

**U.S. Chemical Safety and
Hazard Investigation Board**

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Rafael Moure-Eraso, Ph.D.
Chairperson

Mark Griffon
Board Member

Beth J. Rosenberg, ScD, MPH
Board Member



**In reply, please refer to:
2012-03-I-CA-R6 thru R8 and R16**

Contra Costa County Board of Supervisors:
District I Supervisor John M. Gioia
District II Supervisor Candace Andersen
District III Supervisor Mary N. Piepho
District IV Supervisor Karen Mitchoff
District V Supervisor Federal D. Glover

County Administrative Building
651 Pine Street, 1st Floor, Room 106
Martinez, CA 94553

MAY 07 2013

Dear Supervisors Gioia, Andersen, Piepho, Mitchoff, and Glover:

The U.S. Chemical Safety and Hazard Investigation Board (CSB) recently issued its interim report on the August 6, 2012 incident at the Chevron Refinery in Richmond, California. On that date, the refinery experienced a catastrophic pipe failure in a crude unit, causing the release of flammable hydrocarbon process fluid which partially vaporized into a large vapor cloud. Nineteen Chevron employees engulfed by the vapor cloud escaped, narrowly avoiding serious injury. The ignition and subsequent continued burning of the hydrocarbon process fluid resulted in a large plume of unknown and quantified particulates and vapor. Approximately 15,000 people from the surrounding area sought medical treatment in the weeks following the incident.

The CSB's investigation found that the pipe failure was caused by sulfidation corrosion, a damage mechanism that causes piping walls to thin over time. The CSB found multiple reasons for the failure of the Richmond refinery, as well as the city's regulatory mechanism, to detect this serious damage in time to prevent the failure. Although the refinery conducted a Process Hazard Analysis (PHA) of the crude unit as required by the City of Richmond's Industrial Safety Ordinance (RISO), the CSB found that the ordinance did not require the conduct of formal damage mechanism hazard reviews. Moreover, despite Chevron's extensive knowledge of sulfidation corrosion at the corporate level, the CSB's investigation found that the PHA team for the crude unit at the Richmond refinery did not identify this damage mechanism as a potential cause of a leak or rupture in the piping.

The CSB also found that the RISO did not require the use of a recognized methodology for making an objective determination of the effectiveness of safeguards in place to prevent potentially hazardous consequences. A more detailed safeguard analysis which gave sufficient consideration of the principles of inherently safer technology and to driving risks As Low as Reasonably Practicable (ALARP) could have identified the need to upgrade the metallurgy of the piping to a material less susceptible to sulfidation corrosion. The CSB concluded that the systematic and documented consideration of inherently safer systems and the hierarchy of

U.S. Chemical Safety and Hazard Investigation Board

controls to the greatest extent feasible by Chevron and other process plants during PHAs, Management of Change analyses, prior to new construction, rebuilds, and repairs, and in the development of corrective actions from incident investigation recommendations would provide a more adequate degree of protection from incidents like the one that occurred on August 6, 2012. The CSB also concluded that enforcement steps were necessary to ensure that adequate damage mechanism hazard reviews were conducted to confirm the proper conduct and completion of necessary mechanical integrity work at the Richmond refinery, as reflected in separate recommendations to Chevron on these matters.

Because the RISO contains the same requirements as Contra Costa's Industrial Safety Ordinance (ISO),¹ the CSB issued four recommendations to the Board of Supervisors of Contra Costa County, as follows:

Recommendation No. 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).

Recommendation No. 2012-03-I-CA-R7:

Revise the Industrial Safety Ordinance (ISO)¹ 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.

Recommendation No. 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^{2,3}), so that all necessary mechanical integrity

¹ The CSB issued separate recommendations to the City of Richmond calling for revisions to the Richmond Industrial Safety Ordinance (RISO).

² **Recommendation No. 2012-03-I-CA-R1, to Chevron U.S.A, reads as follows:**

"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."

³ **Recommendation No. 2012-03-I-CA-R2, to Chevron U.S.A, reads as follows:**

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.

U.S. Chemical Safety and Hazard Investigation Board

work at the Chevron Richmond Refinery is identified and recommendations are completed in a timely way.

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

Participate in the joint regulatory program described in recommendation 2012-03-I-CA-R11.⁴ 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.

A more detailed rationale for these recommendations is available in the enclosed interim report, which can also be downloaded from our website at www.csb.gov.

The CSB's Office of Recommendations tracks the implementation of the agency's recommendations, and the Board votes to assign a status to its recommendations depending on the action(s) proposed and taken by recipients. The status of all recommendations is posted on the CSB website (www.csb.gov), where more information about our processes/procedures relative to issued recommendations is also available (see "Frequently Asked Questions" under the Recommendations tab on the web page).

Per our policies and procedures, our staff will need to obtain from the offices of the Board of Supervisors or their authorized representatives, documentation of the relevant actions planned and eventually taken by the Board to implement these recommendations. We would appreciate a response within **60 days** detailing the Board's plans for implementation of these recommendations and indicating the person(s) authorized to correspond with the CSB on this matter.

If you have any questions or need further information, please contact Ms. Morgan at (202) 261-7642, or Christina.Morgan@csb.gov. In all future correspondence pertaining to these recommendations, please refer to the recommendation numbers 2012-3-I-CA-R6 through R8, and copy Ms. Morgan.

⁴ **Recommendation No. 2012-03-I-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.*

**U.S. Chemical Safety and
Hazard Investigation Board**

Sincerely,

A handwritten signature in black ink, appearing to read "Daniel Moure-Eraso" with a stylized flourish at the end.

Rafael Moure-Eraso, PhD, CIH
Chairperson

CC: Tiffany Lennear, Chief Clerk of the Board of Supervisors
Randall L. Sawyer, Chief Environmental Health & HazMat Officer, Contra Costa County
Manuel Gomez, Director, Office of Recommendations, CSB
Don Holmstrom, Director, Western Regional Office, CSB
Christina Morgan, Recommendations Specialist, CSB