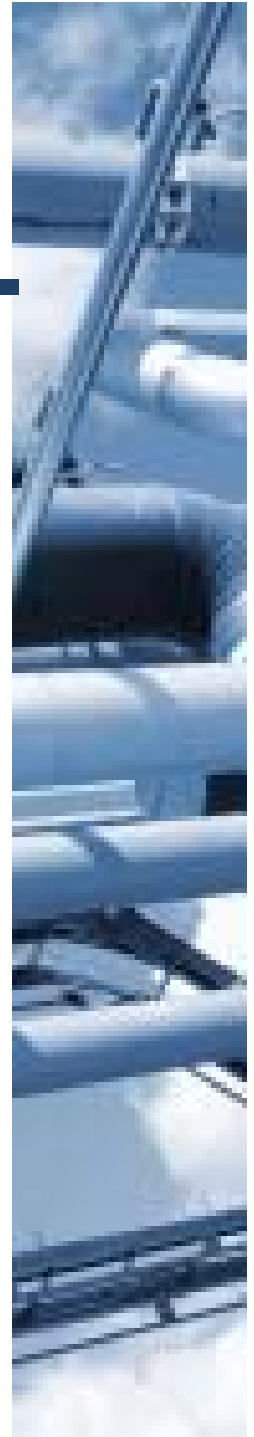
Recent US SMS Regulatory Activities (Onshore Facilities)



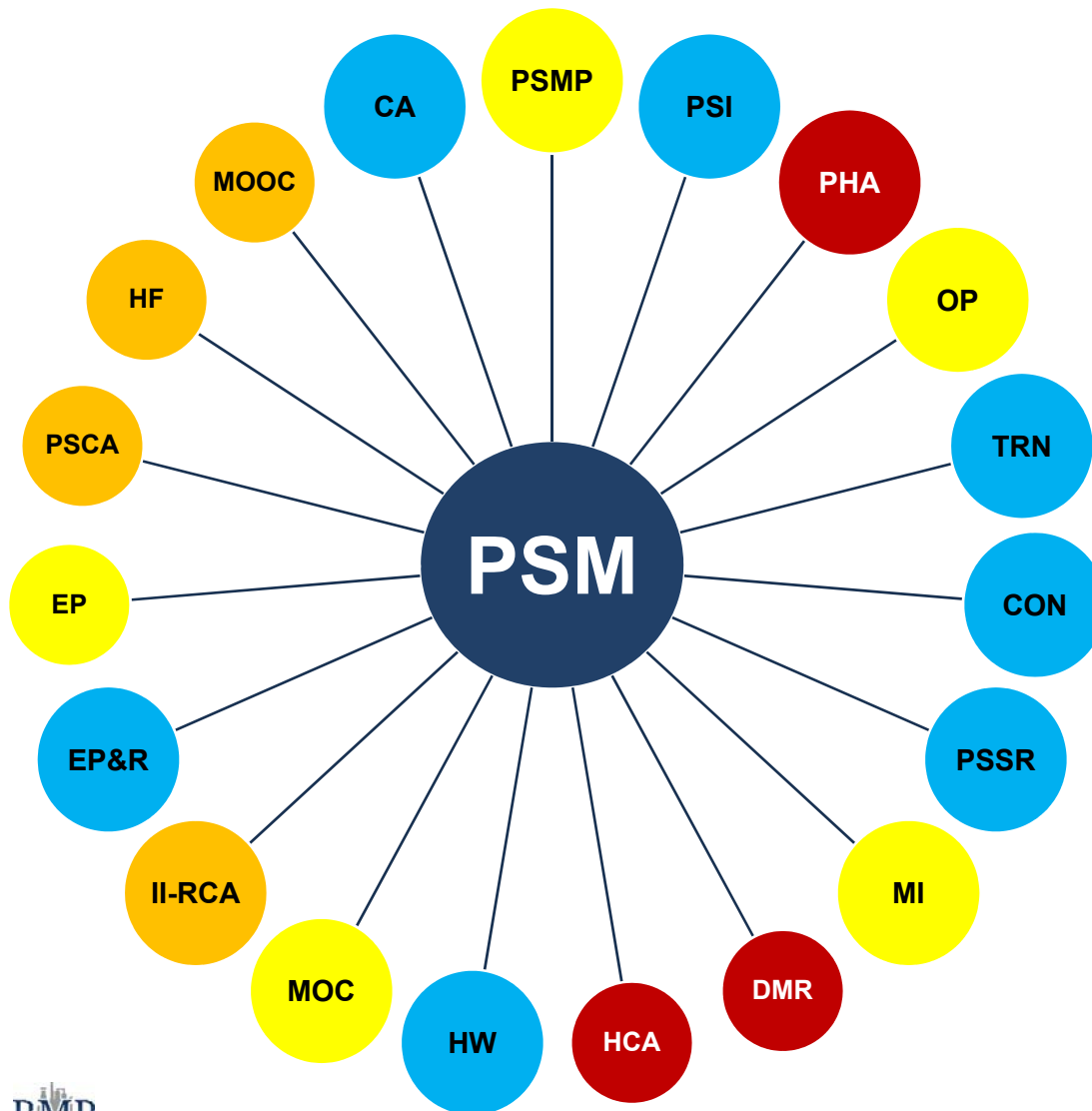
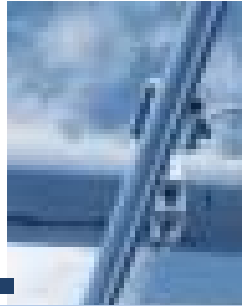
PSM Elements



- Employee Participation
- Process Safety Information
- Process Hazard Analysis
- Operating Procedures
- Training
- Contractors
- Pre-Startup Safety Review
- Mechanical Integrity
- Hot Work Permit
- Management of Change
- Incident Investigation
- Emergency Planning & Response
- Compliance Audits (CA-IIPP)

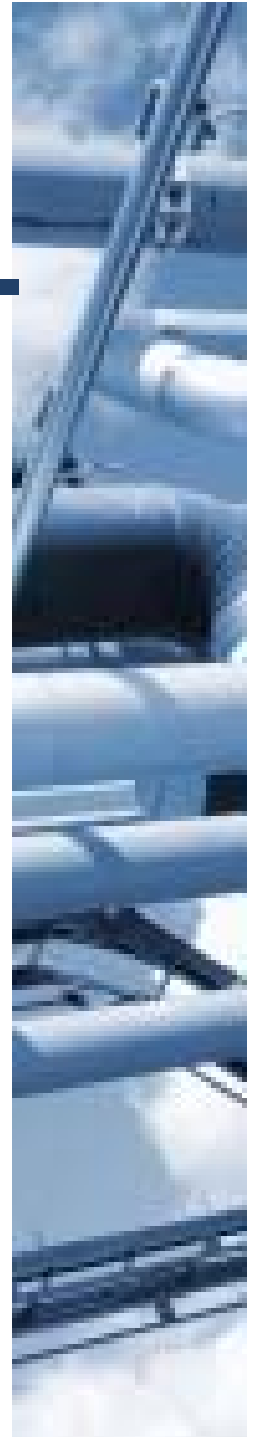
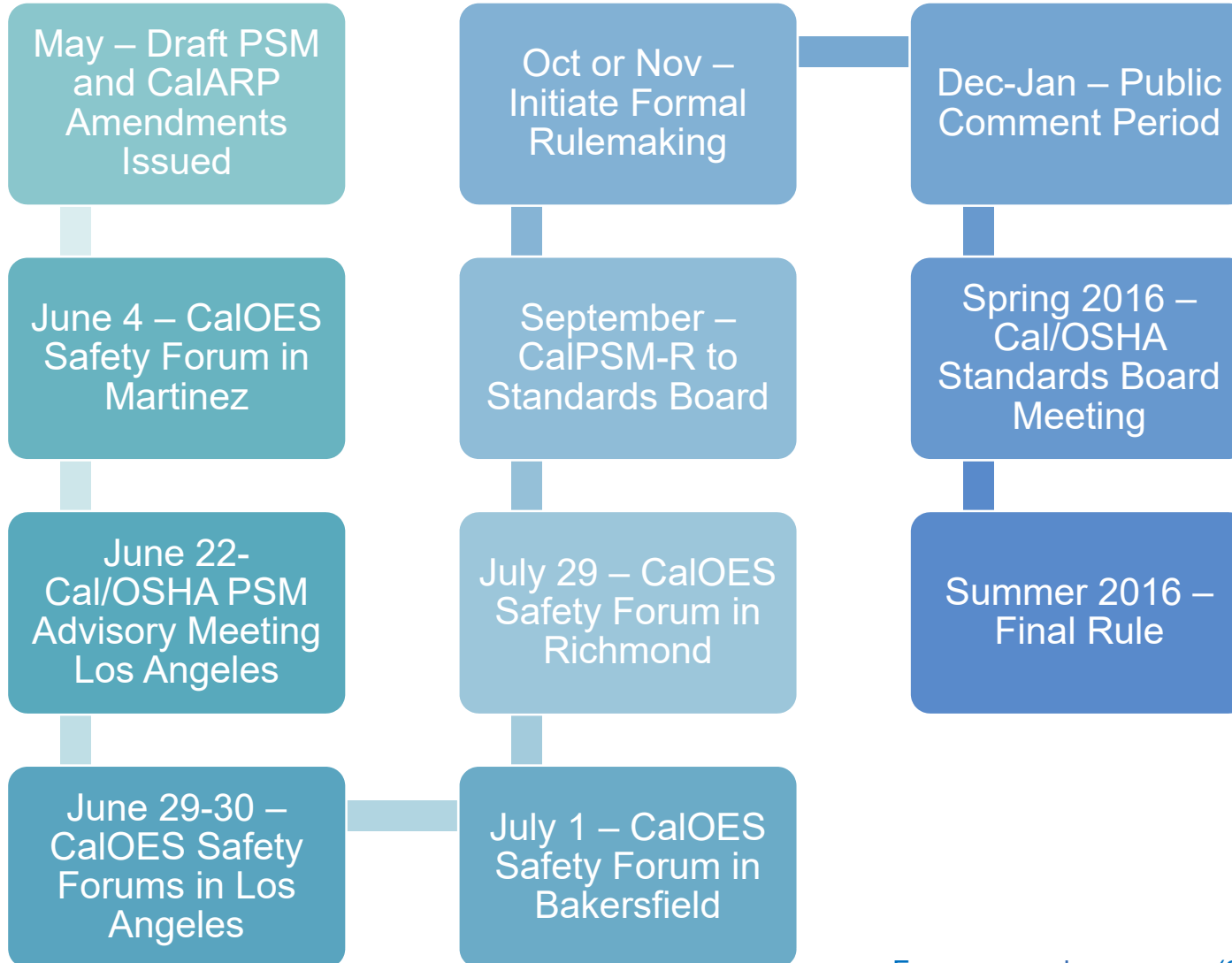


CalPSM-R Elements

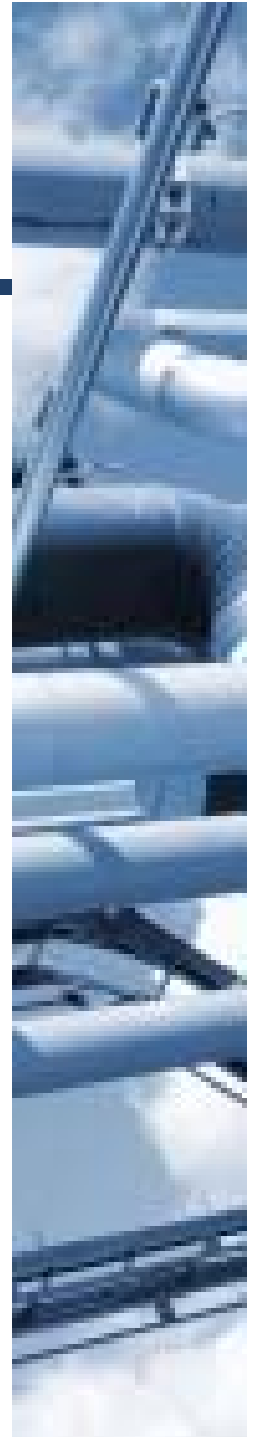


- Process Safety Information
- Process Hazard Analysis
- Operating Procedures
- Training
- Contractors
- Pre-Startup Safety Review
- Mechanical Integrity
- Damage Mechanism Review
- Hierarchy of Hazard Control Analysis
- Hot Work
- Management of Change
- Incident Investigation - RCA
- Emergency Planning & Response
- Employee Participation
- Process Safety Culture Assessment
- Human Factors
- Management of Organizational Change
- Compliance Audits
- PSM Program

Projected CalARP & CalPSM-R Timeline



Addressing Key Elements of CalARP & CalPSM-R Regulatory Expansion/Modernization Efforts (with Implementation Tips)



Impact Categories

- Following table follows 5189.1 Draft Regulation Table of Contents
- Three Main Categories
 - * indicates minimal changes to regulation or minimal effort needed for compliance
 - ** indicates moderate changes to regulation or moderate effort needed for compliance
 - *** indicates new element or significant effort needed for compliance



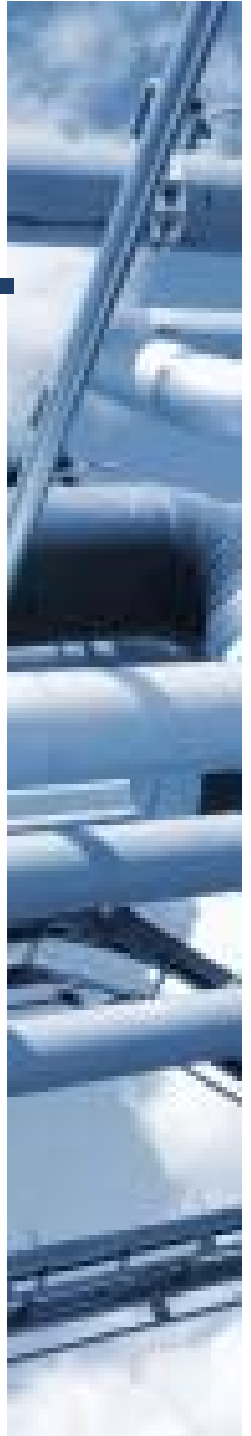
Current Cal/OSHA & CalARP Initiatives

Program Element	Cal/OSHA (Draft)	CalARP (Draft)
Process Safety Information (PSI) *	5189.1(d)	2762.1
Process Hazard Analysis (PHA) * Safeguard Protection Analysis (SPA) ***	5189.1(e)	2762.2 2762.2.1
Operating Procedures (OP) **	5189.1(f)	2762.3
Training *	5189.1(g)	2762.4
Contractors (CON) *	5189.1(h)	2762.12
Pre-Startup Safety Review (PSSR) *	5189.1(i)	2762.7
Mechanical Integrity (MI) ** Damage Mechanism Review (DMR) ***	5189.1(j) 5189.1(k)	2762.5
Hierarchy of Hazard Control Analysis (HCA) ***	5189.1(l)	2762.13
Hot Work *	5189.1(m)	2762.11
Management of Change (MOC) **	5189.1(n)	2762.6
Incident Investigation – Root Cause Analysis (II-RCA) **	5189.1(o)	2762.9
Emergency Planning and Response *	5189.1(p)	2765.2
Employee Participation (EP) **	5189.1(q)	2762.10
Process Safety Culture Assessment (PSCA) ***	5189.1(r)	2762.14
Human Factors ***	5189.1(s)	2762.15
Management of Organizational Change (MOOC) ***	5189.1(t)	2762.6
Compliance Audits (CA) *	5189.1(u)	2762.8
Process Safety Management Program ***	5189.1(v)	2762.16
Division Access to Documents and Information **	5189.1(w)	2762.17
Implementation **	5189.1(x)	



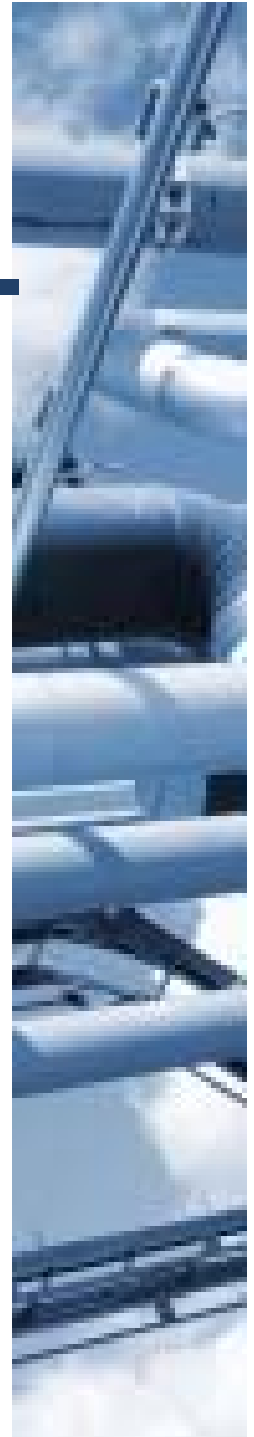
Process Safety Management Program (*CalPSM-R §5189.1(v), CalARP §2762.16*)

- Reviewed and updated at least every 3 years
 - Develop annual goals to achieve continuous improvement in all subsections
 - Written PSM Policies and Procedures
 - Track & document all changes to program
 - Develop, implement & maintain program to track and document Process Safety Performance Indicators
 - Annual report/certification containing information on all process safety performance indicators (PSPIs) for previous year
- CalARP – Stop Work Authority and Hazard Reporting



Management System: PSPIs

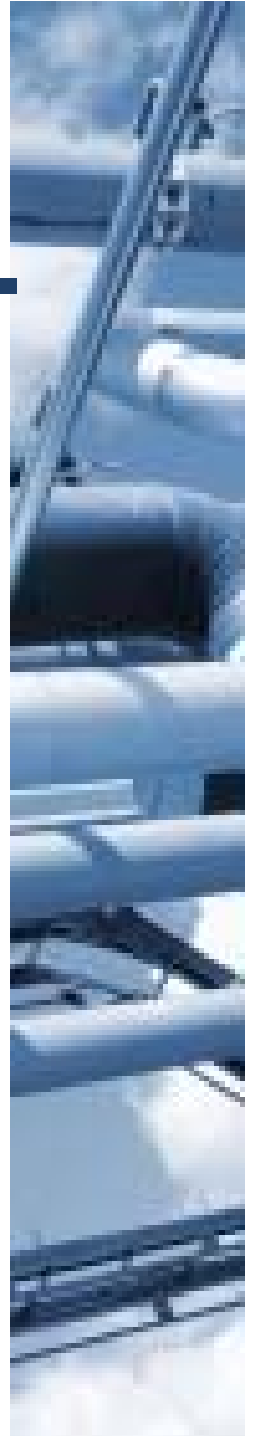
- Process Safety Performance Indicators (PSPIs)
 - From CSB 10Nov14 Final Report
 - Monitor and Analyze Process Safety Indicators (CA-R23)
 - Common PSPIs: Annual reporting begins 01/01/2017
 - Past due inspections of process piping & components;
 - Past due inspections of pressure vessels;
 - Past due recommendation actions;
 - Each leak seal repair on utility systems and date(s) installed;
 - Number of major incidents that occurred in each calendar year.
 - CalOES to place PSPIs on public website
 - Same indicators (past due items & repairs), and monthly reporting/update as CalPSM-R
 - Program 4 Indicators: Develop site-specific list
 - Annual report/certification by January 31 for the previous year
 - CCPS Process Safety Metrics and API RP 754



Management of Organizational Change

(*CalPSM-R §5189.1(t), CalARP §2762.6(i)*)

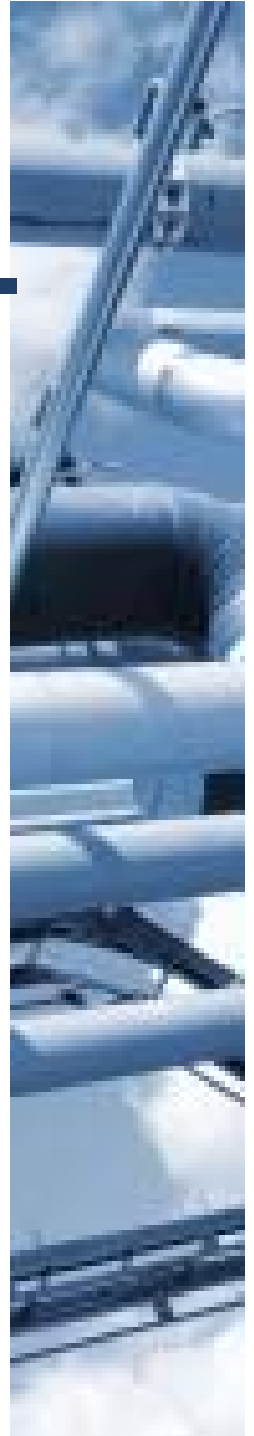
- Include MOOC assessment to address:
 - Experience levels of employees before and after the proposed change
 - Describe the change, team make-up, team rationale, and actions required to make the change
- Ensure job functions are up-to-date and accurate for all affected positions
- Document the following:
 - Results of analysis
 - Team make up
 - What factors were considered
 - Decision to implement the change or not
 - Basis for decision
 - Necessary actions required to move forward with the change
- Shall include Human Factors analysis
- Employees potentially affected by change shall be given information prior to implementation



Human Factors

(CalPSM-R §5189.1(s), CalARP §2762.16)

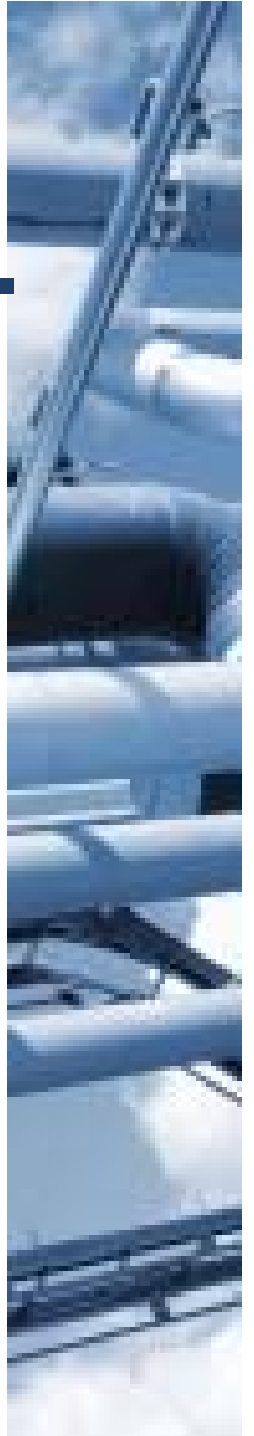
- Develop, implement & maintain written program
- Program should evaluate:
 - Staffing levels
 - Complexity of and length of time needed to complete tasks
 - Level of training and expertise of employees
 - Human-machine interface and human-system interface
 - Physical challenges of the work environment
 - Employee fatigue and shiftwork/overtime
 - Communications
 - Understandability and clarity of SOPs and Maintenance Procedures
- Analysis of human factor controls on process equipment in incident investigation, PHAs, MOOCs, SPA, or HCAs (e.g., error proof mechanisms, automatic alerts, automatic system shutdowns for critical operational errors)



Human Factors

(continued)

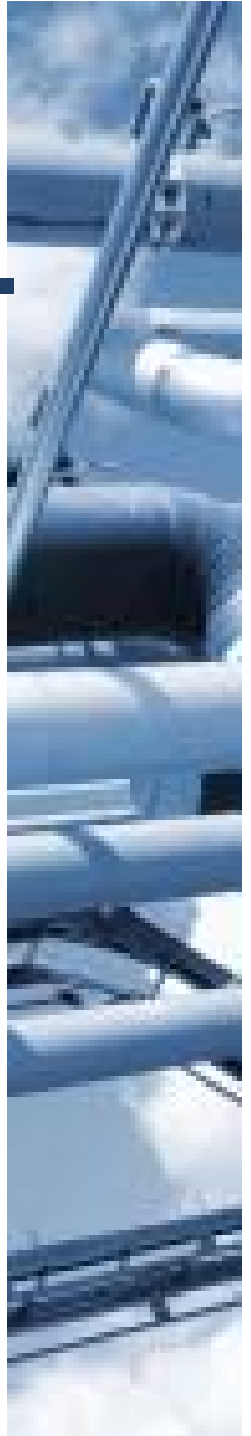
- Assess human factors in new SOPs and maintenance procedures
- Assess human factors in existing SOPs and maintenance procedures
 - Revise procedures accordingly
 - 50% assessment complete within 2 years (following effective date of regulation)
 - 100% assessment complete within 3 years (following effective date of regulation)
- Provide training to operations and maintenance personnel
- Ensure employee/representation in the development, implementation, and maintenance of the Human Factors Program



Incident Investigation

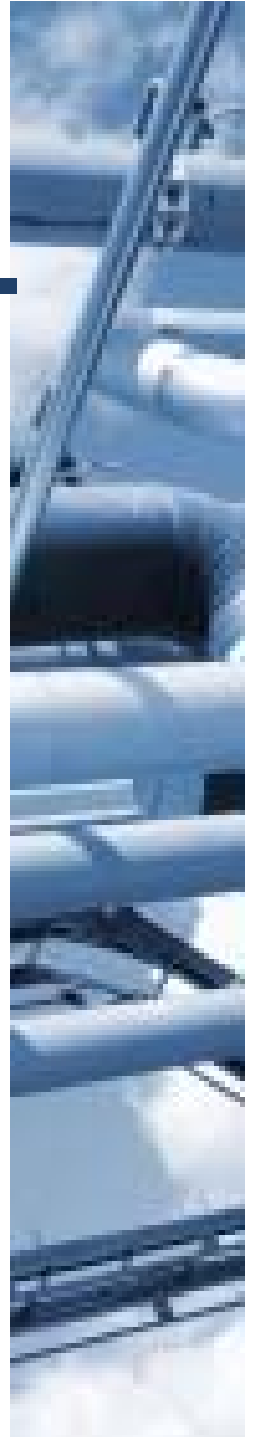
(CaIPSM-R §5189.1(o), CalARP §2762.9)

- Incident Investigation – Root Cause Analysis
 - Implement an effective Root Cause Analysis (RCA)
 - Team must include a person with RCA expertise and oversight
 - Team must investigate underlying management system causes (including organizational and safety culture)
 - Review results of HCA and DMR as part of II
 - Conduct DMR, PHA, HCA, and SPA (demonstrate if an analysis is not applicable)
 - Developing recommendations – conduct DMR, PHA, HCA, and SPA. Recommendations have same implementation requirements as PHA.
 - Timelines:
 - Assemble Team within 48 hours
 - Initial Report within 90 days
 - Final Report within 6 months



Process Safety Culture Assessment (PSCA) (CalPSM-R §2762.14, CalARP §2762.14)

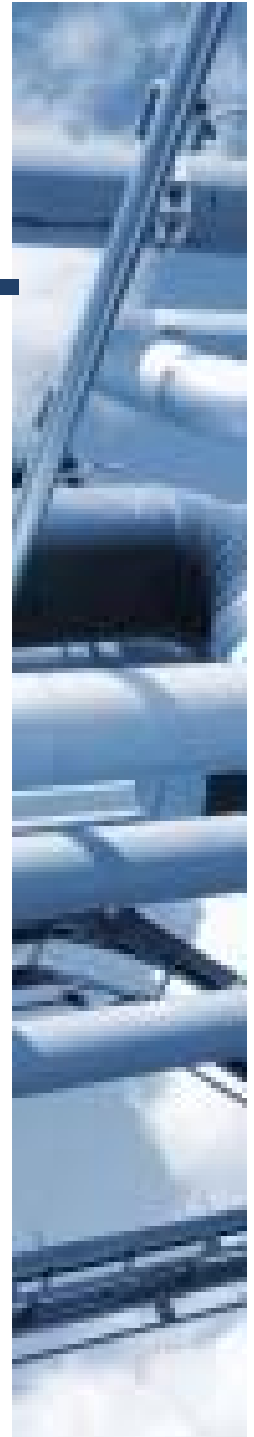
- PSCA Program should address:
 - Encouragement for reporting safety concerns
 - Rewards do not deter reporting safety concerns
 - Ensure safety is not compromised by production
 - Process Safety Leadership at all levels
 - Human Factors Program to be included for all PSM elements
- Written PSCA Program should include:
 - Methods used to assess PSC
 - Conclusions from the PSCA
 - Rationale of the conclusions
 - Recommendations and action plan from PSCA
 - Report to be completed within 90 days of PSCA end
 - Signed off by refinery manager



Mechanical Integrity (MI)

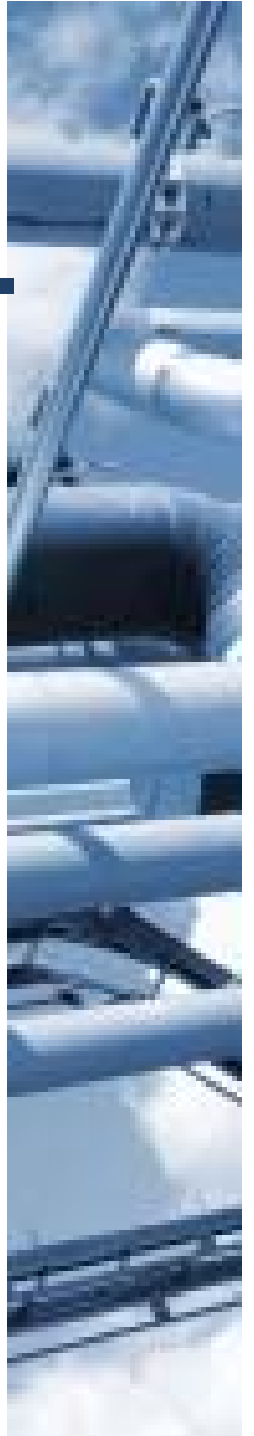
(CalPSM-R §5189.1(j), CalARP §2762.5)

- No discontinuities with current industry best practices
- Minimal substantive changes
- Clear instructions for safely conducting maintenance activities to be included in Mechanical Integrity Procedures
- Additional specificity on required documentation
- Clarification of records retention
- Additional specificity on availability of Mechanical Integrity Procedures and inspection documents
- Additional cross-referencing to Process Safety Information
- Addition of references to RAGAGEP
- For CalARP, DMR is located in 2762.5(f)



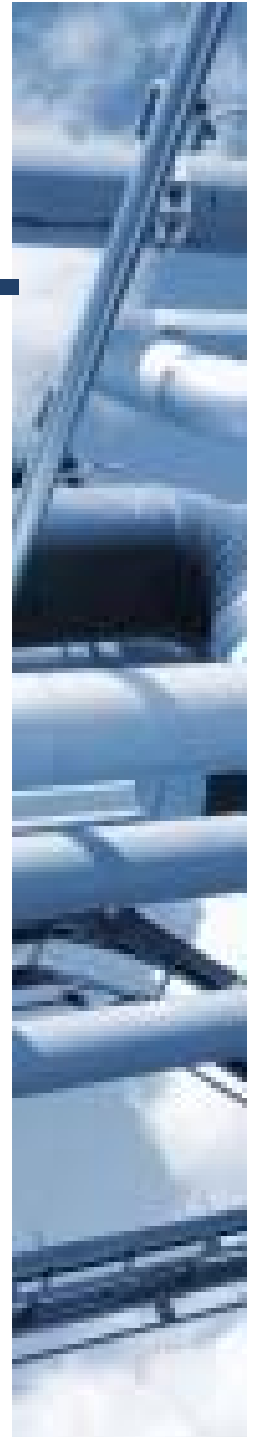
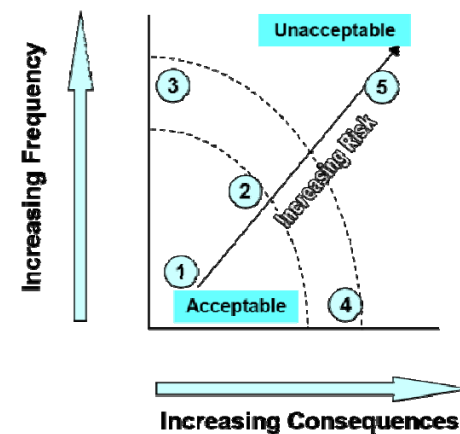
Damage Mechanism Review (DMR) (*CalPSM-R §5189.1(k), CalARP §2762.5(f)*)

- Damage Mechanisms – mechanical, chemical, physical or other process that results in equipment or material degradation
- Damage Mechanism Review (DMR) Timing:
 - Prior to any PHA and prior to changes affecting chemistry, metallurgy, or operating limits
 - Initial to take place at the earliest of the following:
 - Initial DMR within 5 years (50% within 3 years of CalARP/CalPSM-R promulgation)
 - Revalidated every 5 years or prior to a major change
 - Reviewed as part of an incident investigation



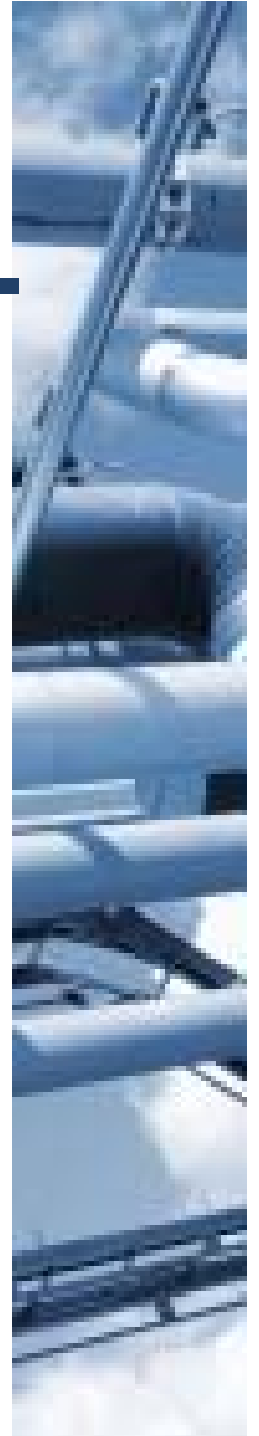
DMR Requirements (continued)

- At minimum, evaluate the following:
 - **Mechanical Loading Failure** – Ductile fracture, brittle fracture, buckling, mechanical fatigue
 - **Erosion** – Abrasive wear, adhesive wear, fretting
 - **Corrosion** – Uniform corrosion, localized corrosion, pitting
 - **Thermal-Related Failure** – Creep, thermal fatigue, transformation
 - **Cracking** – Stress-corrosion cracking
 - **Embrittlement** – High Temperature Hydrogen Attack (HTHA)
- DMR reports must be retained for the life of the process.



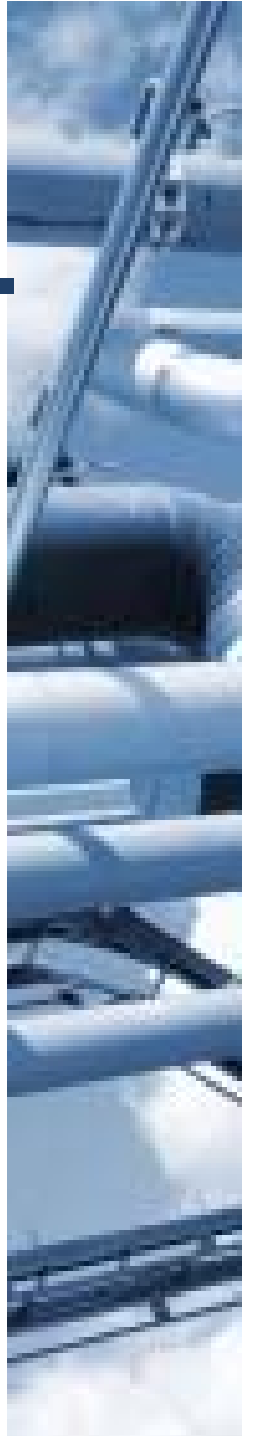
New Regulatory Updates

- From OSHA
 - Interpretation Letters (June-July 2015):
 - RAGAGEP Enforcement
 - Guidance on how to document RAGAGEP
 - Retail Exemption
 - If the facility does not fall under SIC 44 or 45, it is not eligible for the exemption
 - Covered Concentration
 - Uses EPA's 1% policy, rather than "commercial grade"
 - Other Enforcement/Interpretation Letters are reported to follow

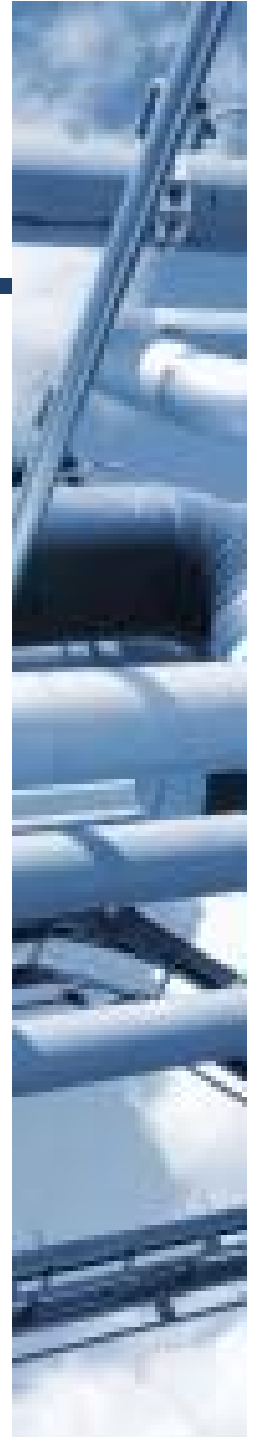


New Regulatory Updates

- From California:
 - SB-612:
 - UPA General Duty Clause
 - New mapping requirements
 - Other changes to UPA Programs for UST/AST, SPCC, hazardous waste
 - http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB612



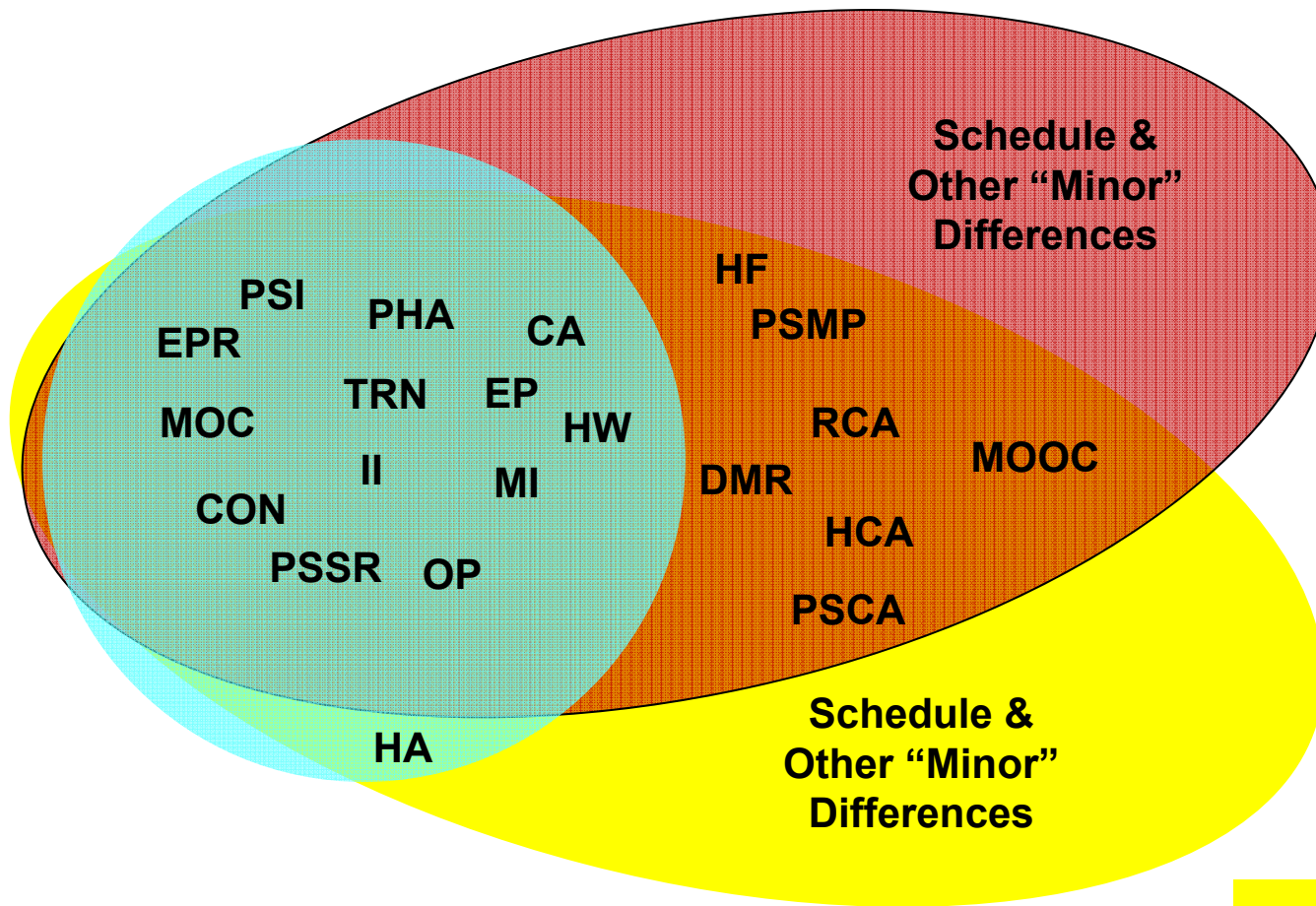
General Implementation Strategies & Resources



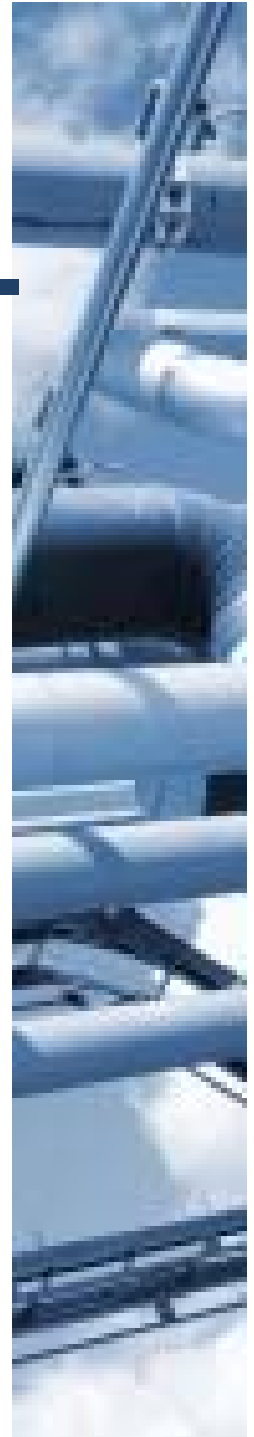
Overlap of Post-2016 CA SMS Programs (Onshore Petroleum Refineries)

Fed-RMP

CalPSM-R (5189.1)

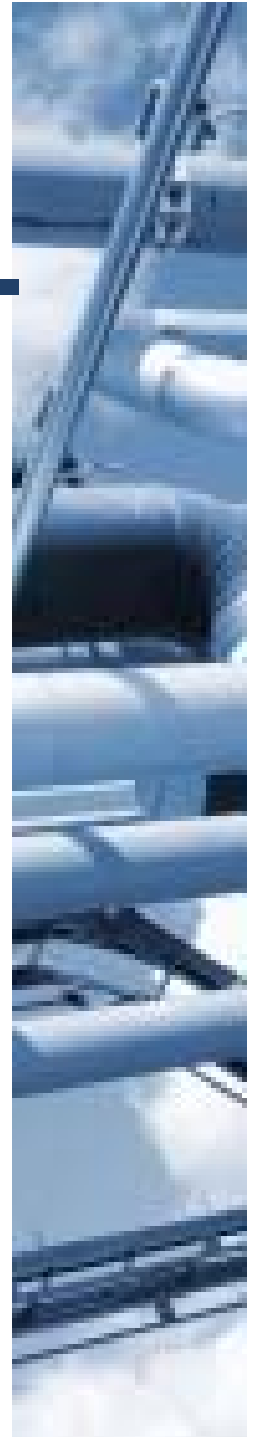


CalARP



Resources for Handling Evolving Requirements

- HAZOP/LOPA Facilitation Webinar Series (Module 10) – Effective approaches to handling CSB recommendations and PSM and CalARP changes
 - **DMR**
 - **SPA**
 - Inherently Safer Systems/Design (i.e., **HCA**)
- 2015 Global Congress on Process Safety – Papers
 - Maher, Nour, Schultz, “Effectively Addressing New PSM/RMP Damage Mechanism Review Requirements with an Integrated PHA (iPHA)”
 - Maher, Schultz, “Changes in the PSM/RMP Regulatory Framework (California and National)”
- Webinars – Updates on the PSM/RMP Regulatory Modernization Programs
 - 19Aug14
 - 25Sep14
 - 22Jan15
 - 09Apr15
 - 25Jun15
 - 30Jul15
 - 27Aug15
- Webinar – DMR and the Integrated PHA (iPHA) Approach – 26Mar15



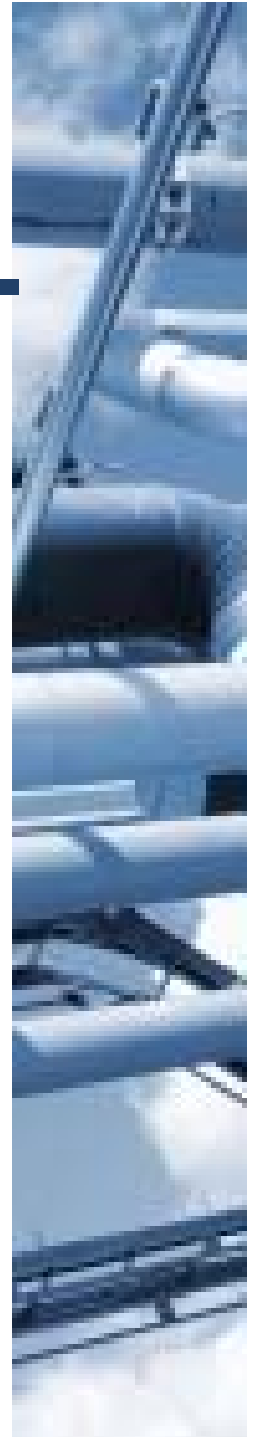
Summary & Conclusion

- Agencies have taken a fresh look at SMS Programs.
- Current focus is California and Refineries.
- Potential For:
 - Later expansion to other highly-hazardous facilities in California
 - Later expansion to non-California petroleum refineries & others
 - Inference to new requirements as best practice
 - General Duty Clause Correlation – SB 612 clarifies Owner/Operator responsibilities.
- Initial promulgation will not be synchronized with federal requirements, but plan to harmonize CalARP & CalPSM-R.
- Potential for long-term movement towards synchronization.
- There are “**easy**” steps to take now to infuse some of the new requirements into your PSM/RMP/CalARP activities.



Summary & Conclusion

- **Recommendation from a Key Regulator** – Begin Applying “High-Value/Priority” Elements of CalPSM-R Now – Once promulgated, “schedule will be tight,” and if substantial progress has been made, selective-”grandfathering” may be allowed.
- **Tight schedules could result in a resource shortage.**
- In addition, some elements (e.g., HCA) are significantly more cost-effective in the design-phase, or at the earliest possible opportunity.
- Risk Management & Process Safety Professionals should:
 - Carefully monitor modernization programs.
 - Focus on charting the course for the long-term success of your facility’s programs.
 - Develop a strategy for effective implementation.



Questions?

John M. Johnson

John.Johnson@RMPCorp.com

(949) 282-0123

(877) 532-0806

www.RMPCorp.com

