

Report to the CWS/ISO Ad Hoc and the City of Richmond Committee
Contra Costa County's Response to the Chemical Safety and Hazard Investigation
Board Recommendations to Contra Costa County

Recommendation No. 2012-03-I-CA-R3 & 6:

Revise the Industrial Safety Ordinance (ISO) to require that Process Hazard Analyses include documentation of the recognized methodologies, rationale and conclusions used to claim that safeguards intended to control hazards will be effective. This process shall use established qualitative, quantitative, and/or semi-quantitative methods such as Layers of Protection Analysis (LOPA).

The language in the Industrial Safety Ordinance will be revised to include a qualitative, quantitative, and/or semi-quantitative method to determine effectiveness of the safeguards from a Process Hazard Analysis. The language in the Industrial Safety Ordinance will state that this method will be used when there is a possibility of a Major Chemical Accident or Release could occur.

Recommendation No. 2012-03-I-CA-R4 & 7:

Revise the Industrial Safety Ordinance (ISO)' to require the documented use of inherently safer systems analysis and the hierarchy of controls to the greatest extent feasible in establishing safeguards for identified process hazards. The goal shall be to drive the risk of major accidents to As Low As Reasonably Practicable (ALARP). Include requirements for inherently safer systems analysis to be automatically triggered for all Management of Change and Process Hazard Analysis reviews, prior to the construction of new processes, process unit rebuilds, significant process repairs, and in the development of corrective actions from incident investigation recommendations.

The existing language in the Industrial Safety Ordinance states that §450-8.016(d)(3) *"The stationary source shall select and implement inherently safer systems to the greatest extent feasible. If a stationary source concludes that an inherently safer system is not feasible, the basis for this conclusion shall be documented in meaningful detail. This documentation shall include (i) sufficient evidence to demonstrate to the County's satisfaction that implementing this inherently safer system is impractical, and (ii) the reason for this conclusion. A claim of "financial infeasibility" shall not be based solely on evidence of reduced profits or increased cost, but rather shall include evidence that the financial impacts would be sufficiently severe to render the inherently safer system as impractical.*

(4) For all covered processes, the stationary source shall document the decision made to implement or not implement all process hazard analysis recommended action items and the results of recommendations for additional study." The Industrial Safety Ordinance language will be revised to include in addition to mitigation items from the Process Hazard Analysis and in the design and review of new processes and facilities that is already in the Industrial Safety Ordinance, Inherently Safer Systems shall be implemented to the greatest extent feasible during the Management of Change process, major modifications to a process, and corrective actions from incident investigation recommendations. The ordinance will be revised such that the regulated business will

be required to follow the Industrial Safety Ordinance Inherently Safer Systems Guidance.

Recommendation No. 2012-03-I-CA-R5 & 8:

Monitor and confirm the effective implementation of the damage mechanism hazard review program (2012-03-I-CA-R1 and 2012-03-I-CA-R2), so that all necessary mechanical integrity work at the Chevron Richmond Refinery is identified and recommendations are completed in a timely way.

Recommendation No. 2012-03-I-CA-R1, to Chevron U.S.A, reads as follows:

"At all Chevron US. refineries, engage a diverse team of qualified personnel to perform a documented damage mechanism hazard review. This review shall be an integral part of the Process Hazard Analysis cycle and shall be conducted on all PSM-covered process piping circuits and process equipment. The damage mechanism hazard review shall identify potential process damage mechanisms and consequences of failure, and shall ensure safeguards are in place to control hazards presented by those damage mechanisms. Analyze and incorporate into this review applicable industry best practices, Chevron Energy Technology Company findings and recommendations, and inherently safer systems to the greatest extent feasible. "

CCHS will review the method that Chevron has developed to ensure that it meets the intent of the recommendation and will review during the auditing process that Chevron Richmond Refinery is following this method and that it is effective.

Recommendation No. 2012-03-I-CA-R2, to Chevron U.S.A, reads as follows:

At all California Chevron US. refineries, report leading and lagging process safety indicators, such as the action item completion status of recommendations from damage mechanism hazard reviews, to the federal, state, and local regulatory agencies that have chemical release prevention authority.

The language in the Industrial Safety Ordinance will be revised to require regulated businesses to report and make public specified, as determined by the City of Richmond and the County, leading and lagging process safety indicators that will show the overall effectiveness of the businesses process safety management program. The revised ordinance will also require that the regulated businesses develop leading and lagging indicators that show the completion status of recommendations from Management of Change, Incident Investigations (internal and external), Process Hazard Analyses, audits (internal and external), and recommendations that result from Mechanical Integrity recommendations, including damage mechanism hazard reviews. These indicators will be available to Contra Costa Health Services upon request and when performing an audit or inspection of the refinery.

Recommendation No. 2013-03-I-CA-R16 & 17:

Participate in the joint regulatory program described in recommendation 2012-03-I-CA-R11 This participation shall include contributing relevant data to the repository

of investigation and inspection data created by the California Department of Industrial Relations and jointly coordinating activities.

Recommendation No. 2012-03-/R11, to the CA State Legislature and Governor, reads as follows:

Establish a multi-agency process safety regulatory program for all California oil refineries to improve the public accountability, transparency, and performance of chemical accident prevention and mechanical integrity programs. This program shall: Establish a system to report to the regulator the recognized methodologies, findings, conclusions and corrective actions related to refinery mechanical integrity inspection and repair work arising from Process Hazard Analyses, California oil refinery turnarounds and maintenance-related shutdowns;

1. Require reporting of information such as damage mechanism hazard reviews, notice of upcoming maintenance-related shutdowns, records related to proposed and completed mechanical integrity work lists, and the technical rationale for any delay in work proposed but not yet completed;

2. Establish procedures for greater workforce and public participation including the public reporting of information; and

3. Provide mechanisms for federal, state and local agency operational coordination, sharing of data (including safety indicator data), and joint accident prevention activities.

The California Department of Industrial Relations will be designated as the lead state agency for establishing a repository of joint investigative and inspection data, coordinating the sharing of data and joint accident prevention activities.

Contra Costa Health Services Hazardous Materials Programs will work with other local, state, and federal agencies by submitting all incident investigation reports and audits that are performed or are reported to Contra Costa Health Services Hazardous Materials Programs to the California Department of Industrial Relations that can be shared with other agencies and the public.

U. S. Chemical Safety and Hazard Investigation Board Recommendations

Chevron U.S.A (Urgent)

2012-03-I-CA-R1

At all Chevron U.S. refineries, engage a diverse team of qualified personnel to perform a documented damage mechanism hazard review. This review shall be an integral part of the Process Hazard Analysis cycle and shall be conducted on all PSM-covered process piping circuits and process equipment. The damage mechanism hazard review shall identify potential process damage mechanisms and consequences of failure, and shall ensure safeguards are in place to control hazards presented by those damage mechanisms. Analyze and incorporate into this review applicable industry best practices, Chevron Energy Technology Company findings and recommendations, and inherently safer systems to the greatest extent feasible.

2012-03-I-CA-R2

At all California Chevron U.S. refineries, report leading and lagging process safety indicators, such as the action item completion status of recommendations from damage mechanism hazard reviews, to the federal, state, and local regulatory agencies that have chemical release prevention authority.

**Mayor and City Council,
City of Richmond, California**

2012-03-I-CA-R3

Revise the Industrial Safety Ordinance (ISO) to require that Process Hazard Analyses include documentation of the recognized methodologies, rationale and conclusions used to claim that safeguards intended to control hazards will be effective. This process shall use established qualitative, quantitative, and/or semi-quantitative methods such as Layers of Protection Analysis (LOPA).

2012-03-I-CA-R4

Revise the Industrial Safety Ordinance (ISO) to require the documented use of inherently safer systems analysis and the hierarchy of controls to the greatest extent feasible in establishing safeguards for identified process hazards. The goal shall be to drive the risk of major accidents to As Low As Reasonably Practicable (ALARP). Include requirements for inherently safer systems analysis to be automatically triggered for all Management of Change and Process Hazard Analysis reviews, prior to the construction of new processes, process unit rebuilds, significant process repairs, and in the development of corrective actions from incident investigation recommendations.

2012-03-I-CA-R5

Ensure the effective implementation of the damage mechanism hazard review program (2012-03-I-CA-R1 and 2012-03-I-CA-R2), so that all necessary mechanical integrity work at the Chevron Richmond Refinery is identified and recommendations are completed in a timely way.

**Board of Supervisors
Contra Costa County, California**

2012-03-I-CA-R6

Revise the Industrial Safety Ordinance (ISO) to require that Process Hazard Analyses include documentation of the recognized methodologies, rationale and conclusions used to claim that safeguards intended to control hazards will be effective. This process shall use established qualitative, quantitative, and/or semi-quantitative methods such as Layers of Protection Analysis (LOPA).

2012-03-I-CA-R7

Revise the Industrial Safety Ordinance (ISO) to require the documented use of inherently safer systems analysis and the hierarchy of controls to the greatest extent feasible in establishing safeguards for identified process hazards. The goal shall be to drive the risk of major accidents to As Low As Reasonably Practicable (ALARP). Include requirements for inherently safer systems analysis to be automatically triggered for all Management of Change and Process Hazard Analysis reviews, prior to the construction of new processes, process unit rebuilds, significant process repairs, and in the development of corrective actions from incident investigation recommendations.

2012-03-I-CA-R8

Monitor and confirm the effective implementation of the damage mechanism hazard review program (2012-03-I-CA-R1 and 2012-03-I-CA-R2), so that all necessary mechanical integrity work at the Chevron Richmond Refinery is identified and recommendations are completed in a timely way.

**California State Legislature,
Governor of California**

2012-03-I-CA-R9

Revise the California Code of Regulations, Title 8, Section 5189, Process Safety Management of Acutely Hazardous Materials, to require improvements to mechanical integrity and process hazard analysis programs for all California oil refineries. These improvements shall include engaging a diverse team of qualified personnel to perform a documented damage mechanism hazard review. This review shall be an integral part of the Process Hazard Analysis cycle and shall be conducted on all PSM-covered process piping circuits and process equipment. The damage mechanism hazard review shall identify potential process damage mechanisms and consequences of failure, and shall ensure safeguards are in place to control hazards presented by those damage mechanisms. Require the analysis and incorporation of applicable industry best practices and inherently safety systems to the greatest extent feasible into this review.

2012-03-I-CA-R10

For all California oil refineries, identify and require the reporting of leading and lagging process safety indicators, such as the action item completion status of recommendations from damage mechanism hazard reviews, to state and local regulatory agencies that have chemical release prevention authority. These indicators shall be used to ensure that requirements described in 2012-03-I-CA-R9 are effective at improving mechanical integrity and process hazard analysis performance at all California oil refineries and preventing major chemical incidents.

2012-03-I-R11

Establish a multi-agency process safety regulatory program for all California oil refineries to improve the public accountability, transparency, and performance of chemical accident prevention and mechanical integrity programs. This program shall:

1. Establish a system to report to the regulator the recognized methodologies, findings, conclusions and corrective actions related to refinery mechanical integrity inspection and repair work arising from Process Hazard Analyses, California oil refinery turnarounds and maintenance-related shutdowns;
 2. Require reporting of information such as damage mechanism hazard reviews, notice of upcoming maintenance-related shutdowns, records related to proposed and completed mechanical integrity work lists, and the technical rationale for any delay in work proposed but not yet completed;
 3. Establish procedures for greater workforce and public participation including the public reporting of information; and
 4. Provide mechanisms for federal, state and local agency operational coordination, sharing of data (including safety indicator data), and joint accident prevention activities.
- The California Department of Industrial Relations will be designated as the lead state agency for establishing a repository of joint investigative and inspection data, coordinating the sharing of data and joint accident prevention activities.

2012-03-I-CA-R12

Require that Process Hazard Analyses required under California Code of Regulations, Title 8, Section 5189 Section (e) include documentation of the recognized methodologies, rationale and conclusions used to claim that safeguards intended to control hazards will be effective. This process shall use established qualitative, quantitative, and/or semi-quantitative methods such as Layers of Protection Analysis (LOPA).

2012-03-I-CA-R13

Require the documented use of inherently safer systems analysis and the hierarchy of controls to the greatest extent feasible in establishing safeguards for identified process hazards. The goal shall be to drive the risk of major accidents to As Low As Reasonably Practicable (ALARP). Include requirements for inherently safer systems analysis to be automatically triggered for all Management of Change and Process Hazard Analysis reviews, prior to the construction of new process, process unit rebuilds, significant process repairs and in the development of corrective actions from incident investigation recommendations.

2012-03-I-CA-R14

Monitor and confirm the effective implementation of the damage mechanism hazard review program (2012-03-I-CA-R9 and 2012-03-I-CA-R10), so that all necessary mechanical integrity work at all California Chevron Refineries is identified and recommendations are completed in a timely way.

The U.S. Environmental Protection Agency

2012-03-I-CA-R15

Jointly plan and conduct inspections with Cal/OSHA, California EPA and other state and local regulatory agencies with chemical accident prevention responsibilities to monitor the effective implementation of the damage mechanism hazard review and disclosure requirements under 2012-03-I-CA-R9 and R10 above.

The Board of Supervisors, Contra Costa County, California, 2012-03-I-CA-R16;

The Mayor and City Council, City of Richmond, California, 2012-03-I-CA-R17;

The California Air Quality Management Divisions, 2012-03-I-CA-R18;

The U.S. Environmental Protection Agency, 2012-03-I-CA-R19; and

The California Environmental Protection Agency, 2012-03-I-CA-R20;

Participate in the joint regulatory program described in recommendation 2012-03-I-CA-R11. This participation shall include contributing relevant data to the repository of investigation and inspection data created by the California Department of Industrial Relations and jointly coordinating activities.

8 Types of Damage Mechanisms

1. Uniform (General) Corrosion
 - Atmospheric Corrosion (external)
 - Process Corrosion (internal)
2. Localized Corrosion
 - Pitting
 - Crevice Corrosion
 - Under Deposit (Coating Corrosion, Thinning, Cracking)
 - Under Insulation Corrosion
3. Galvanic Corrosion
4. Environmental Cracking (Stress Corrosion Cracking)
 - a) Chloride Stress Corrosion Cracking (CISCC)
 - b) Alkaline Stress Cracking (caustic, amines, carbonates) (ASCC)
 - c) Ammonia Stress Corrosion Cracking (Ammonia SCC)
 - d) Hydrofluoric Acid Stress Corrosion Cracking (HFSCC)
 - e) Polythionic Acid Stress Corrosion Cracking (PASCC)
 - f) Sulfide stress Corrosion Cracking (SSC)
 - g) Hydrogen Induced Cracking (HIC)
 - h) Stress Oriented Hydrogen induced Cracking (SOHIC)
5. Intergranular Corrosion
6. Dealloying (Dezincification, Graphitization)
7. High Temperature Corrosion
 - a) Oxidation
 - b) Sulfidation
 - c) Organic Acid Corrosion (Napthenic acid)
 - d) Carburization
 - e) Metal Dusting
 - f) Decarburization
 - g) Hydrogen Attack (HTHA)
8. Mechanical/Metallurgical Assisted Degradation
 - a) Erosion Corrosion
 - b) Cavitation
 - c) Fatigue
 - d) Fretting
 - e) Metallurgical Effects
 1. Grain Growth
 2. Graphitization
 3. Hardening
 4. Sensitization
 5. Sigma Phase Embrittlement
 6. 885 Embrittlement
 7. Temper Embrittlement
 8. Liquid Metal Embrittlement
 9. Brittle Fracture
 10. Creep
 11. Stress Rupture
 - f) Other: Carbonic acid, Amine corrosion, ammonium Bisulfide corrosion, Ammonium Chloride Salt corrosion, Sulfuric acid