



U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

8701 S. Gessner, Suite 630
Houston TX 77074

NOTICE OF AMENDMENT

ELECTRONIC MAIL - RETURN RECEIPT REQUESTED

October 4, 2021

Steve Angel
Chief Executive Officer
Linde, PLC
10 Riverview Drive
Danbury, Connecticut 06810

CPF 4-2021-054-NOA

Dear Mr. Angel:

From March 22, 2021 through April 6, 2021, a representative of the Pipeline and Hazardous Materials Safety Administration (PHMSA) pursuant to Chapter 601 of 49 United States Code (U.S.C.) inspected Linde, PLC's (Linde) written procedures for the operation and maintenance of its hydrogen pipelines operating in the Gulf Coast Area; Ontario, California; Geismar, Louisiana; Ecorse, Michigan; Whiting, Indiana; and Niagara Falls, New York via video teleconference.

Based on the inspection, PHMSA has identified the apparent inadequacies found within Linde's plans or procedures, as described below:

1. § 192.605 Procedural manual for operations, maintenance, and emergencies

(a) General. Each operator shall prepare and follow for each pipeline, a manual of written procedures for conducting operations and maintenance activities and for emergency response. For transmission lines, the manual must also include procedures for handling abnormal operations. This manual must be reviewed and updated by the operator at intervals not exceeding 15 months, but at least once each calendar year. This manual must be prepared before operations of a pipeline system commence. Appropriate parts of the manual must be kept at locations where operations and maintenance activities are conducted.

§ 192.187 - Vaults: Sealing, venting, and ventilation.

Each underground vault or closed top pit containing either a pressure regulating or reducing station, or a pressure limiting or relieving station, must be sealed, vented or ventilated, as follows:

- (a) When the internal volume exceeds 200 cubic feet (5.7 cubic meters):**
 - (1) The vault or pit must be ventilated with two ducts, each having at least the ventilating effect of a pipe 4 inches (102 millimeters) in diameter**
 - (2) The ventilation must be enough to minimize the formation of combustible atmosphere in the vault or pit; and,**
 - (3) The ducts must be high enough above grade to disperse any gas-air mixtures that might be discharged.**
- (b) When the internal volume is more than 75 cubic feet (2.1 cubic meters) but less than 200 cubic feet (5.7 cubic meters):**
 - (1) If the vault or pit is sealed, each opening must have a tight fitting cover without open holes through which an explosive mixture might be ignited, and there must be a means for testing the internal atmosphere before removing the cover;**
 - (2) If the vault or pit is vented, there must be a means of preventing external sources of ignition from reaching the vault atmosphere; or**
 - (3) If the vault or pit is ventilated, paragraph (a) or (c) of this section applies.**
- (c) If a vault or pit covered by paragraph (b) of this section is ventilated by openings in the covers or gratings and the ratio of the internal volume, in cubic feet, to the effective ventilating area of the cover or grating, in square feet, is less than 20 to 1, no additional ventilation is required.**

Linde's written operations and maintenance procedure is inadequate because it does not sufficiently address the conditions of each underground vault or closed top pit containing either a pressure regulating or reducing station or a pressure limiting or relieving station, which must be sealed, vented, or ventilated as required per § 192.187. Specifically, Linde's *Operations and Maintenance Manual, Regulated Hydrogen Gas Pipeline, OM-2287, 26.2 Vaults* (Revised: February 12, 2021) does not state the required criteria for ventilation, formation of combustible atmosphere, or gas dispersion in vaults with an internal volume that exceeds 200 cubic feet. Additionally, Linde's operations and maintenance procedure fails to address vaults with an internal volume of less than 200 cubic feet but greater than or equal to 75 cubic feet. Furthermore, Linde's procedure fails to address the criteria for ventilated openings in covers or gratings.

Linde must amend its written operations and maintenance procedures to address the required criteria for ventilation, formation of combustible atmosphere, and gas dispersion for vaults with an internal volume of 200 cubic feet, less than 200 cubic feet but greater than 75 cubic feet, and the required criteria for ventilated opening in covers or gratings as required by § 192.187.

2. § 192.605 Procedural manual for operations, maintenance, and emergencies

(a) General. Each operator shall prepare and follow for each pipeline, a manual of written procedures for conducting operations and maintenance activities and for emergency response. For transmission lines, the manual must also include procedures for handling abnormal operations. This manual must be reviewed and updated by the operator at intervals not exceeding 15 months, but at least once each calendar year. This manual must be prepared before operations of a pipeline system commence. Appropriate parts of the manual must be kept at locations where operations and maintenance activities are conducted.

§ 192.515 - Environmental protection and safety requirements.

(a) In conducting tests under this subpart, each operator shall insure that every reasonable precaution is taken to protect its employees and the general public during the testing. Whenever the hoop stress of the segment of the pipeline being tested will exceed 50 percent of SMYS, the operator shall take all practicable steps to keep persons not working on the testing operation outside of the testing area until the pressure is reduced to or below the proposed maximum allowable operating pressure.

Linde's operations and maintenance procedures are inadequate because they do not address the protection of its employees and the general public during actual pressure testing as required by § 192.515. Specifically, Linde's *T-6, Hydrostatic Testing of Pipelines* (Effective Date: 10/30/2018) does not include the requirements of safe distances, communication to the public, or precautions for conditions where the hoop stress of a segment being tested will be equal to or greater than 50 percent SMYS, and a requirement to maintain a clear test area. Additionally, Linde's *Operations and Maintenance Manual, Regulated Hydrogen Gas Pipeline, OM-2287, 13 Pressure Testing* (Revised: February 12, 2021) does not discuss employee or public safety. However, Linde's *T-1, Procedure for Pneumatic Testing in Lieu of Hydrostatic Test* (Effective Date: 02/20/2018) sufficiently references safety protocols. Subsequently, Linde provided *Policy W.SES-2.02.15: Pressure and Leak Testing of Piping and Equipment* (Effective: 12/2/2014) that does not provide a safe setback distance for test liquids from a hydrostatic test and is not mentioned in Linde's T-1 or T-6 procedures.

Linde must amend its written operations and maintenance procedures to ensure that every reasonable precaution is taken to protect its employees and the general public during pressure testing, including whenever the hoop stress of the segment of pipeline being tested will exceed 50 percent of SMYS, Linde will take all practicable steps to keep persons not working on the testing operation outside of the testing area until the pressure is reduced to or below the proposed allowable operating pressure in accordance with § 192.515.

3. § 192.605 - Procedural manual for operations, maintenance, and emergencies.

(a) ...

(b) **Maintenance and normal operations.** The manual required by paragraph (a) of this section must include procedures for the following, if applicable, to provide safety during maintenance and operations.

(1) ...

(2) **Controlling corrosion in accordance with the operations and maintenance requirements of subpart I of this part.**

Linde's operation and maintenance procedure is inadequate because it does not address low-purity gas with potential corrosive compounds. Specifically, Linde's *Operations and Maintenance Manual, Regulated Hydrogen Gas Pipeline, OM-2287, 32.3 Inspection of Exposed Internal Pipe Surfaces* (Revised: February 12, 2021) states:

Linde hydrogen pipelines transport very high-purity dry hydrogen gas, which does not contain significant amounts of corrosive compounds. Internal corrosion is not anticipated, nor has evidence of internal corrosion ever been found. As a result, Linde pipelines do not require coupons for monitoring internal corrosion nor other features incorporated into its design and construction to reduce the risk of internal corrosion such as liquid collection reduction configurations, liquid removal features, or devices for monitoring internal corrosion. Only the Geismar Syn-Gas hydrogen/carbon monoxide pipeline requires periodic internal inspection based on the lower purity of hydrogen/carbon monoxide syn-gas.

During the inspection, Linde stated that it does not take various measures to monitor internal corrosion due to its high-purity gas. However, Linde's *Operations and Maintenance Manual, Regulated Hydrogen Gas Pipeline* notes that its Geismar Syn-Gas facility requires periodic internal inspection based on the existence of low-purity gas. Therefore, with the existence of low-purity gas, a procedure is required to address potential internal corrosion threats from low-purity gas.

Linde must amend its written operations and maintenance procedures to include a specific procedure for the periodic internal inspection for corrosion control of potentially corrosive compounds entrained within low-purity gas as required by § 192.605.

Response to this Notice

This Notice is provided pursuant to 49 U.S.C. § 60108(a) and 49 C.F.R. § 190.206. Enclosed as part of this Notice is a document entitled, *Response Options for Pipeline Operators in Compliance Proceedings*. Please refer to this document and note the response options. Be advised that all material you submit in response to this enforcement action is subject to being made publicly available.

If you believe that any portion of your responsive material qualifies for confidential treatment under 5 U.S.C. 552(b), along with the complete original document, you must provide a second copy of the document with the portions you believe qualify for confidential treatment redacted and an explanation of why you believe the redacted information qualifies for confidential treatment under 5 U.S.C. 552(b).

Following the receipt of this Notice, you have 30 days to submit written comments, revised procedures, or a request for a hearing under §190.211. If you do not respond within 30 days of receipt of this Notice, this constitutes a waiver of your right to contest the allegations in this Notice and authorizes the Associate Administrator for Pipeline Safety to find facts as alleged in this Notice without further notice to you and to issue an Order Directing Amendment. If your plans or procedures are found inadequate as alleged in this Notice, you may be ordered to amend your plans or procedures to correct the inadequacies (49 C.F.R. § 190.206). If you are not contesting this Notice, we propose that you submit your amended procedures to my office within 90 days of receipt of this Notice. This period may be extended by written request for good cause. Once the inadequacies identified herein have been addressed in your amended procedures, this enforcement action will be closed.

It is requested (not mandated) that Linde, PLC maintain documentation of the safety improvement costs associated with fulfilling this Notice of Amendment (preparation/revision of plans, procedures) and submit the total to Mary L. McDanie, P.E., Director, Southwest Region, Pipeline and Hazardous Materials Safety Administration. In correspondence concerning this matter, please refer to **CPF 4-2021-054-NOA** and, for each document you submit, please provide a copy in electronic format whenever possible.

Sincerely,

Mary L. McDaniel, P.E.,
Director, Southwest Region
Pipeline and Hazardous Materials Safety Administration

Enclosure: *Response Options for Pipeline Operators in Enforcement Proceedings*

cc: John Maitino – Compliance Manager, John.Maitino@Linde.com