UNITED STATES COAST GUARD
U.S. Department of Homeland Security

FINDINGS OF CONCERN

Sector San Francisco

October 28, 2022
San Francisco, CA

Findings of Concern 015-22

WASTED FIXED CO_2 MOUNTING RACKS

Purpose. The U.S. Coast Guard issues findings of concern to disseminate information related to unsafe conditions that were identified as causal factors in a casualty and could contribute to future incidents. Findings of concern are intended to educate the public, state, or local agencies about the conditions discovered so they may address the findings with an appropriate voluntary action or highlight existing applicable company policies or state/local regulations.

The Incident. On August 13, 2021, a U.S. Coast Guard Certificated Industrial Vessel, inspected in accordance with Title 46 Code of Federal Regulations, Subchapter I, experienced an unintentional discharge of its 5,600 lb. fixed CO_2 fire extinguishing system. The vessel was underway when the fire extinguishing system's pilot cylinder bottle became dislodged from its mount. The weight of the cylinder generated enough force to discharge the bottle by activating the operating wire and linkage. The agent was released through the system's audible alarm and not into any protected spaces. The secondary operating control for the system was not activated. In addition to these findings, this incident revealed that several of the system's automatic shut-down pressure switches failed to operate upon the pilot cylinder's discharge. The system did not shut-down ventilation to the protected space or the fuel booster pumps as designed.

Contributing Factors and Analysis. The fire extinguishing system implemented a combination of steel saddles and center clamps to mount each cylinder to the storage rack. The saddles supported the back of each bottle; the steel clamps were used to sandwich the cylinders within their saddle to the rack. The interior cylinders were secured on either side by steel clamps; however, the end cylinders, including the pilot bottle, were only clamped on their inner side while the outer side of each was held in place by two 1 inch by 3/16 inch prongs.

The investigation identified that there were multiple unsafe storage conditions that enabled the pilot cylinder to become dislodged. First, the prongs for the exterior cylinders were bent. Second, the welds for the pilot cylinder's steel saddles had failed. The bent prongs no longer provided adequate support against lateral movement, thus the center clamps needed to be overtightened to compensate. The additional stress placed on the rack by the overtightened clamps likely caused the prongs to bend further and the steel saddles to fail.

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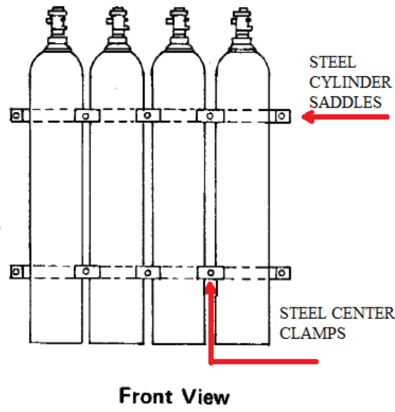

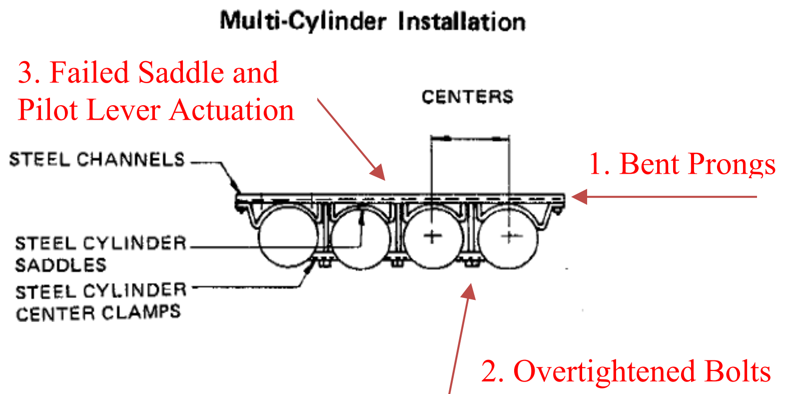

Failed Cylinder Bottle Brackets

Pilot Bottle Actuation Lever Under Load and Activated

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Findings of Concern. Coast Guard Investigating Officers have identified the following voluntary actions for an owner/operator of vessels with similar systems to mitigate the risks associated with the above contributing factors:

- Create a Standard Operating Procedure (SOP) to include inspecting storage arrangements at regular intervals.
- Re-evaluate current storage arrangements and consider if any changes to existing supports or additional supports are needed. Cylinders shall be securely fastened and supported in accordance with 46 CFR 34.15-20 (d) / 76.15-20(d) / 95.15-20(d) / 118.410 (c) (4) / 181.410 (c) (4).
- When conducting required annual testing, ensure that time delays, alarms, and automatic shutdowns function properly.

In addition, these Findings of Concern act as a reminder for local Coast Guard vessel inspections offices to ensure that these types of fixed CO2 system mounting arrangements are inspected for metal wastage, weld failures, and improperly modified components.

Closing. These findings of concern are for informational purpose only and do not relieve any entity or party of domestic or international safety, operational, or material requirements. For any questions or comments please contact Sector San Francisco Investigations Division at SectorSF.Investigations@uscg.mil.