TEXT OF REGULATIONS

CALIFORNIA CODE OF REGULATIONS
TITLE 19. PUBLIC SAFETY
DIVISION 1. STATE FIRE MARSHAL
CHAPTER 14. HAZARDOUS LIQUID PIPELINE SAFETY

Article 9. CO2 Pipelines

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§ 2170. Definitions.

(a) Definitions applicable to this Article:

(1) **Carbon dioxide** means a fluid consisting of more than 50 percent carbon dioxide molecules in any combination of gas or dense phases.

(2) **Close interval survey** means a series of closely and properly spaced pipe-to-electrolyte potential measurements taken over the pipe to assess the adequacy of cathodic protection or to identify locations where a current may be leaving the pipeline that may cause corrosion and for the purpose of quantifying voltage (IR) drops other than those across the structure electrolyte boundary, such as when performed as a current interrupted, depolarized, or native survey.

(3) **Crack arrestor** means a structural engineering device that serves to contain cracks, helping to prevent the catastrophic failure of a pipeline.

(4) **Dense phase** is a collective term for CO2 in its liquid or supercritical phases.

(5) **Emergency planning zone** means the area within two miles of either side of a pipeline used to transport carbon dioxide, measured from the centerline of the pipeline.

(6) **Lead agency** means the same as defined in Section 21067 of the Public Resources Code. The Office of the State Fire Marshal shall not be considered a lead agency for a project that includes the construction of a pipeline to transport carbon dioxide.

(7) **Notification of potential rupture**

(A) Notification of potential rupture means the notification to, or observation by, an operator (e.g., by or to its controller(s) in a control room, field personnel, nearby pipeline or utility personnel, the public, local responders, or public authorities) of one or more of the below indicia of a potential unintentional or uncontrolled release of a large volume of carbon dioxide from a pipeline:

1. An unanticipated or unexplained pressure loss outside of the pipeline's normal operating pressures, as defined in the operator's written procedures. The operator must establish in its written procedures that an unanticipated or unplanned pressure loss is outside of the pipeline's normal operating pressures when there is a pressure loss greater than 10 percent occurring within a time interval of 15 minutes or less, unless the operator has documented in its written procedures the operational need for a greater pressure-change threshold due to pipeline flow dynamics (including changes in operating pressure, flow rate, or volume), that are caused by fluctuations in product demand, receipts, or deliveries;

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2. An unanticipated or unexplained flow rate change, pressure change, equipment function, or other pipeline instrumentation indication at the upstream or downstream station that may be representative of an event meeting paragraph (A)1.; or

3. Any unanticipated or unexplained rapid release of a large volume of carbon dioxide, a fire, or an explosion, in the immediate vicinity of the pipeline.

(B) A notification of potential rupture occurs when an operator first receives notice of or observes an event specified in paragraph (A).

(8) **Pipeline or pipeline system** means all parts of a pipeline facility through which carbon dioxide moves in transportation, including, but not limited to, line pipe, valves, and other appurtenances connected to line pipe, pumping units or compressing units, fabricated assemblies associated with pumping units or compressing units, metering and delivery stations and fabricated assemblies therein, and breakout tanks.

(9) **Rupture** means every unintentional release of carbon dioxide from a pipeline, including any leak that occurs during hydrostatic testing.

(10) **Rupture-mitigation valve (RMV)** means an automatic shut-off valve (ASV) or a remote-control valve (RCV) that a pipeline operator uses to minimize the volume of hazardous liquid or carbon dioxide released from the pipeline and to mitigate the consequences of a rupture.

(11) **Sensitive receptor**

(A) Sensitive receptor means any of the following:

1. An education facility, including a preschool, school with transitional kindergarten, kindergarten, or any of grades 1 to 12, inclusive, daycare center, park, playground, college, or university.

2. A community resource center, including a youth center.

3. A health care facility, including a hospital, retirement home, or nursing home.

4. Live-in housing, including a long-term care hospital, hospice, prison, detention center, or dormitory.

5. A residence, including a private home, condominium, apartment, and living quarter.

6. A building that is a business that is open to the public.

(B) A sensitive receptor does not include a facility or building set forth in paragraph (A)1.

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that is not certified for occupancy or has been abandoned.

§ 2171. Incorporated by Reference.

(a) This Article incorporates by reference the following standards:

(1) American Petroleum Institute (API) Specification 5L, Line Pipe, 46th edition, April 2018, including Errata 1 (May 2018), (API Spec 5L); IBR approved for §2174(b)(5), §2174.1(a)(4), and §2174.2(a).

(2) API Standard 1104, Welding of Pipelines and Related Facilities, 21st edition, September 2013, including Errata 1 through 5 (April 2014 through September 2018), Addendum 1 (July 2014), and Addendum 2 (May 2016), (API Std 1104); IBR approved for §2175.7(b).

(3) API Recommended Practice 1130, "Computational Pipeline Monitoring for Liquids: Pipeline Segment," 3rd edition, September 2007, (API RP 1130); IBR approved for §2174.4(a)(2).

(4) API Recommended Practice 1185, Pipeline Public Engagement, First Edition, March 2024, (API RP 1185); IBR approved for section 2173(c).

(5) API Recommended Practice 1187, Pipeline Integrity Management of Landslide Hazards, 1st Edition, August 2024 (API 1187); IBR approved for 2178.6.

(6) ASME B31.4-2019, Pipeline Transportation Systems for Liquids and Slurries: ASME Code for Pressure Piping, B31, issued November 1, 2019, (ASME B31.4); IBR approved for §2174 and §2175.1

(7) ANSI/NACE SP0502-2010, Pipeline External Corrosion Direct Assessment Methodology, revised June 24, 2010, (NACE SP0502); IBR approved for §2175.5

(8) Form PSD-104, "Notification of Proposed CO2 Pipeline Construction", rev. 6/2025

(b) In the event of any differences between these regulations and the documents incorporated by reference then the provisions of this Article shall govern. Where a specific provision varies from the general provision the specific provision shall apply.

§ 2172. Pipelines Subject to This Article.

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(a) Covered. Except for the pipelines listed in paragraph (b), all segments of intrastate pipelines as specified in Government Code §§ 51010 et seq. are subject to this Article.

(b) Excepted. This Article does not apply to any of the following:

(1) Through piping or equipment used in the production (including flow lines), extraction, recovery, lifting, stabilization, separation, or treatment of carbon dioxide or the preparation of carbon dioxide for transportation by pipeline at production (including flow lines), refining, or manufacturing facilities. This exception does not apply to any device and associated piping that are necessary to control pressure in the pipeline under 49 CFR §195.406(b).

(2) Transportation of carbon dioxide downstream from the outlet of the pipeline isolation valve located at the wellhead of an injection well used for long-term carbon dioxide storage.

§ 2173. CO2 Pipeline Safety Program.

(a) All references to Title 49 Code of Federal Regulations (CFR), Part 195 in this Article shall correspond to federal regulations in place as of January 1, 2026. Amendments or future changes to federal regulations referenced in this Article shall not be incorporated unless specifically adopted by the Office of the State Fire Marshal. In the event of a conflict between this Article and 49 CFR, Part 195 then the provisions of this Article shall govern.

(b) CO2 Pipeline Safety Program.

(1) No later than [INSERT SIX (6) MONTHS FROM EFFECTIVE DATE OF THIS FINAL RULE], an operator of a pipeline shall prepare and follow a manual of written procedures that contains all the elements described in this Article.

(2) This manual shall be reviewed at intervals not exceeding 15 months, but at least once each calendar year, and appropriate changes are made as necessary to ensure that the manual is effective. This manual shall be prepared before initial operations of a pipeline system commence, and appropriate parts shall be kept at locations where operations and maintenance activities are conducted.

(c) Pipeline Engagement Program.

(1) Pipeline operators must develop and implement an engagement program with external stakeholders for each pipeline under construction and throughout the life of those pipelines in accordance with API RP 1185 (incorporated by reference).

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§ 2174. Design Requirements

(a) Existing pipelines shall not be retrofit or converted to service for carbon dioxide transportation.

(b) General. All carbon dioxide pipelines shall be constructed of steel and must be new materials and comply with relevant provisions of 49 CFR, Part 195, Subpart C – Design Requirements and Part 1 of Chapter II of ASME B31.4. Materials (incorporated by reference) for pipe and components must

(1) Be able to maintain the structural integrity of the pipeline under the full temperature range and other environmental conditions that may be anticipated. Blow down and bypass piping in carbon dioxide pipelines shall be of a material suitable for the low temperatures expected.

(2) Be chosen for the temperature environment in which the components will be used so that the pipeline will maintain its structural integrity.

(3) Be made of materials that are suitable for low temperatures specifically for components of carbon dioxide pipelines that are subject to low temperatures during normal operation because of rapid pressure reduction or during the initial fill of the line.

(4) Be chemically compatible with carbon dioxide for transport and with any other material or other chemical components in the pipeline with which they are in contact,

(5) Be qualified for use under 49 CFR, Part 195, Subpart C – Design Requirements and that has been cold expanded must comply with the requirements of API Specification 5L (incorporated by reference)

(6) Be able to account for occasional loads including landslides, ground movement, alongside earthquakes, and other earth movements that impose abnormal stresses on pipelines.

(7) Be able to account for active faults with the potential for surface rupture and subsequent horizontal and vertical displacement; and

(8) Be able to withstand combined internal pressure, thermal expansion, and external geohazards as described in paragraph (b)(6) and (b)(7) of this section via flexibility analysis to ensure that stresses remain below yield limits even under such conditions.

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§ 2174.1 Fracture mechanics

(a) Fracture propagation. A carbon dioxide pipeline constructed, replaced, relocated, or otherwise changed or after [INSERT EFFECTIVE DATE OF THIS FINAL RULE] must be designed to mitigate the effects of fracture propagation, including the following:

(1) Ensure resistance to fracture initiation while addressing the full range of operating temperatures, pressures, product compositions, pipe grade, and operating stress levels, including maximum pressures and minimum temperatures for shut-in conditions, that the pipeline is expected to experience. If these parameters change during operation of the pipeline such that they are outside the bounds of what was considered in the design evaluation, the evaluation and operating procedures must be reviewed and updated to assure continued resistance to fracture initiation over the operating life of the pipeline;

(2) Address adjustments to toughness of pipe for each grade used and the decompression behavior of the carbon dioxide at operating parameters;

(3) Ensure at least 99-percent probability of fracture arrest within eight pipe lengths (not to exceed 320 feet) with a probability of not less than 90-percent within five pipe lengths (not to exceed 200 feet); and

(4) Include fracture toughness testing that is equivalent to that described in the supplementary requirements of Annex G of API Specification 5L (incorporated by reference) for shear fracture area, Charpy v-notch impact test, and drop weight tear test and ensure ductile fracture and arrest as follows:

(i) The results of the Charpy v-notch impact test prescribed in Annex G must indicate at least 85-percent average shear fracture area; and

(ii) The results of the drop weight tear test prescribed in Annex G must indicate 85-percent average shear fracture area with a minimum single test result of 80-percent shear fracture area for any steel test samples. The test results must ensure a ductile fracture and arrest.

§ 2174.2 Material strength

(a) Toughness. The toughness properties for pipe must address the potential for initiation, propagation and arrest of fractures in accordance with:

(1) Annex G of API Specification 5L (incorporated by reference); and

(2) Any correction factors needed to address pipe grades, pressures, temperatures, or product compositions not expressly addressed in Annex G of API Specification 5L

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(incorporated by reference).

(3) Alternative measures. If it is not physically possible to achieve the pipeline toughness properties of section 2174.1 and paragraph (a) of this section, additional design features, such as mechanical or composite crack arrestors, heavier walled pipe of proper design and spacing, must be used to ensure fracture arrest as described in paragraph (a)(3) of this section.

§ 2174.3 Valves.

(a) Each part of the valve that will be in contact with carbon dioxide must be made of materials that are compatible with the product stream and carbon dioxide that is anticipated to flow through the pipeline system.

(b) Valve locations. Valves must be placed in accordance with the following:

(1) Valves must be placed on the suction end and the discharge end of a pump station or compressor station in a manner that permits isolation of the pump station or compressor station equipment in the event of an emergency.

(2) Rupture-mitigation valves (RMV) shall not be placed further than 7 ½ miles apart on pipelines constructed in a location where one or more sensitive receptors are located within the emergency planning zone.

(3) Emergency flow restriction device (EFRD). Operators must undertake an EFRD study and risk analysis to determine additional valve locations where one or more sensitive receptors are located within the emergency planning zone that provide for protection of human health and the environment. In making this determination, an operator must, at least, evaluate the following factors: the swiftness of leak detection and pipeline shutdown capabilities, the type of commodity carried, the rate of potential leakage, the volume that can be released, topography or pipeline profile, the potential for ignition, proximity to power sources, location of nearest response personnel, specific terrain within the area and between the pipeline segment and the sensitive receptors it could affect, and benefits expected by reducing the spill or release size. An RMV installed under this paragraph must meet all of the other applicable requirements in 49 CFR, Part 195.

(i) This study must document the decision-making process and all factors taken into the consideration and must be supplemented by an independent third-party verification.

(ii) All additional EFRD findings must be implemented within six (6) months following completion of the EFRD study, or as soon as practicable after obtaining necessary permits, not to exceed six (6) months after the receipt of permits. An operator must notify the Office of the State Fire Marshal, in accordance with section 2180, if the operator

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cannot meet the schedule for implementation and explain the reason for the delay.

(iii) A vapor dispersion analysis completed in accordance with section 2177.2 may be used when conducting the EFRD study.

(iv) The EFRD assessments and risk analysis conducted under paragraph (c)(3) of this section must be reviewed by the operator and certified by a senior executive of the company for operational matters that could affect EFRD processes and procedures for areas where one or more sensitive receptors are located within the emergency planning zone. Review and certification must occur at intervals not exceeding 15 months, but at least once per calendar year.

§ 2174.4 Leak detection.

(a) Each pipeline transporting carbon dioxide must have a leak detection system that, at a minimum, includes

(1) A computational pipeline monitoring (CPM) leak detection system.

(2) A continuous externally based leak detection system that uses sensors to directly detect the presence of carbon dioxide or physical changes in environment due to a leak.

(b) When a CPM leak detection system is installed on a pipeline it must comply with API RP 1130 (incorporated by reference) in operating, maintaining, testing, record keeping, and dispatcher training of the system.

§ 2174.5 Fixed vapor detection, alarm systems, and safety devices.

(a) General. Each pump station, compressor station, meter station, and valve station (including facilities for launching and receiving in-line inspection tools or instrumented internal inspection devices) on a pipeline transporting carbon dioxide must have a fixed vapor detection and alarm system.

(b) Capabilities. Except when shutdown of the system is necessary for maintenance, each fixed vapor detection and alarm system required by this section must

(1) Be capable of detecting any product or deleterious constituent that might be transported in concentrations above those described in paragraph (b)(2) of this section;

(2) Continuously monitor for concentrations of not more than 25 percent of the lower explosive limit for flammability, and 25 percent of the NIOSH IDLH for asphyxiation and toxicity hazards, whichever is lower; and

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(3) If a concentration of vapor from paragraph (b)(2) of this section is detected, warn persons inside or about to enter the area of danger with audible and visual alarms and provide notification to personnel in an operational control center.

(c) Station safety. The following must be provided in each pump station and compressor station:

(1) Adequate ventilation must be provided in pump stations and compressor station buildings to prevent the accumulation of hazardous vapors.

(2) Warning devices must be installed to warn of the presence of hazardous vapors in any pump station or compressor station building.

(3) Safety devices that prevent over pressuring of pumping equipment and compressing equipment, including the auxiliary pumping equipment within the pump station and auxiliary compressing equipment within the compressor station.

(4) A device for the emergency shutdown of each pump station and compressor station.

(5) If power is necessary to actuate the safety devices, an auxiliary power supply.

(d) Equipment location. Except for offshore pipelines, pumping equipment and compressing equipment must be installed on property that is under the control of the operator and at least 15.2 m (50 ft) from the boundary of the pump station or compressor station.

(e) Fire protection. Adequate fire protection must be installed at each pump station and compressor station. If the fire protection system installed requires the use of pumps, motive power must be provided for those pumps that is separate from the power that operates the station.

(f) Testing. Each fixed vapor detection, alarm systems, and safety device required under this section must be tested and found to function properly before the pump station or compressor station may be used.

§ 2175. Construction Requirements.

§ 2175.1 Construction specifications.

The operator shall ensure that any new pipeline construction conforms to the requirements of ASME B31.4 (incorporated by reference), as applicable. The longitudinal

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seams of adjoining pipe joints shall be offset by a minimum of two inches. In addition, when pipe is installed in an open trench, longitudinal seams shall be positioned on the upper half of the pipe.

§ 2175.2 Protection from hazards.

The operator must perform geotechnical analysis to identify geohazard-prone segments and take all practicable steps to protect each carbon dioxide pipeline segment from washouts, floods, unstable soil, landslides, ground movement, subsidence or other hazards that may cause the pipeline to move or to sustain abnormal loads.

§ 2175.3 Proximity to sensitive receptors.

(a) Pipeline right-of-way must be selected to avoid, as far as practicable, areas containing sensitive receptors.

(b) For pipelines constructed in a location where one or more sensitive receptors are located within the emergency planning zone, the operator must

(1) Perform a vapor dispersion analysis in accordance with section 2177.2 that assesses the potential for one or more sensitive receptors to be harmed by exposure to carbon dioxide from a pipeline rupture determines that the risk of exposure to carbon dioxide is within an acceptable range as determined by the lead agency,

(2) Provide training services for State and local emergency services, and disaster agencies for training, exercises, and equipment related to carbon dioxide pipelines in accordance with section 2177.3, and

(3) Distribute emergency preparedness materials in accordance with section 2177.4.

§ 2175.4 Cover over buried pipeline.

Unless specifically exempted in this Article, all pipe must be buried so that it is below the level of cultivation. The pipe must be installed so that the cover between the top of the pipe and the ground level, road bed, river bottom, or underwater natural bottom (as determined by recognized and generally accepted practices) must meet a minimum of 48 inches of cover or equivalent to protect the pipeline from outside force damage or external loads.

§ 2175.5 Installation of pipe in a ditch.

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(a) When installed in a ditch, each carbon dioxide pipeline must be installed so that the pipe fits the ditch so as to minimize stresses and protect the pipe coating from damage.

(b) When a ditch for a carbon dioxide pipeline is backfilled, it must be backfilled in a manner that:

(1) Provides firm support under the pipe; and

(2) Prevents damage to the pipe and pipe coating from equipment or from the backfill material.

(c) Promptly after a ditch for an onshore carbon dioxide pipeline is backfilled (if the construction project involves 1,000 feet or more of continuous backfill length along the pipeline), but not later than six (6) months after placing the pipeline in service, the operator must perform an assessment to assess any coating damage and ensure integrity of the coating using direct current voltage gradient (DCVG), alternating current voltage gradient (ACVG), or other technology that provides comparable information about the integrity of the coating. Coating surveys must be conducted, except in locations where effective coating surveys are precluded by geographical, technical, or safety reasons.

(d) An operator must notify the Office of the State Fire Marshal at least 90 days in advance of using other technology to assess integrity of the coating under paragraph (c) of this section.

(e) An operator of an onshore carbon dioxide pipeline must develop a remedial action plan and apply for any necessary permits within six (6) months of completing the assessment that identified the deficiency. An operator must repair any coating damage classified as severe (voltage drop greater than 60 percent for DCVG or 70 dBµV for ACVG) in accordance with section 4 of NACE SP0502 (incorporated by reference) within six (6) months of the assessment, or as soon as practicable after obtaining necessary permits, not to exceed six (6) months after the receipt of permits. An operator must notify the Office of the State Fire Marshal, in accordance with section 2180, if the operator cannot meet the schedule for repair and explain the reason for the delay.

§ 2175.6 Cathodic protection requirements.

(a) The cathodic protection must be in operation prior to the commencing operation of a carbon dioxide pipeline.

§ 2175.7 Additional construction requirements.

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(a) For a new carbon dioxide pipeline segment must meet the following additional construction requirements.

(b) Quality assurance:

(1) The construction of the pipeline segment must be done under a quality assurance plan addressing pipe inspection, hauling and stringing, field bending, welding, non-destructive examination of girth welds, applying and testing field applied coating, lowering of the pipeline into the ditch, padding and backfilling, and hydrostatic testing.

(2) The quality assurance plan for applying and testing field applied coating to girth welds must be:

(i) Covered the surface quality of the bare pipe, surface cleanliness and chlorides, blast cleaning, application temperature control, adhesion, cathodic disbondment, moisture permeation, bending, coating thickness, holiday detection, and repair and

(ii) Performed by an individual with the knowledge, skills, and ability to assure effective coating application.

(c) All girth welds on a new pipeline segment must be non-destructively examined.

(1) Any nondestructive testing of welds must be performed-

(A) In accordance with a written set of procedures for nondestructive testing; and

(B) With personnel that have been trained in the established procedures and in the use of the equipment employed in the testing.

(2) Procedures for the proper interpretation of each weld inspection must be established to ensure the acceptability of the weld as follows:

(A) Each weld and welding must be inspected by a weld inspector to ensure compliance with the requirements of this Article. Visual inspections must be supplemented by nondestructive testing.

(B) The acceptability of a weld is determined according to the standards in section 9 or Appendix A of API Std 1104 (incorporated by reference). Appendix A of API Std 1104 may not be used to accept cracks.

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(d) Interference currents for a new pipeline segment, the construction must address the impacts of induced alternating current from parallel electric transmission lines and other known sources of potential interference with corrosion control.

§ 2176. Integrity Testing.

(a) Every newly constructed or relocated pipeline system that transports carbon dioxide shall be tested in accordance with the requirements of this section and applicable portions of 49 CFR, Part 195, Subpart E (commencing with Section 195.300).

(b) Piping that crosses public rights of way, such as roads, shall also be tested consistent with the requirements of this section.

(c) No operator may operate a pipeline unless it has been pressure tested under this section without leakage. In addition, no operator may return to service a segment of pipeline that has been replaced, relocated, or otherwise changed until it has been pressure tested under this section without leakage.

§ 2176.1 Pressure testing requirements

(a) The length of pipe being tested must be purged of all hazardous liquids or carbon dioxide prior to conducting testing.

(b) Water must be used as the test medium.

(c) Pipeline operators must develop and follow a procedure for drying pipelines after pressure testing including methods of drying and selection of equipment for drying before filling with carbon dioxide to reduce the risk of corrosion.

§ 2176.2 Spike test requirements.

(a) A spike test is required if the operator uses pressure testing to assess the integrity of a carbon dioxide pipeline. The spike hydrostatic pressure test must be conducted in accordance with the requirements of this section and the remaining, applicable portions of 49 CFR, Part 195, Subpart E.

(1) The baseline test pressure must be maintained throughout the part of the system being tested at a pressure equal to 125 percent, or more, of the maximum operating pressure.

(2) The test must be conducted by maintaining a pressure at or above the baseline test pressure for at least 8 hours.

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(3) After the test pressure stabilizes at the baseline pressure and within the first 2 hours of the 8-hour test interval, the hydrostatic pressure must be raised (spiked) to a minimum of the lesser of 1.5 times maximum operating pressure or 100% specified minimum yield strength. This spike hydrostatic test pressure must be held for at least 30 minutes after the spike hydrostatic test pressure stabilizes.

§ 2176.3 Integrity Testing Notification.

(a) Operators shall notify the Office of the State Fire Marshal of pressure tests or inline inspections in accordance with section 2180.

§ 2177. Emergency Planning and Preparedness

§ 2177.1 Emergency planning zone inventory and map.

(a) Each operator shall submit to the Office of the State Fire Marshal and the public agency that is the lead agency for any pipeline project subject to CEQA, all the following

(1) A list of all sensitive receptors within the emergency planning zone that encompasses the pipeline. The list must collect data including the number of affected entities (including any residents or occupants), their ages, preferred language, primary and secondary phone numbers, and any specific evacuation information, such as special access routes into buildings, and if additional help in evacuation is required.

(2) A detailed map showing the location and distance to the pipeline of each sensitive receptor within the emergency planning zone.

(3) A graphic representation of the results from the vapor dispersion analysis, if required under § 2175.3.

(c) Each operator must, at least once every three years, provide the Office of the State Fire Marshal and the lead agency with an updated emergency planning zone inventory and map for review. If no changes occurred since the last submission, a No Change Notification may be submitted to the Office of the State Fire Marshal and lead agency in lieu of making a submission.

(d) Each operator must, annually, provide sensitive receptors with a redacted emergency planning zone map in accordance with Government Code section 51015.06(e).

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§ 2177.2 Vapor dispersion analysis.

(a) General. Operators must develop a process for identifying which pipeline segments could affect sensitive receptors, including a vapor dispersion analysis that meets the requirements of this section.

(1) Applicability. Whenever an operator of a pipeline is required by this part to perform a vapor dispersion analysis, the operator must meet the requirements of this section.

(b) Analysis. An operator must use a validated, engineering-based model and must include in its analysis, each of the following elements to determine the distance a release could affect sensitive receptors within the emergency planning zone:

(1) The physical and thermodynamic properties and characteristics of the product the pipeline is transporting and operating conditions of the pipeline, including but not limited to maximum operating pressure, temperature, maximum flow rate, hydraulic gradient of the pipeline, density, and vapor pressure;

(2) The diameter of the pipeline, the potential release volume, and the distance between the isolation points;

(3) Release characteristics, including release rates (instantaneous and continuous), orientation of the release, and phase composition of the release;

(4) Concentrations of released product, in terms of flammability, asphyxiation, and toxicity, at which the operator determines the pipeline segment, at which the operator determines the pipeline segment could affect a sensitive receptor.

(5) Terrain surrounding the pipeline, including natural topography (e.g., valleys, ravines, hills, and low-lying areas) and manmade structures (e.g., buildings, roadways, ditches, and canals);

(6) Vegetation in any area that could interact with released vapor, and

(7) Typical weather conditions that could affect released vapor, including but not limited to humidity, prevailing winds, and temperature.

(c) Analysis updates. Each operator using a validated, engineering-based model must review and update the analysis performed under this section at intervals not exceeding 15 months, but at least once each calendar year. In performing this review, operators must evaluate and document any material changes made to the model itself or elements used in the analysis described in this section.

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§ 2177.3 Emergency training.

(a) Training. Prior to commencing operations and annually thereafter, pipeline operators must provide annual training services for State and local emergency services, and disaster agencies for training, exercises, and equipment related to carbon dioxide pipelines. Training shall be offered to all emergency responders and interested parties, including hospitals and residents, local business, and other utilities, within the Emergency Planning Zone. At a minimum training shall include

(1) How to identify a carbon dioxide release and consequences of a carbon dioxide release,

(2) Communications procedures to inform of a carbon dioxide release, including alarms, sirens, text message alerts, and other means of alerting the public,

(3) Procedures for relocating residents and others in the affected area, evacuation routes, and transportation for those impacted by a release to health care facilities,

(4) Take steps necessary to control any accidental release of hazardous liquid or carbon dioxide and to minimize the potential for fire, explosion, toxicity, asphyxiation, or environmental damage; and

(5) Signs and symptoms of exposure to a carbon dioxide release.

(6) Procedures for inspecting the affected areas prior to repopulation for the presence of carbon dioxide or other hazardous conditions that may impact the health of sensitive receptors as a result of the release of carbon dioxide.

(b) Each training shall be recorded and the most recent training shall be posted to the owner and operator's website, the Office of the State Fire Marshal's website, and shall be provided to State and local emergency management agencies.

§ 2177.4 Emergency preparedness materials.

(a) Prior to commencing operations, the pipeline operator shall develop and distribute emergency preparedness materials to sensitive receptors within the emergency planning zone. The operator must perform a population density survey along the pipeline route. The survey must collect data including the number of affected entities (including any residents or occupants), their ages, preferred language, primary and secondary phone numbers, and any specific evacuation information, such as special access routes into buildings, and if additional help in evacuation is required. At a minimum, the materials shall include:

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(1) What to do in the event of a carbon dioxide release,

(2) Symptoms of exposure to a carbon dioxide release, and

(3) Recommendations for carbon dioxide monitors and air supply respirators.

§ 2177.5 Emergency response.

(a) Operators must provide safety when an emergency condition occurs, including, but not limited to the following:

(1) Having personnel, equipment, instruments, tools, and materials available as needed at the scene of an emergency, including equipment, instruments, and tools capable of detecting hazardous concentrations of hazardous liquid, carbon dioxide, and known deleterious product stream constituents.

(2) In the case of failure of a pipeline system transporting carbon dioxide, use of appropriate instruments to assess the extent and coverage of the vapor cloud and determine the hazardous areas.

(3) In the case of an emergency on an onshore pipeline system transporting carbon dioxide and as soon as practicable after identifying an emergency on the pipeline, initiate an automatic notification system that will contact the affected entities (including residents and occupants) within the emergency planning zone of the pipeline with a message indicating that an emergency exists and what safety precautions members of the public should take. Operators must transmit additional messages to affected entities throughout the emergency as critical safety information is updated or the emergency is resolved. All communications required by this paragraph must be conducted in English and in other languages commonly understood by a significant number and concentration of the non-English speaking population in the operator's area. Operators must use the contact information obtained at paragraph 2177.1(a)(1) of this section to meet the requirements of this section, to determine if additional assistance is required to aid in the evacuation process, and to inform appropriate Federal, State, regional, county, local, and tribal emergency response officials.

(b) Should a pipeline rupture occur, that pipeline shall remain non-operational until an investigation is completed that determines the origin and cause of the failure. The Office of the State Fire Marshal, in consultation with appropriate State, Federal, and local agencies, shall determine if or when a pipeline may resume operations.

§ 2177.6 Effectiveness review.

(a) Every 4 years, the pipeline operator must review and, if necessary, revise their

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emergence training in section 2177.3, emergence preparedness materials in section 2177.4, and emergence response in section 2177.5, and take corrective action where deficiencies are found.

§ 2178. Operations and Maintenance.

(a) No operator may operate or maintain its CO2 pipeline systems at a level of safety lower than that required by this article and the procedures it is required to establish under Section 2173.

(b) No operator may operate any part of a CO2 pipeline unless

(1) It was designed and constructed by this article.

(2) The carbon dioxide transported is a fluid consisting of more than 90 percent carbon dioxide molecules compressed to a dense phase.

§ 2178.1 Signs.

(a) Each operator must maintain signs visible to the public around each pump station, compressor station. Each sign must contain the name of the operator and a telephone number (including area code) where the operator can be reached at all times.

§ 2178.2 Security of facilities.

(a) Each operator must provide protection for each pump station, compressor station, and breakout tank area, and other exposed facility (such as scraper traps) from vandalism and unauthorized entry.

§ 2178.3 Smoking or open flames.

(a) Each operator must prohibit smoking and open flames in each pump station area, compressor station area, and each breakout tank area where there is a possibility of the leakage of a flammable hazardous liquid or of the presence of flammable vapors.

§ 2178.4 Excavated Trenches

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(a) Taking adequate precautions in excavated trenches to protect personnel from the hazards of unsafe accumulations of vapor or gas, and making available when needed at the excavation, on-site fire control equipment, devices capable of detecting hazardous concentrations of vapor or gas, emergency rescue equipment, including a breathing apparatus, and a rescue harness and line.

§ 2178.5 Inspections.

(a) Inspection of rights-of-way and crossings under navigable waters.

(1) Each operator must, at intervals not exceeding 3 weeks, but at least 26 times each calendar year, inspect the surface conditions on and adjacent to each pipeline right-of-way for indications of leakage, construction activity, geologic hazards, reduced depth of cover, and other factors that may affect pipeline integrity, safety, and operation. Methods of inspection include walking, driving, flying or other appropriate means of traversing and inspecting the right-of-way.

(b) Inspections of vapor detection, alarm systems, and safety devices.

(1) Each operator shall maintain each fixed vapor detection and alarm system to function properly.

(2) Each operator shall inspect and test each fixed vapor detection, alarm system, and safety device required under § 2174.5 at least once per calendar year, but at intervals not exceeding 15 months, to determine that it is functioning properly.

(3) Each inspection and test must be under conditions approximating actual operations and include individual components of the system and the entire system.

§ 2178.6 Land movement.

(a) Whenever an operator observes an indication of geologic hazards on or adjacent to a pipeline right-of-way, the operator must perform additional inspections and evaluations, determine the extent of the geologic hazards and the impact of those hazards on the pipeline, and take remedial action, including

(1) Implementation of a preventative and mitigative program in accordance with API RP 1187 (incorporated by reference).

(2) Make repairs on its pipeline system according to the requirements of 49 CFR, Part 195.401(b), if necessary.

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§ 2178.7 Depth-of-cover survey.

(a) Each operator shall, at intervals not exceeding five (5) years, inspect and confirm depth-of-cover survey of its pipeline to determine the condition of pipe location and cover depth that complies with section 2175.4 of this Article. In areas that are subject to washouts, floods, unstable soil, landslide, ground movement, subsidence or other hazards, the survey shall be conducted every three (3) years.

(b) Whenever an operator observes an indication that the depth of cover over a buried pipeline is less than that required by section 2175.4, the operator must perform additional inspections and evaluations, determine the extent of the reduced depth of cover and the impact of the reduced depth of cover over the buried pipeline, and take remedial action, including

(1) Develop a remedial action plan.

(2) Complete remedial actions within one (1) year of completing the inspection that identified the deficiency, not to exceed 15 months, of the inspection that identified the deficiency or as soon as practical, not to exceed six (6) months after obtaining any necessary permits.

(A) If the operator cannot meet the schedule for remedial action, each operator must take further remedial action to ensure the safety of the pipeline and must notify the Office of the State Fire Marshal in accordance with section 2180 to explain the reasons why it cannot meet the schedule and how the changed schedule will not jeopardize the public safety or environmental protection.

§ 2179. Corrosion Control Requirements.

(a) Each cathodic protection system required under this Article shall provide a level of cathodic protection that meets -850 mV “instant” off criterion. Alternatively, the operator shall conduct an annual close-interval survey (CIS) to verify the effectiveness of cathodic protection system on the pipeline.

§ 2179.1 Internal corrosion control: Monitoring and mitigation.

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(a) Carbon dioxide pipeline monitoring and mitigation. Each operator of a pipeline transporting carbon dioxide must develop and implement a monitoring and mitigation program to mitigate the corrosive effects of the combined constituents in the product stream, as necessary. Potential corrosion-affecting constituents include, but are not limited to, microbes, H_2O (water), O_2 (oxygen), CH_4 (methane), H_2S (hydrogen sulfide), CO (carbon monoxide), SOx (sulfur oxides), and NOx (nitrogen oxides). An operator must evaluate the individual and combined effects of the applicable corrosion affecting constituents in the product stream, at the operating temperatures and pressures of the pipeline, on the internal corrosion of the pipe and implement mitigation measures, as necessary. The monitoring and mitigation program must include:

(1) The use of quality monitoring methods at points where carbon dioxide containing corrosion-affecting constituents enters the pipeline to determine the presence and quantity of corrosion-affecting constituents.

(2) Technology to mitigate the corrosion-affecting constituents, which may include product sampling, inhibitor injections, in-line cleaning pigging, separators, or other technology that mitigates potentially corrosive effects. The operator must use technology to:

(i) Allow no free water and otherwise limit water to 50 ppm by volume of total product in any phase.

(ii) Limit hydrogen sulfide (H_2S) to 20 ppm by volume of total product in any phase.

(3) An evaluation at least four times per calendar year, at intervals not to exceed 4 ½ months, to ensure that corrosion-affecting constituents are effectively monitored and mitigated.

(4) An evaluation and review of the monitoring and mitigation program at least once each calendar year, at intervals not to exceed 15 months, updating and adjusting the program based on the results of that evaluation and review as necessary.

(b) **Inhibitors**. Each operator using corrosion inhibitors to mitigate internal corrosion must

(1) Use inhibitors in sufficient quantity to protect the entire part of the pipeline system that the inhibitors are designed to protect;

(2) Use coupons or other monitoring equipment to determine the effectiveness of the inhibitors in mitigating internal corrosion; and

(3) Examine the coupons or other monitoring equipment at least twice each calendar year, but with intervals not exceeding 7 ½ months.

(4) An evaluation and review of the monitoring and mitigation program at least once each

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calendar year, at intervals not to exceed 15 months, updating and adjusting the program based on the results of that evaluation and review as necessary.

§ 2180. Notifications and submissions.

(a) All notifications or required submissions to the Office of the State Fire Marshal required in this Article shall be made via email to pipelinenotification@fire.ca.gov.

§ 2180.1 New construction, replacement, or relocation.

(a) An operator shall notify the Office of the State Fire Marshal of any new construction, replacement, or relocation of a carbon dioxide pipeline subject to this Article by filing Form PSD-104 with the Office of the State Fire Marshal Pipeline Safety Division at least 60 days before construction begins.

§ 2180.2 Notification of Rupture or Potential Rupture.

(a) Every potential rupture, rupture, explosion, or fire involving a carbon dioxide pipeline, including a pipeline undergoing testing, shall be immediately reported by the pipeline operator to the fire department having fire suppression responsibilities and to the Office of Emergency Services pursuant to Government Code section 51018.

§ 2181. Record Retention.

(a) An operator shall retain for the life of the pipeline and components, records that demonstrate compliance with the requirements of this Article. At minimum, the following records shall be retained for the life of the intrastate pipeline:

(1) The physical characteristics of the pipeline, including diameter, yield strength, ultimate tensile strength, wall thickness, seam type, and chemical composition of materials including those records specified under section 2174.2(d).

(2) Records documenting the coating assessment findings and remedial actions performed under section 2175.5(c) through (e).

(3) If the pipeline is located where one or more sensitive receptors are located, the reason the location was impracticable to avoid.

(4) Records demonstrating compliance with sections 2174 - Design Requirements and 2175 - Construction Requirements, including any tests, inspections, and attributes required by the manufacturing specifications applicable at the time the pipe and

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components were manufactured or installed.

(5) Records demonstrating compliance with section 2176 - Integrity Testing.

(6) Records of the analysis, review, and any update performed pursuant to section 2177 - Emergency Planning and Preparedness.

(7) Records of additional inspections, evaluations, determinations of need for remedial action, and remedial actions performed under sections 2178.6 and 2178.7.

(b) All documentation shall be made available to the Office of the State Fire Marshal upon request.

(c) When an operator divests its assets, it shall transfer all records listed in paragraph (a) of this section to the new operator who acquired those assets.

§ 2182. Enforcement.

(a) The State Fire Marshal may take enforcement action for violations of this Article consistent with authority found in Government Code Sections 51010 et seq.

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