U. S. Chemical Safety and Hazard Investigation Board
RECOMMENDATIONS STATUS CHANGE SUMMARY

Report:	Chevron Refinery Fire
Recommendation Number(s):	2012-3-I-CA-R03
Date Issued:	April 19, 2013
Recipient:	Mayor and City Council, City of Richmond, California
New Status:	Closed – Acceptable Alternative Action
Date of Status Change:	May 11, 2018

Recommendation Text 2012-3-I-CA-R03:

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).

Board Status Change Decision:

A. Rationale for Recommendation

On August 6, 2012, the Chevron Refinery in Richmond, California, experienced a catastrophic pipe failure in a crude unit, causing the release of flammable hydrocarbon process fluid which partially vaporized into a large cloud. Nineteen Chevron employees engulfed by the vapor cloud narrowly escaped, avoiding serious injury. Approximately 15,000 people from the surrounding area sought medical treatment in the weeks following the incident. The U.S. Chemical Safety and Hazard Investigation Boards's (CSB) investigation found that the pipe failure was caused by sulfidation corrosion, a damage mechanism that causes piping walls to thin over time.

In addition to identifying several contributing causes of the incident at the refinery, the CSB found a serious gap in the city's regulatory oversight needed to detect this serious damage mechanism in order to prevent the failure. The CSB found that the City of Richmond Industrial Safety Ordinance (ISO), 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 gives sufficient consideration of the principles of inherently safe 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.

B. Response to the Recommendation

On July 1, 2014, the City of Richmond adopted ordinance No. 13-14 N.S., which amended sections of the Richmond Municipal Code Chapter 6.43 relating to the ISO. According to the

City of Richmond, the two facilities located in the City of Richmond that are subject to this ordinance are the Chevron Richmond Refinery and Chemtrade Richmond Works.

On February 17, 2015, the City Manager sent a letter to the CSB outlining the relevant changes to the ISO and how these changes address the CSB recommendations (Attachment 1). The Board voted on August 12, 2015, to designate CSB Recommendation No. 2012-3-I-CA-R03 (R3) as **"Open-Acceptable Response or Alternate Response."**

With regards to addressing R3, the City of Richmond added the following language in Section (J)(1)-(4) regarding safeguard protection analysis and layers of protection analysis:

(j) Safeguard Protection Analysis.

(1) Effective September 30, 2014, a stationary source shall conduct a Layer of Protection Analysis or an alternative type of analysis approved by the department that uses a quantitative, qualitative or equivalent semi-quantitative method to determine the effectiveness of existing safeguards and safeguards recommended in a PHA to reduce the probability and/or severity of a catastrophic release. The safeguard protection analysis may be a standalone analysis or incorporated within a PHA.

(2) The stationary source shall complete the safeguard protection analysis no later than June 30, 2019. A safeguard protection analysis that was completed by a stationary source within five years prior to June 30, 2019, in accordance with the standards set forth in subsection (j)(1) of this section, will be deemed to comply with this requirement. The stationary source shall update and revalidate the safeguard protection analysis at least once every five years.

(3) All safeguard protection analyses shall be performed by a team with expertise in engineering and process operations. The team shall include at least one employee who has experience and knowledge specific to the safeguards and one member who is knowledgeable about the specific safeguard protection analysis method used.

(4) The stationary source shall prepare a written report that documents the safeguard protection analysis in accordance with the standard of practice applicable to the type of analysis conducted. The stationary source will complete the report within thirty days after the completion of the safeguard protection analysis and make the report available to the department during an audit or inspection and upon request. (Ords. 2014-07 § 5, 2006-22 § 5, 2000-20 § 1, 98-48 § 2).

The above language satisfies the CSB's recommendation by requiring that safeguard protection analysis incorporate a quantitative, qualitative or equivalent semi-quantitative method such as LOPA into its process hazard analysis (PHA). The language also requires that the stationary source update and revalidate its safeguard protection analysis at least once every five years, which is above and beyond what was originally specified in the CSB recommendation.

This recommendation and 2012-3-I-CA-R04 (R4) are related, in that R4 requires safeguards be established to the greatest extent feasible.[1] While the language above does outline the

[1] 2012-3-I-CA-R04: 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**

requirements for LOPA, it does not state that LOPA and safeguard protection analysis are implemented to the greatest extent feasible. Contra Costa County (CCC) staff told the CSB that they require covered facilities to meet the risk level of as low as reasonably practicable, or ALARP, when conducting these analyses.[2] CCC views this as an acceptable risk reduction level. The CSB also views this as an acceptable standard.

C. Board Analysis and Decision

As the City of Richmond has met the intent of the CSB Recommendation, the Board voted to change the status of CSB Recommendation No. **2012-3-I-CA-R03** to: **"Closed – Acceptable Alternative Action."**

identified process hazards. (Emphasis Added) 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.

[2] Pursuant to an agreement, Contra Costa County implements the Richmond ISO for the City of Richmond and enforces it within the city. The Richmond ISO has been amended to make it equivalent to the Contra Costa County ISO. As Contra Costa County has been assigned as the City of Richmond's regulator and responsible administrator, their response is applicable.