



U. S. Chemical Safety and Hazard Investigation Board

RECOMMENDATION STATUS CHANGE

SUMMARY

Report:	Xcel Energy Company Hydroelectric Tunnel Fire
Recommendation Number:	2008-01-I-CO-R2
Date Issued:	August 25, 2010
Recipient:	Occupational Safety and Health Administration (OSHA)
New Status:	Closed – Acceptable Alternative Action
Date of Status Change:	February 2, 2024

Recommendation Text:

Publish a “Safety and Health Information Bulletin” addressing the hazards and controls when using flammable materials in confined spaces that includes actionable guidance regarding:

- a. The importance of implementing a hierarchy of controls to address hazards in a confined space that first seeks to eliminate hazards or substitute with a less hazardous material(s) or method(s). Examples include performing work outside of a confined space where reasonably practicable or substituting a flammable material with a non-flammable one.*
- b. The necessity of establishing a maximum permissible percentage substantially below the lower explosive limit (LEL) for safe entry and occupancy of permit required confined spaces.*
- c. The need to comprehensively control all potential ignition sources and continuously monitor the confined space at appropriate locations and elevations when work activities involve the use of flammable materials or where flammable atmospheres may be created.*
- d. The importance of treating confined spaces with the potential for flammable atmospheres above 10 percent of the LEL as a hazard immediately dangerous to life or health (IDLH) that requires rescuers to be stationed directly outside the permit space and available for immediate rescue with appropriate fire-extinguishing and rescue equipment.*
- e. The requirement that confined spaces such as penstocks be managed as permit-required that are so large or part of a continuous system that they cannot be fully characterized from the entry point. Such spaces need to be monitored for hazardous atmospheres both prior to entry and continuously in areas where entrants are working.*

Board Status Change Decision:

A. Rationale for Recommendation

On October 2, 2007, five contract workers were killed and three others were injured when a flash fire erupted inside a drained penstock at the Xcel Energy, Inc. Cabin Creek hydroelectric power plant in Georgetown, Colorado. The fire, which trapped the workers deep underground, resulted from the ignition of methyl ethyl ketone (MEK); a flammable solvent being used by the workers

to clean spraying equipment. The spraying equipment was unsuccessfully employed by the workers to apply a protective epoxy coating to the interior walls of the penstock.

The flash fire occurred and spread rapidly as a result of the ignition of flammable MEK vapors in the atmosphere inside the penstock. Neither RPI's (the contractor working inside the penstock) nor Xcel Energy's (the owner of the penstock) policies and permits established safe limits that prohibited entry or occupancy of a confined space with a hazardous flammable atmosphere, even though both companies claimed to have developed their respective policies and permits in accordance with OSHA's general industry permit-required confined space (PRCS) standard (29 CFR 1910.146).

As a part of its investigation, the U.S. Chemical Safety and Hazard Investigation Board (CSB) reviewed OSHA regulations and agency policies pertaining to the use of flammable materials inside PRCSs. The CSB concluded that the PRCS standard does not prohibit entry or occupancy above a maximum permissible level of the lower flammable limit (LFL). CSB also noted in the Xcel report that in 1996, OSHA issued a letter of interpretation that allows work to be performed in atmospheres in excess of 10 percent of the lower explosive limit (LEL), provided all requirements of the rule are met and the employer has implemented control measures based on a hazard analysis of the means, procedures, and practices necessary for safe permit operations. As a result, CSB issued two recommendations to OSHA. This status change summary addresses CSB Recommendation No. 2008-01-I-CO-R2.

B. Response to the Recommendation

OSHA published a Fatal Facts guidance document titled "[Confined Space Fire](#)"¹ in the summer of 2023. This document provides a brief description of the Evergreen incident and its likely causes. It also contains recommended actions for incident prevention cross referenced with the requirements of OSHA's standard on Permit-Required Confined Spaces (29 CFR 1910.146).

Although the document published is not a "Safety and Health Information Bulletin" as prescribed by the recommendation, it does address the requirements of the recommendation and increase industry awareness of the critical importance of controlling the hazards of confined spaces, especially those hazards that are not pre-existing within the confined space. The information provided in the Fatal Fact guidance document is sufficient enough that if followed the Xcel incident would have been prevented or its consequences mitigated, thus, meeting the intent of the recommendation envisioned by the Board when the recommendation was issued.

C. Board Analysis and Decision

Based upon the information above, the Board voted to change the status of CSB Recommendation No. 2008-01-I-CO-R2 to: "Closed – Acceptable Alternative Action."

¹ Available at https://www.osha.gov/sites/default/files/publications/OSHA_FF-4278.pdf (Accessed December 14, 2023)