



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

# RECOMMENDATION STATUS CHANGE SUMMARY

<b>Report:</b>	Loy Lange Box Company Pressure Vessel Explosion
<b>Recommendation Number:</b>	2017-04-I-MO-R8
<b>Date Issued:</b>	July 29, 2022
<b>Recipient:</b>	National Board of Boiler and Pressure Vessel Inspectors (NBBI)
<b>New Status:</b>	Closed – Exceeds Recommended Action
<b>Date of Status Change:</b>	September 6, 2025

### Recommendation Text:

*Update NB-263 Rules for Commissioned Inspectors to include prescriptive elements in the boiler and pressure vessel repair and alteration inspection and acceptance process that would prevent the acceptance of a non-conforming repair.*

### Board Status Change Decision:

#### A. Rationale for Recommendation

On April 3, 2017, an explosion occurred at the Loy-Lange Box Company (Loy-Lange) in St. Louis, Missouri when the bottom head of a pressure vessel (called a Semi-Closed Receiver (SCR)) catastrophically failed. The pressure vessel failure caused a boiling liquid expanding vapor explosion (BLEVE) which fatally injured a Loy-Lange employee working nearby. The pressure vessel then launched from the Loy-Lange building into the air and crashed through the roof of a nearby business, fatally injuring three members of the public.

The U.S. Chemical Safety and Hazard Investigation Board (CSB) investigated the incident and found that the failed pressure vessel resulted from oxygen pitting corrosion and generalized corrosion which thinned the pressure vessel bottom head until it could no longer contain the pressure inside the vessel. The CSB determined that the cause of the incident was deficiencies in Loy-Lange's operations, policies, and process safety practices that failed to prevent or mitigate chronic corrosion in the pressure vessel as well as Kickham Boiler and Engineering, Inc.'s performance of an inadequate repair to the SCR in 2012 that left damaged material in place. The CSB identified additional issues in their overall regulatory compliance as well as with their records and data management. As a result of these findings, the CSB issued one recommendation to The National Board of Boiler and Pressure Vessel Inspectors (NBBI). This status change summary addresses CSB Recommendation No. 2017-04-I-MO-R8.

#### B. Response to the Recommendation

NBBI published the 2025 Edition of NB-263, RCI-1, *Rules for Commission Inspectors* (NB-263) in 2024 with an effective date of January 1, 2025. NB-263 contains new requirements in Part 5<sup>1</sup>

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<sup>1</sup> Part 5 of NB-263 applies to repair inspections.

which are intended to reduce the likelihood of the acceptance of non-conforming repairs as intended by the recommendation. The new rule changes became mandatory July 1, 2025.

Additionally, NBBI issued the 2025 Edition of the National Board Inspection Code (NBIC) on July 1, 2025. Part 3<sup>2</sup> contains new requirements for flush patches in section 3.3.4.6. New text in this section explicitly requires repair organizations to evaluate defects, measure the area adjacent to the flush patch to ensure that is above the required minimum thickness, and inspect the fit-up and tack welding.

Finally, in addition to the updates made to these industry resources, NBBI also broadly publicized the events of the Loy Lange Box Company Pressure Vessel Explosion, and other pressure vessel incidents investigated by the CSB, to include an NBBI Special Report on Loy Lange as the cover story of the Summer 2023 Edition of The National Board Bulletin<sup>3</sup>. NBBI also invited the CSB to give a presentation on the Loy Lange incident at their 92<sup>nd</sup> General Meeting<sup>4</sup> among other opportunities.

### C. Board Analysis and Decision

The changes made NB-263 and the NBIC are important steps to ensure an incident such as the one that occurred at Loy Lange does not happen again. Had the repair organization measured the area adjacent to the flush patch to ensure it was above the required minimum thickness, or otherwise effectively dealt with the defects discovered during the repair, they would not have made the inadequate repair. Equally important, had the repair inspector ensured defects discovered during the repair were effectively addressed, the SCR would not have been placed back into service with the inadequate repair in place. Either of these actions would have prevented this incident.

The Board appreciates the work of the leadership and staff of NBBI, the Committee on Qualifications, and the NBIC Committee in updating these critical industry resources. NBBI added language to NB-263 which met the objective of the recommendation. Additionally, NBBI also revised or added language to Part 3 of the NBIC and conducted extensive outreach to share the learnings from the Loy Lange investigation which surpassed the objective of the recommendation. Their work in updating these documents and broadly publicizing the circumstances of the incident are truly commendable. Based upon the information above, the Board voted to change the status of CSB Recommendation No. 2017- 04-I-MO-R8 to: “Closed – Exceeds Recommended Action.”

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<sup>2</sup> Part 3 of the NBIC applies to repairs and alterations.

<sup>3 3</sup> The National Board Bulletin is a technical journal distributed worldwide three times annually. Each issue includes articles pertaining to the pressure equipment industry covering topics such as laws and regulations covering equipment, tips on equipment inspection, repairs, and alterations, and industry case histories.

<sup>4</sup> The General Meeting is conducted each year by the NBBI to address important issues relative to the safe installation, operation, maintenance, construction, repair, and inspection of boilers and pressure vessels. Attendees include boiler and pressure vessel inspectors, mechanical engineers, engineering consultants, equipment manufacturers and many others.