Hazardous Liquid Pipeline Operator Qualification (OQ)

API RECOMMENDED PRACTICE 1161
SIXTH EDITION, MAY 2025

Special Notes

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed. The use of API publications is voluntary. In some cases, third parties or authorities having jurisdiction may choose to incorporate API standards by reference and may mandate compliance.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to ensure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be utilized. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

Foreword

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

The verbal forms used to express the provisions in this document are as follows.

Shall: As used in a standard, “shall” denotes a minimum requirement in order to conform to the standard.

Should: As used in a standard, “should” denotes a recommendation or that which is advised but not required in order to conform to the standard.

May: As used in a standard, “may” denotes a course of action permissible within the limits of a standard.

Can: As used in a standard, “can” denotes a statement of possibility or capability.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API standard. Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually by API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001.

Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org.

Contents

Figures

Tables

Tasks

Introduction

API 1161 *Hazardous Liquid Pipeline Operator Qualification (OQ)* provides guidance to the pipeline industry to create and manage an operator qualification (OQ) program as described in 49 *Code of Federal Regulations (CFR)* Part 195, Subpart G—Qualification of Pipeline Personnel, Rule of August 1999. The rule applies to all employees and contractors working on the Pipeline and Hazardous Materials Safety Administration–regulated facilities when performing tasks that meet the Four-part Test. The four parts of the Four-part Test (listed below) identify work that:

— is performed on a pipeline facility;

— is an operations or maintenance task;

— is performed as a requirement of 49 *CFR* Part 195;

— affects the operation or integrity of the pipeline.

API 1161 is intended to be used by operators, training providers, vendors, and regulators. The document includes a recommended covered task list with supporting covered task standards developed by subject matter experts from operators, training providers, vendors, and other industry sources.

API 1161 has been published five times prior to this edition.

a) August 2000, API Publication 1161, Guidance Document for the Qualification of Liquid Pipeline Personnel, First Edition.

    1) Created by the Consortium on Operator Qualification sponsored by API in response to the publication of the OQ rule. The First Edition focused on requirements to establish an OQ program.

    2) Forty-five initial tasks identified.

b) April 2012, API Recommended Practice 1161, *Recommended Practice for Pipeline Operator Qualification (OQ)*, Second Edition.

    1) Standardized the format and published the document as a formal API recommended practice.

    2) Task list expanded to 99 tasks.

    3) Published task standards that contained knowledge and skills for some of the tasks included in the task list.

c) January 2014, API Recommended Practice 1161, *Recommended Practice for Pipeline Operator Qualification (OQ)*, Third Edition.

    1) Additional task standards published.

    2) Added Annex C, Evolution of the Covered Tasks.

    3) Standardized the titles of task names.

d) February 2019, API Recommended Practice 1161, *Recommended Practice for Pipeline Operator Qualification (OQ)*, Fourth Edition.

    1) Published task standards for all tasks listed on the task list.

    2) Codified the format for the task list and task standards.

    3) Expanded the abnormal operating conditions for each task.

4) Added Annex D, Testing and Evaluation Guidance.

5) Added Annex E, Program Effectiveness Guidance.

6) Annex C removed.

e) November 2021, API Recommended Practice 1161, *Recommended Practice for Pipeline Operator Qualification (OQ)*, Fifth Edition.

1) Task list expanded to 100 tasks.

2) Introduced revised language on evaluation with a specific focus on conducting remote evaluations.

3) Added Annex F, Management of Change Guidance.

4) Added Annex G, Abnormal Operating Conditions Guidance.

Changes to the Sixth Edition include the following:

— changed the title to *Hazardous Liquid Pipeline Operator Qualification (OQ)*;

— reduced scope to liquids assets regulated by 49 *CFR* Part 195 (all references to gas assets regulated by 49 *CFR* Part 192 have been removed);

— general updates to the front matter;

— Annex C, Covered Task Development, was updated and republished;

— updates to Annex G, Abnormal Operating Conditions Guidance;

— task-specific abnormal operating conditions identified for all covered tasks;

— revisions to all covered tasks previously published in the Fifth Edition;

— expansion of the task list to 120 tasks.

New tasks published in the Sixth Edition include the following:

Task Number	Task Name
9.6.1	Install Electrical Insulating Device—Piping Isolation
9.6.2	Install Electrical Insulating Device—Casing Isolation
9.6.3	Install Electrical Insulating Device—Isolation Joints
9.6.4	Install Electrical Insulating Device—Lightning Protection and Electrical Grounding
33	Move In-service Pipe
35	Inspect Clearance of Existing Pipe to Underground Structures
38.8	Perform Nondestructive Testing—Magnetic Flux Leakage Testing
40.12	Cutting on Steel Pipeline
40.13	Perform Flange Bolting
40.14	Install Threaded Connections
40.15	Install and Monitor Vapor Barriers

Task Number	Task Name
40.16	Remove Casings
40.17	Install Tubing
45	Operate Pressure Relieving Devices for Launching and Receiving Facilities
101	Underwater—Measure Structure-to-electrolyte Potentials
102	Underwater—Examine for Mechanical Damage
103	Underwater—Examine for External Corrosion
104	Underwater—Inspect the Condition of External Coating
105	Underwater—Install Galvanic Anodes
120	Underwater—Install Pipe-end Connectors
140	Underwater—Locate Line and Install Temporary Marker

Hazardous Liquid Pipeline Operator Qualification (OQ)

1 Scope

API 1161 establishes a framework for developing and maintaining an operator qualification (OQ) program for hazardous liquid pipeline personnel. This recommended practice is applicable for all hazardous liquid pipelines, both onshore and offshore, subject to 49 *Code of Federal Regulations (CFR)* Part 195, Subpart G. Operators may choose to use all or part of this document as applicable to their operations.

For the purposes of this document, the word “pipeline” is used interchangeably with “pipeline facility” or “pipeline system,” as defined in 49 *CFR* Part 195. This document pertains to all employees, contractors, subcontractors, or other entities who perform covered tasks on behalf of the operator.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API 510, *Pressure Vessel Inspection Code: In-service Inspection, Rating, Repair, and Alteration*, Ninth Edition, June 2006

API Standard 653, *Tank Inspection, Repair, Alteration, and Reconstruction*, Third Edition, December 2001, including Addendum 1 (September 2003), Addendum 2 (November 2005), Addendum 3 (February 2008), and Errata (April 2008)

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 Standard 2350, *Overfill Prevention for Storage Tanks in Petroleum Facilities*, Fifth Edition, September 2020, including Errata 1 (April 2021)

ASME *Boiler and Pressure Vessel Code* [1], *Section IX: Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators*, 2007 Edition, July 2007

ASNT SNT-TC-1A [2], *Personnel Qualification and Certification in Nondestructive Testing*

U.S. DOT Title 49, *Code of Federal Regulations* Part 195 [3], *Transportation of Hazardous Liquids by Pipeline*

NOTE Dated editions referenced above are incorporated by reference (IBR) into 49 *CFR* § 195.3 and are current as of the publication date of this document.

3 Terms, Definitions, Acronyms, and Abbreviations

3.1 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

NOTE When identical terms are defined within the task standard and in this section, the task standard definitions apply.

---

1 ASME International, 2 Park Avenue, New York, NY 10016, www.asme.org.

2 American Society for Nondestructive Testing, 1201 Dublin Road, Suite G04, Columbus, OH 43215, www.asnt.org.

3 U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, 1200 New Jersey Avenue, SE, Washington, DC 20590, www.phmsa.dot.gov.

3.1.1
abnormal operating condition
AOC
A condition identified by the operator that may indicate a malfunction of a component or deviation from normal operations that may:

— indicate a condition exceeding design limits, or

— result in a hazard(s) to persons, property, or the environment.

NOTE As defined in 49 *CFR* § 195.503.

3.1.2
accident
A failure in a pipeline system in which there is a release of the hazardous liquid or carbon dioxide transported, resulting in any of the following:

a) Explosion or fire not intentionally set by the operator.

b) Release of 5 gallons (19 liters) or more of hazardous liquid or carbon dioxide, except that no report is required for a release of less than 5 barrels (0.8 m^3) resulting from a pipeline maintenance activity if the release is:

    1) not otherwise reportable under this section;

    2) not one described in 49 *CFR* § 195.52(a)(4);

    3) confined to company property or pipeline right-of-way;

    4) cleaned up promptly.

c) Death of any person.

d) Personal injury necessitating hospitalization.

e) Estimated property damage, including cost of cleanup and recovery, value of lost product, and damage to the property of the operator or others, or both, exceeding $50,000.

NOTE As defined in 49 *CFR* § 195.50.

3.1.3
covered task
An activity, identified by the operator, that:

a) is performed on a pipeline facility;

b) is an operations or maintenance task;

c) is performed as a requirement of 49 *CFR* Part 195;

d) affects the operation or integrity of the pipeline.

NOTE As defined in 49 *CFR* § 195.501.

3.1.4
disqualification
The act of removing an individual’s qualification to perform any or all covered tasks until completing the requirements for requalification.

3.1.5
evaluation
A process, established and documented by the operator, to determine an individual's ability to perform a covered task by any of the following:

a) written examination;

b) oral examination;

c) work performance history review (WPHR);

d) observation during:

   1) performance on the job,

   2) on-the-job training (OJT), or

   3) simulations;

e) other forms of assessment.

NOTE As defined in 49 *CFR* § 195.503.

3.1.6
IR drop
The voltage or potential difference as a result of current flow. From Ohm's Law, V = IR. When evaluating structure-to-soil measurements, IR drop is the voltage drop other than the drop across the structure-to-soil boundary.

3.1.7
new construction
The act of building a pipeline facility or expanding an existing pipeline facility (as in looping a pipeline segment, which may also be done to meet increased load requirements or to enhance reliability of the system) in order to provide new service to a customer(s) or in order to meet increased demand.

NOTE As defined in the Pipeline and Hazardous Materials Safety Administration (PHMSA) Pipeline Glossary.

3.1.8
operator qualification program
OQ program
A written qualification program that meets or exceeds the requirements of 49 *CFR* § 195.505.

3.1.9
qualification
The result of a process determined by the operator that includes successful completion of task-specific evaluation(s) with the associated abnormal operating conditions (AOCs), documentation, and meets the requirements of the OQ program.

3.1.10
qualified
An individual who has been evaluated and can:

a) perform assigned covered tasks;

b) recognize and react to AOCs associated with those tasks.

3.1.11
remote evaluation
An evaluation that is conducted and controlled remotely by an evaluator who is not physically present.

3.1.12
repair
Repair is the act of returning a damaged or defective item to restore its serviceability and safe operation. Pipeline repairs address defects or anomalies that reduce the strength of a pipe in a manner that restores that strength. Repairs can include replacing sections of pipeline.

3.1.13
risk and difficulty analysis
A tool to assist in determining a requalification interval or span-of-control ratio.

3.1.14
span of control
The ratio of qualified to unqualified individual(s) where the unqualified individual(s) is directed and observed by a qualified individual while performing a covered task.

3.1.15
suspension
The temporary act of removing an individual's qualification to perform any or all covered tasks.

3.1.16
training
The learning, development, and improvement of new or existing knowledge and skills, not to include the evaluation or qualification of those knowledge and skills.

3.2 Acronyms and Abbreviations

AC	alternating current
AO	abnormal operation
AOC	abnormal operating condition
BPVC	*Boiler and Pressure Vessel Code*
CFR	*Code of Federal Regulations*
CP	cathodic protection
CPM	computational pipeline monitoring
DC	direct current
DCF	density correction factor
HMI	human machine interface
HVL	highly volatile liquid
IBR	incorporated by reference
I/O	input/output
KSA	knowledge, skills, and abilities

mil	1/1000 of an inch
MOP	maximum operating pressure
MOV	motor-operated valve
NDT	nondestructive testing
OJT	on-the-job training
OPD	overfill protective device
OQ	operator qualification
PCR	polarization cell replacement
PHMSA	Pipeline and Hazardous Materials Safety Administration
PIG	pipeline inspection gauge
PLC	programmable logic controller
P/V	pressure/vacuum
RMU	remote monitoring unit
SCADA	supervisory control and data acquisition
SSD	solid-state decoupling
VOM	volt-ohm meter
WPHR	work performance history review

4 Developing an Operator Qualification Program

4.1 Roles and Responsibilities

4.1.1 Operators should identify roles for the administration, management, and execution of the OQ program.

4.1.2 Operators should establish and assign responsibilities to each applicable OQ program role. The responsibilities should be communicated to affected individuals. Examples of responsibilities include the following:

— managing and overseeing the OQ program;

— identifying covered tasks;

— assigning covered tasks to individuals;

— training, as appropriate;

— conducting and administering evaluations, per the operator's OQ program;

— verifying individuals' qualifications;

— managing contractors and other entities;

— documentation and recordkeeping.

4.2 Communication

The operator's OQ program should include mechanisms to facilitate effective communication when a communication barrier exists. Examples may include the following:

— interpreter for alternative languages or individual(s) with hearing loss;

— training materials or task steps in applicable formats;

— qualification methods in applicable formats.

4.3 Program Improvement

4.3.1 General

Operators should develop processes for periodic review and audit of their OQ program. Operators should incorporate program improvements based on the findings. The operator has the flexibility to structure the review and audit as formally or informally as deemed necessary but should document the results and identify and communicate any modifications.

4.3.2 Operator Qualification Program Review

The purpose of periodically reviewing the OQ program is to verify that it meets current regulatory and operator requirements.

NOTE Refer to Annex E for further information.

4.3.3 Internal Audit

The purpose of an internal audit is to verify that the OQ program is being executed as written.

NOTE Refer to Annex E for further information.

4.3.4 Participation in an Industry Group

The operator may consider participating in an industry OQ group. These groups develop and update OQ guidance materials, share best practices, and interact with regulatory agencies.

5 Identification of Covered Tasks

5.1 General

The four criteria listed below are referred to hereafter as the Four-part Test.

The program shall identify and document covered tasks. A covered task is an activity, identified by the operator, that:

a) is performed on a pipeline facility;

b) is an operations or maintenance task;

c) is performed as a requirement of 49 *CFR* Part 195;

d) affects the operation or integrity of the pipeline.

NOTE Pipeline repair activities not explicitly identified in 49 *CFR* Part 195, while performed in accordance with the requirements of 49 *CFR* § 195.422(a), may be considered by the operator as meeting the third component of the Four-part Test.

5.2 Identifying Covered Tasks

5.2.1 General

In developing the covered task list, operators are required by 49 *CFR* Part 195 to include tasks meeting all elements of the Four-part Test that are performed for the operator, regardless of who performs them. This includes employees, contractors, subcontractors, or other entities, such as other pipeline operators. Operators can include additional tasks that do not meet all elements of the Four-part Test.

The operator has flexibility to determine how to accomplish covered task identification. The operator should document the method and justification for selecting covered tasks.

5.2.2 Adoption of an Industry-developed Covered Task List

Industry and technical associations, OQ vendors, and others have developed covered task lists. When adopting such a list, the operator should compare the covered task list to its operations and maintenance activities. The operator has the flexibility to combine or separate covered tasks as applicable to its operations. If gaps are identified, the operator should apply the Four-part Test to add or remove covered tasks as applicable.

NOTE Annex A presents covered tasks identified by API's Operator Qualification Workgroup.

NOTE Annex C presents a record of covered task development. This includes tasks previously published and subsequently removed, and tasks considered for publication but rejected.

5.2.3 Analysis of Operations and Maintenance Activities

An analysis of operations and maintenance activities should be used to determine which activities will be included in an operator's covered task list. Subject matter experts, regulatory compliance personnel, and others may be enlisted to assist in the identification and analysis. Examples of items to be considered can include the following:

— 49 *CFR* Part 195;

— state or local requirements;

— company requirements;

— operations, maintenance, and safety procedures;

— applicable PHMSA Advisory Bulletins.

It may be helpful to record each applicable activity on a master list and document applicability to each element of the Four-part Test, adding justification notes as needed. This method of documentation produces a list of covered and noncovered tasks and may assist in regulatory and internal reviews.

5.3 Interpreting the Four-part Test

5.3.1 Part 1—Is the Task Performed on a Pipeline Facility?

Operators should review the regulatory definitions of pipeline and pipeline facility. Components, piping, and equipment that are physically connected to the pipeline or pipeline system (i.e. by wires, tubing, pipe, or the pipeline right-of-way) are considered part of the pipeline facility. A component, piping, or equipment disconnected and physically removed from the pipeline or pipeline system is not considered part of the pipeline facility.

5.3.2 Part 2—Is the Task an Operations or Maintenance Task?

Operations tasks are those activities associated with monitoring and controlling the transportation of hazardous materials within a pipeline system. Maintenance tasks are those activities performed to maintain, restore, replace, or relocate active pipeline facilities.

5.3.3 Part 3—Is the Task Performed as a Requirement of 49 *CFR* Part 195?

The operator should review all subparts of 49 *CFR* Part 195, including IBR documents, and state and local requirements to ensure completeness of all tasks. Operations and maintenance tasks are not limited to those tasks addressed in 49 *CFR* Part 195, Subpart F.

5.3.4 Part 4—Does the Task Affect the Operation or Integrity of the Pipeline?

Tasks that, if performed incorrectly, could adversely affect the operations or integrity of the pipeline during or after the performance of the task would meet the Part 4 requirement of the Four-part Test.

5.4 Risk and Difficulty Analysis

If determining the span-of-control ratio and reevaluation interval for each covered task, operators should analyze the risk and difficulty associated with performing the covered task. Operators may use a tool similar to that found in Annex H.

6 Ensuring, Through Evaluation, That Individuals Performing Covered Tasks Are Qualified

6.1 General

Operators shall have a documented process for the evaluation of individuals to be qualified to perform covered tasks.

The terms qualification and evaluation are frequently used interchangeably throughout the industry; however, they are two distinct terms (see definitions).

6.2 Establishing Criteria for Qualification Through Evaluation

6.2.1 Qualification Process

6.2.1.1 Covered Task

The operator should review the covered tasks to determine the appropriate evaluation method(s) and other qualification requirements. Items to be considered should include the following:

— the difficulty of performing the covered task;

— the importance or risk;

— the frequency.

Additionally, the operator should consider the level of knowledge and/or skill needed to perform the covered task and any other factors as determined by the operator.

6.2.1.2 Individuals or Groups of Individuals

The operator has flexibility to determine the evaluation methods and other qualification requirements for all individuals who perform covered tasks. In certain circumstances, an operator may establish provisions to accept qualifications from other entities' internal OQ programs.

6.2.2 Evaluation Methods

6.2.2.1 General

As stated in 49 *CFR* § 195.503, evaluation is a process, established and documented by the operator, to determine an individual's ability to perform a covered task.

Neither WPHR nor OJT can be used as the sole evaluation method for determining qualification. If either of these methods are used, they shall be used in conjunction with other allowable methods of evaluation.

Individual evaluations should be documented.

6.2.2.2 Written or Oral Examination

Written and oral examinations should consist of predetermined questions and should contain enough questions to adequately measure the knowledge required to perform a covered task. Consideration should be made for the role of a proctor and/or evaluator to ensure that examinations are administered in a secure and controlled setting.

6.2.2.3 Work Performance History Review

WPHR is a structured, documented review of an individual's task-related performance records. If an operator chooses to use WPHR as an evaluation method, the following steps should be completed and documented:

— a search of existing records for documentation of an individual's past satisfactory performance of a covered task(s);

— verification that the individual's work performance history contains no indications of substandard work or involvement in an accident caused by an error in performing a covered task.

6.2.2.4 Observation During Performance on the Job

Visual observation during performance on the job includes the evaluation of specific steps required to be performed when completing the task. Evaluators performing observations shall possess the knowledge required to ascertain an individual's ability to perform covered tasks and to substantiate an individual's ability to recognize and react appropriately to AOCs that might occur while performing these activities. Observation during performance on the job cannot be used as a sole evaluation method and shall be used in conjunction with another allowable evaluation method.

6.2.2.5 Observation During On-the-job Training

Observation during the OJT process is a structured performance evaluation conducted at the conclusion of training on a covered task or while an individual is performing the actual work. Observation during OJT should require an evaluator to observe all specific steps required to be performed when completing the task.

6.2.2.6 Observation During Simulation

Observation during simulation can be used as an evaluation method. Simulation should include a realistic performance of the covered task under controlled conditions. Simulation may include the following:

— scenario of a closed pipeline system, such as those used in control centers;

— off the right-of-way using a mock-up scenario to perform various covered tasks;

— demonstrating and communicating the performance of the covered task steps without physically affecting in-service equipment.

When performing an evaluation that simulates the covered task, the evaluation method shall, as closely as possible, mimic the actual task steps. During simulation all requirements (AOC, safety, etc.) shall be met.

6.2.2.7 Other Forms of Assessment

Other forms of assessment may include the following:

— a current professional certification or license through an industry-recognized association with a formal evaluation process;

— specialized equipment manufacturer or vendor certification, including a formal evaluation process.

6.2.3 Evaluation Material

Operators have the option of developing evaluation material or using material developed by third parties.

If developing evaluation material, operators should base evaluations on operations and maintenance procedures or other industry recognized documents. If using material developed by third parties, operators should align the content with the operator’s practices.

Operators may periodically review and update evaluation material to ensure it meets current requirements.

6.2.4 Evaluation Process

6.2.4.1 General

The evaluation process is established and documented by the operator to determine an individual’s ability to perform covered tasks and recognize and react to AOCs. The evaluation establishes that an individual is qualified to perform covered tasks.

6.2.4.2 Roles and Responsibilities

Operators should define evaluation process roles and responsibilities. Examples of these roles applicable to the evaluation process are as follows:

a) an *evaluator* conducts performance evaluations;

b) an *individual* is evaluated for initial qualification or requalification;

c) a *proctor* administers written, oral, or online examinations.

6.2.4.3 Evaluator Selection

Evaluators determine if an individual meets task requirements during a performance evaluation. Operators should develop evaluator acceptance criteria. At a minimum, evaluators should:

a) understand safe work practices;

b) possess a high degree of integrity;

c) possess effective communication skills;

d) be trained to perform and document OQ performance evaluations;

e) be knowledgeable of covered tasks to be evaluated;

f) be able to recognize and react to AOCs that may occur during the evaluation.

Operators may decide that evaluators are not required to be currently qualified to perform the covered tasks they will evaluate. If the individual to be evaluated performs a qualification or requalification on an active jurisdictional pipeline, span-of-control requirements apply (see Section 7).

6.2.4.4 Proctor Selection

Operators should determine whether examination proctoring will be required. Proctors administer written, oral, or online examinations to ensure that individuals complete examinations independently, without help from others, and without using unapproved resources. Proctoring increases the integrity and reliability of the examination process and associated qualification records. Proctors should:

a) possess a high degree of integrity;

b) possess effective communication skills;

c) know examination security procedures;

d) understand procedures for proctoring knowledge examinations.

Proctors are not required to be qualified in the covered tasks they proctor.

6.2.4.5 Examination/Evaluation Procedures

Operators should establish guidelines for:

a) verifying the identity of the individual to be evaluated;

b) ending an evaluation when an AOC or unsafe condition occurs;

c) pausing and resuming an evaluation when conditions warrant;

d) limiting the number of evaluation attempts;

e) taking necessary remedial actions after an unsuccessful evaluation attempt;

f) handling suspected cheating during an evaluation.

The area where the evaluation takes place should ensure:

a) the environment is quiet, without distractions;

b) no unauthorized reference materials are present;

c) equipment and tools necessary for task performance are ready for use;

d) safety equipment, including personal protective equipment, is available, inspected, and appropriate for the task being performed;

e) examination sheets, answer sheets, and performance evaluation checklists are secure;

f) proctor and individual system logins and records are secure;

g) individuals are aware of company procedures for examinations, such as no cell phone or unauthorized internet use during examinations and no talking with others.

6.2.4.6 Evaluation Criteria

Operators should develop and document evaluation criteria for each covered task. Evaluation criteria may be developed internally, provided by third-party vendors, adopted from manufacturers, incorporated from an industry standard, or a combination of these.

Evaluation safety:

a) During any evaluation, safety should be the primary consideration.

b) Evaluators should ensure that individuals are following all safety procedures and act in a safe manner before, during, and after the evaluation.

c) Safety equipment, including personal protective equipment, should be used according to company policies and procedures.

Grading system:

a) For written, oral, or online examination, operators should determine the type of grading system to use and the rationale for their selection. Examples of grading systems include the following:

   1) pass or fail—where all questions shall be answered correctly to pass the examination;

   2) criterion-based—uses a percentage score (e.g. 80 % minimum passing score);

   3) criterion-based with critical questions—uses a percentage score (e.g. 80 % minimum passing score) with critical questions established for information that is essential to safely perform the task.

b) Operators should score performance evaluations as either pass or fail.

c) Operators should not allow individuals to self-score.

Reference materials:

a) During performance evaluations, individuals should be permitted to refer to company procedures, manufacturer instructions, or any other document they would normally be permitted to access when performing the task.

b) During written, oral, or online examination, individuals should not be permitted to access reference materials.

Checklists:

a) For performance evaluations, a checklist that contains each step necessary to perform the task and copies of relevant work procedures may be used by the evaluator to aid in assessing whether all steps in the process were performed.

Evaluation participants:

a) Operators should establish limits to the number of individuals assessed during proctored written, oral, or online examination to ensure that the proctor can properly administer examination.

b) Performance evaluations should be conducted with one evaluator assessing one individual at a time.

Knowledge, skills, and abilities (KSA):

Evaluations are conducted to determine whether the individual has the KSA to perform the task and to recognize and react to AOCs that may occur during task performance.

a) Knowledge includes the following:

1) AOCs that may occur during the performance of the task;

2) applicable procedures to safely perform the task;

3) equipment or tool selection, use, testing, and calibration requirements;

4) the sequence of steps to perform the task;

5) general knowledge of the task topic and related information, such as Code requirements;

6) handling anticipated variables that may occur (including weather, darkness, noise, etc.).

b) Skills include the following:

1) demonstration of the task;

2) demonstration of the recognition and appropriate reaction to AOCs that may occur during task performance.

c) Physical abilities to consider:

1) seeing;

2) hearing;

3) smelling;

4) walking;

5) lifting and moving equipment and components (as necessary);

6) operating necessary tools and equipment.

6.2.4.7 Selection of Evaluation Methods

The selected evaluation methods should be appropriate for the assessment/examination. Operators may use a different evaluation method for an individual's initial qualification as opposed to an individual's subsequent qualification of a task. Individuals, currently qualified, are typically more experienced in the task during subsequent qualification.

Table 1 is a representation of evaluation methods and their applicability for various assessments and examinations.

a) "X" is a suitable evaluation method for the assessment/examination;

b) "O" is an evaluation method that may complement another evaluation method;

c) blank means the evaluation method is not suitable for the assessment/examination.

Table 1—Evaluation Methods

Evaluation Method	Assessment/Examination of				
	Knowledge	**Skill**	**Abilities**	**AOC Recognition**	**AOC Reaction**
Written, oral, or online	X	O		X	O
Performance	O	X	X	X	X

6.2.4.8 Evaluations Conducted via Technology

Historically, performance evaluations have been conducted in-person, through simulation or with an evaluator observing and assessing an individual on-site as the individual performs the task. Technology is now available to enable operators to conduct realistic evaluations through computer-generated applications, remote meeting technology, or use of remote equipment such as a remote operated vehicle or drone for underwater or air applications, respectively.

Tasks that the operator has identified as more critical or more complex may not be suitable for evaluation via technology. For technology to be suitable for evaluations, it shall allow the individual being evaluated to realistically perform each step in the task while the evaluator assesses their performance. Evaluation criteria for evaluations via technology should be the same as in-person or on-site evaluations. Operators should document their assessment and approval of any technology used to conduct evaluations.

Various methods include:

a) Computer-generated applications:

   1) Virtual reality, augmented reality, and other applications digitally replicate task performance situations under safe and controlled conditions in a digital environment. The evaluator can observe and assess the actions of the individual being evaluated as they perform each task step.

b) Evaluations conducted remotely:

   1) Operators may use video conferencing or other software in situations where the evaluator and individual being evaluated are not in the same location. The operator should determine which tasks are appropriate for a remote evaluation. For example, initial qualification may not be appropriate for remote evaluation. The operator should assess whether communication equipment is sufficient to permit effective remote evaluations.

   2) If an evaluation is taking place on an active pipeline, and the individual being evaluated is not qualified in the task, the unqualified individual shall be directed and observed by a qualified individual, within close proximity.

   3) If necessary, the evaluator should designate an on-site observer to continuously monitor the evaluation to ensure the integrity of the evaluation and the safety of the environment. The observer shall remain within close proximity until the evaluation is complete.

6.2.4.9 Documentation

Operators should maintain documentation of an individual’s qualification, including the methods used to assess KSA to perform a task. Qualification records shall include the following:

a) identification of qualified individual(s);

b) identification of the covered tasks the individual is qualified to perform;

c) date(s) of current qualification;

d) qualification method(s).

Operators shall maintain records supporting an individual’s current qualification while the individual is performing the covered task. Records of prior qualification and records of individuals no longer performing covered tasks shall be retained for five years.

6.2.5 Abnormal Operating Conditions

Identification of AOCs for covered tasks includes analyzing the covered task procedures for any potentially hazardous condition that could occur while the task is being performed. Upon identification, determine and document the AOC, the recognition and appropriate reaction. Operators should consider both general and task-specific AOCs. General AOCs are generic in nature, but are observable to individuals on-site, while task-specific AOCs may be encountered while performing the covered task.

Further guidance on identifying AOCs is provided in Annex G.

An evaluation of the individual's ability to perform a covered task shall include the ability to recognize and react to AOCs associated with the covered task. Operators have the flexibility to determine evaluation method(s). These methods include developing a stand-alone AOC evaluation and/or incorporating AOCs into task evaluation.

6.2.6 Type of Qualification

Operators should consider the type of qualification when determining evaluation methods. Requirements may differ between initial, subsequent, and post-suspension qualification.

6.3 Other Circumstances That Require Qualification Considerations

6.3.1 New Construction

New construction is not covered under the OQ regulations for pipeline safety. Operators should consider applicability when existing regulated assets may be affected by the new construction. Examples include the following:

— line locating in the right-of-way of an existing asset;

— observing excavation activities near a regulated asset;

— cathodic protection (CP) system installation;

— building in an existing station or facility;

— tying into an existing regulated asset.

New construction ends upon connection to an active pipeline. Thereafter, tasks performed are operations and maintenance activities requiring operator qualification, until the pipeline is officially abandoned.

6.3.2 Mergers and Acquisitions

An operator's OQ program should include provisions for mergers and acquisitions of assets included in the program to ensure that individuals performing covered tasks are qualified.

A review should be conducted to identify compatibility with the operator's program and identify any processes that may need to be addressed. Items to consider:

— AOCs;

— covered tasks, including span of control;

— reevaluation intervals;

— evaluation methods;

— contractor qualifications;

— current suspensions;

— past regulatory audit findings and corrective actions.

Following the review, the operator may accept all or part of the acquired asset's program or incorporate any new personnel and/or contractors. A plan should be established when transitioning personnel and/or contractors under the acquired asset's program to the operator's program.

Annex E may be used to aid in the OQ program review. Where possible, the operator should document actions taken.

6.3.3 Mutual Assistance

Operators may enter into mutual assistance agreements with other operators to help ensure that they have the resources necessary to complete covered tasks, particularly in times of emergency. Operators should ensure that individuals who perform covered tasks on the operator's pipeline are operator qualified.

7 Allowing Individuals Who Are Not Qualified to Perform a Covered Task

7.1 General

Operators may consider a mechanism to observe and direct performance of a covered task by unqualified personnel.

7.2 Span of Control

An operator's program may allow unqualified individuals to perform some covered tasks, providing they are directed and observed by a qualified individual. For a qualified individual to direct and observe an unqualified individual, the qualified individual shall be in close proximity and within line of sight to the unqualified individual so that the qualified individual may intervene if needed, assume control if the task is being performed incorrectly, and respond to an AOC if one should arise.

Span of control is determined by analyzing the risk and difficulty of the task. Refer to Annex H.

An operator should consider temporarily reducing span of control for a specific task when actual jobsite conditions (i.e. language barriers, weather conditions, and excessive distraction) limit the qualified individual's ability to direct and observe unqualified individuals.

Span of control applies only to individuals who are physically performing steps of a covered task. Span of control does not apply to individuals who are performing only ancillary functions (such as a welder's helper). A qualified individual can only direct and observe unqualified individuals performing a single task at any given time.

7.3 Guidance on Emergency Response

Operator qualification requirements for emergency response are limited to existing covered tasks performed on the pipeline facility.

Individuals who act, or could be reasonably expected to act, on behalf of an operator during emergency situations, as an extension of the operator's workforce, shall be qualified under the operator's OQ program. Emergency responders, such as firefighters or police officers, need not be qualified by the operator to act on their own accord consistent with their job responsibility of protecting public safety. During the emergency phase, the operator's primary responsibilities are the protection of life, property, and the environment.

8 Individuals Who Contribute to an Accident

8.1 General

Operators should consider suspending and reviewing an individual's qualification if the individual's performance of a covered task(s) may have contributed to an accident.

8.2 Appropriate Action Following Individual's Involvement in an Accident

If the operator has determined that a covered task was being performed at the time an accident occurred, the operator should investigate to determine whether the incorrect performance of a covered task was a causal factor to the accident. When making this determination, the operator should review:

— an individual's knowledge on how to perform a covered task;

— any change in an individual's skills or ability required to perform a covered task;

— any deficiency in the performance of a procedure;

— any unidentified AOCs related to the particular covered task(s);

— unsatisfactory or unsafe performance of a covered task;

— if the task was performed by an unqualified individual.

The operator shall determine and execute appropriate action(s) based on their review, which may include the following:

— suspension or disqualification from performing the covered task(s);

— additional training;

— a procedure(s) review;

— a procedure(s) revision;

— evaluation;

— requalification;

— revision of the OQ program;

— other actions as warranted.

Operators should document the results of the review and evidence of suspension, disqualification, or requalification.

9 Potential Reasons for Disqualification

9.1 General

Operators shall review an individual's performance of covered tasks if there is reason to believe the individual is no longer qualified.

9.2 Determining if an Individual Should No Longer Be Qualified

Operators should develop a process to determine if an individual is no longer qualified to perform a covered task. Factors to consider include the following:

— contributing to an accident while performing a covered task;

— failure to properly perform a covered task;

— failure to recognize or properly react to an AOC;

— significant changes in company/regulatory task qualification requirements;

— loss of motor skills, vision, or impairments;

— concern expressed about an individual's ability to perform a covered task;

— qualification period, as determined by company, has expired.

If an individual is determined to no longer be qualified, the operator should suspend the individual's qualification to perform the task and consider additional actions, which may include the following:

— restricting performance of covered task (such as performing task under span of control);

— additional training;

— reevaluation;

— procedure review.

9.3 Suspension Process

Suspension of an individual's qualification(s) should be documented and upheld until the operator has determined if the suspension was warranted, retraining and/or evaluation has been completed, or it was determined that the individual's actions did not contribute to an accident. Upon the operator's review, the suspension could result in a reinstatement or a removal of the individual's task qualification(s).

The suspension of an individual's qualification(s) should at a minimum apply to the specific covered task(s). The operator should determine if the suspension of such qualifications will affect the individual's ability to perform other covered task(s).

10 Identifying Covered Tasks Reevaluation Intervals

10.1 General

Operators shall establish a reevaluation interval for each covered task.

10.2 Developing Reevaluation Intervals

When developing reevaluation intervals, the operator has the option of using industry associations' (or other entities) recommended intervals as guidance or developing operator-specific intervals. If an operator chooses to adopt industry-developed intervals, they should review each interval to verify alignment with the operator's OQ program. Some covered tasks, such as welding or nondestructive testing (NDT), have regulatory requirements that may affect reevaluation intervals.

When developing or revising intervals, the operator should document the rationale used to determine the intervals and may use a similar process as described in Annex H.

11 Communicating Changes

11.1 General

The operator shall establish a process for communicating changes that affect the performance of covered tasks.

11.2 Developing Processes to Communicate Changes That Affect Covered Tasks

Changes that affect the performance of covered tasks may include the following:

— task modification;

— revisions to policies, procedures, or standards;

— changes to tools, equipment, or technology.

Other changes that may require communication include the following:

— task addition or deletion;

— modification of reevaluation intervals;

— revision to span of control;

— modification, addition or deletion of evaluation methods, materials, and criteria;

— revisions or additions to identified AOCs.

Changes to covered tasks may necessitate additional evaluation to maintain qualification.

12 Training

12.1 General

The operator shall provide training, as appropriate, to ensure that individuals performing covered tasks have the necessary knowledge and skills required for qualification to perform the tasks in a manner that ensures the safe operation of the pipeline facilities.

12.2 Providing Training

Training on specific covered tasks and/or based on the individual's need for training may be appropriate in the following circumstances:

— initial and/or requalification;

— following a suspension;

— per an accident investigation or a near miss;

— addition of a covered task;

— revisions to policies and procedures;

— changes to tools, equipment, or technology;

— after a failed examination/evaluation;

— or as determined by the operator.

The operator may choose the mechanism by which training will be delivered. The delivery method shall be fit for purpose and meet operator requirements. Training delivery methods can include the following:

— OJT;

— instructor-led training;

— computer-based training;

— certification programs;

— table-top/simulation;

— self-study;

— other methods as determined by the operator.

13 Regulatory Notification of Significant Changes

13.1 General

Operators shall identify significant modifications made to the operator's approved qualification program and submit the changes to PHMSA and appropriate state regulatory agencies.

13.2 Guidance on Determining a Significant Change

Operators shall determine what changes are considered significant to the OQ program. At a minimum, the following should be considered significant:

— increasing evaluation intervals;

— increasing span of control ratios;

— eliminating covered tasks;

— evaluation method changes;

— wholesale changes made to the operator's OQ program (e.g. consolidation of programs following a merger, acquisition, or divestiture; changes to roles and responsibilities).

13.3 Guidance on Transmitting Operator Qualification Program Revisions

The operator should submit the complete OQ program to the PHMSA administrator or participating state agencies, accompanied by a revision log and the effective date of change(s). Revisions should be made allowing the changes to be readily identified. Employee-specific information (i.e. social security numbers) and examination material do not need to be sent.

Each notification should include the following:

— operator identification number(s), operator name(s), and headquarters address;

— name of individual submitting notification;

— date/email/phone number;

— commodity (gas/liquid/both);

— PHMSA region(s) where pipeline(s) operates;

— names of respective facilities or pipeline systems where changes apply.

14 Recordkeeping

14.1 General

The operator shall maintain records that demonstrate compliance with 49 *CFR* § 195.507. Qualification records shall include the following:

— identification of qualified individual(s);

— identification of the covered task(s) the individual is qualified to perform;

— date(s) of current qualification;

— qualification method(s).

Records supporting an individual's current qualification shall be maintained while the individual is performing the covered task(s). Records of prior qualification and records of individuals no longer performing covered task(s) shall be retained for a period of five years.

14.2 Developing Recordkeeping Criteria

Operators should develop and document a process to verify that individuals performing covered tasks have valid qualifications. Validation methods can include hard copy records, electronic records, or ID cards. Different methods may be used to validate qualification for employees, contractors, subcontractors, or other individuals.

The operator should consider maintaining additional records to demonstrate compliance with the program. While this list of records is not required by regulation, many are integral to the OQ program:

— documented history of OQ program and all program revisions, including covered task changes;

— communication of the OQ program;

— evaluation criteria;

— reevaluation records for cause;

— feedback from field personnel, accident investigations, near miss programs, or other sources that could enhance the OQ program, such as AOCs, evaluations, and training;

— results of program review and/or auditing;

— history file of checklist used for performance verifications and written/oral exams;

— justification for selection of evaluators;

— revision log.

Annex A
(informative)

Covered Task List

The covered tasks listed below were identified by API and may be adopted by the operator as described in Section 5.2 of this document. Operators are encouraged to develop a unique covered task list for their operations, which may not include these covered tasks.

Tasks with the title "Underwater" were developed to identify the task steps and abnormal operating conditions (AOCs) involved when the asset is submerged in deep water. The task steps and AOCs involved in these tasks may be materially different from similar tasks performed "topside."

Covered Task Number	Covered Task Title	195 Reference
1.1	Measure Structure-to-soil Potentials	195.573(a) 195.573(b) 195.575(c)
1.2	Conduct Close Interval Survey	195.573(a) 195.573(b) 195.575(c)
1.3	Test to Detect Interference	195.577(a)
1.4	Inspect and Perform Electrical Test of Bonds	195.573(a) 195.573(b) 195.575(c)
1.5	Inspect and Test Electrical Isolation	195.573(a) 195.573(b) 195.575(c)
2.1	Verify Test Lead Continuity	195.567
2.2	Repair or Replace Damaged Test Lead	195.567
2.3	Install Test Leads by Nonexothermic Welding Methods	195.567
2.4	Install Test Leads by Exothermic Welding Methods	195.567
3	Obtain a Voltage and Current Output Reading from a Rectifier to Verify Proper Performance	195.573(c)
4.1	Troubleshoot Rectifier	195.573(c)
4.2	Repair or Replace Defective Rectifier Components	195.573(c)
4.3	Adjust Rectifier	195.573(c)
5.1	Examine for Mechanical Damage on Buried or Submerged Pipe	195.452(h) 195.569
5.2	Examine for External Corrosion on Buried or Submerged Pipe	195.452(h) 195.569
5.3	Inspect the Condition of External Coating on Buried or Submerged Pipe	195.452(h) 195.569
7.1	Perform Visual Inspection of Atmospheric Coatings	195.583
7.2	Prepare Surface for Coating Using Hand and Power Tools	195.581(a)

Covered Task Number	Covered Task Title	195 Reference
7.3	Prepare Surface for Coating by Abrasive Water Blasting	195.581(a)
7.4	Prepare Surface for Coating by Abrasive Blasting Methods Other Than Water	195.581(a)
7.5	Apply Coating Using Hand Application Methods	195.581(a)
7.6	Apply Coating Using Spray Applications	195.581(a)
7.7	Perform Coating Inspection	195.561
8.1	Measure Pit Depth with Pit Gauge	195.585 195.587
8.2	Measure Wall Thickness with Ultrasonic Meter	195.585 195.587
8.3	Measure Corroded Area	195.585 195.587
9.1	Install Bonds	195.575
9.2	Install Galvanic Anodes	195.577(b)
9.3	Install Rectifiers	195.563
9.4	Install Impressed Current Groundbeds	195.577(b)
9.5	Repair Shorted Casings	195.571
9.6.1	Install Electrical Insulating Device—Piping Isolation	195.575
9.6.2	Install Electrical Insulating Device—Casing Isolation	195.575
9.6.3	Install Electrical Insulating Device—Isolation Joints	195.575
9.6.4	Install Electrical Insulating Device—Lightning Protection and Electrical Grounding	195.575
10.1	Insert and Remove Coupons	195.579(a) 195.579(b)(2)
10.2	Monitor Probes (Online)	195.579(a) 195.579(b)(2)
11	Monitor and Control the Injection Rate of the Corrosion Inhibitor	195.579(b)
12	Perform Visual Inspection of Internal Pipe Surface	195.579(c)
14.1	Locate Line	195.410
14.2	Install, Inspect, and Maintain Permanent Marker	195.410
14.5	Install, Inspect, and Maintain Temporary Marker	195.442(c)(4 and 5)
15.1	Perform Visual Inspection of Surface Conditions of Right-of-way	195.412
16.1	Inspect Navigable Waterway Crossing	195.412 195.413
19.1	Perform Valve Body Winterization or Corrosion Inhibition	195.420
19.2	Perform Valve Lubrication	195.420
19.3	Perform Valve Seat Sealing	195.420
19.4	Perform Valve Stem Packing Maintenance	195.420
19.5	Adjust Actuator/Operator, Electric	195.420

Covered Task Number	Covered Task Title	195 Reference
19.6	Adjust Actuator/Operator, Pneumatic	195.420
19.7	Adjust Actuator/Operator, Hydraulic	195.420
20	Inspect Mainline Valves	195.420
21.1	Repair Valve Actuator/Operator, Pneumatic	195.420
21.2	Disassemble/Reassemble Valves	195.420
21.3	Perform Internal Inspection of Valves	195.420
21.4	Repair Valve Actuator/Operator, Hydraulic	195.420
21.5	Repair Valve Actuator/Operator, Electric	195.420
22.1	Inspect Tank Pressure/Vacuum Breakers	195.432
22.2	Inspect, Test, and Calibrate Highly Volatile Liquid Tank Pressure-relief Valves	195.428(b)
23.1	Maintain/Repair Relief Valves	195.428
23.2	Inspect, Test, and Calibrate Relief Valves	195.428
24.1	Maintain/Repair Pressure-limiting Devices	195.428(a)
24.2	Inspect, Test, and Calibrate Pressure-limiting Devices	195.428(a)
25.1	Inspect, Test, and Calibrate Pressure Switches	195.428(a)
25.2	Inspect, Test, and Calibrate Pressure Transmitters	195.428(a)
27.1	Perform Routine Inspection of Breakout Tanks (API 653 Monthly or DOT Annual)	195.432
27.2	Perform API 653 Inspection of In-service Breakout Tanks	195.432(b)
27.3	Perform API 510 Inspection of In-service Breakout Tanks	195.432(c)
30	Test Overfill Protective Devices	195.428
31	Inspect and Calibrate Overfill Protective Devices	195.428(d)
32	Observe Excavation Activities	195.442(c)(6)
33	Move In-service Pipe	195.424
35	Inspect Clearance of Existing Pipe to Underground Structures	195.250
38.1	Perform Visual Inspection of Pipe and Pipe Components Prior to Installation	195.206
38.3	Perform Visual Inspection of Welds	195.228
38.4	Perform Nondestructive Testing—Radiographic Testing	195.234
38.5	Perform Nondestructive Testing—Liquid Penetrant Testing	195.234
38.6	Perform Nondestructive Testing—Magnetic Particle Testing	195.234
38.7	Perform Nondestructive Testing—Ultrasonic Testing	195.234
38.8	Perform Nondestructive Testing—Magnetic Flux Leakage Testing	195.234
39	Perform Backfilling	195.246(a) 195.252
40.1	Fit Full Encirclement Welded Split Sleeve (Oversleeve, Tight-fitting Sleeve, etc.)	195.422

Covered Task Number	Covered Task Title	195 Reference
40.3	Apply Composite Sleeve	195.422
40.4	Install Mechanical Bolt-on Split Repair Sleeve	195.422
40.5	Install Weldable Compression Coupling	195.422
40.6	Install and Remove Plugging Machine	195.422
40.7	Install and Remove a Tap 2 in. and Under on a Pipeline System	195.422
40.8	Install and Remove a Tap Larger Than 2 in. on a Pipeline System	195.422
40.9	Install and Remove Completion Plug Larger Than 2 in. on a Pipeline System	195.422
40.11	Install and Remove Completion Plug 2 in. and Under on a Pipeline System	195.422
40.12	Cutting on Steel Pipeline	195.422
40.13	Perform Flange Bolting	195.422
40.14	Install Threaded Connections	195.422
40.15	Install and Monitor Vapor Barriers	195.422
40.16	Remove Casings	195.422
40.17	Install Tubing	195.422
41	Conduct Pressure Test	195.302 195.307 195.308
42.7	Perform Welding	195.214 195.222 195.226 195.230
43.1	Perform Start-up of a Liquid Pipeline (Control Center)	195.402 195.406 195.408 195.446
43.2	Perform Shutdown of a Liquid Pipeline (Control Center)	195.402 195.406 195.408 195.446
43.3	Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Control Center)	195.402 195.406 195.408 195.446
43.4	Operate Valves Remotely on a Liquid Pipeline System	195.402 195.406 195.408 195.446
44.3	Inspect, Test, and Maintain a Flow Computer for Hazardous Liquid Leak Detection	195.134 195.444
44.4	Inspect, Test, and Perform Corrective and Preventative Maintenance of Tank Gauging for Hazardous Liquid Leak Detection	195.444
44.5	Prove Flow Meters for Hazardous Liquid Leak Detection	195.444

Covered Task Number	Covered Task Title	195 Reference
44.6	Maintain Flow Meters for Hazardous Liquid Leak Detection	195.444
44.7	Inspect, Test, and Maintain Gravitometers/Densitometers for Hazardous Liquid Leak Detection	195.444
44.8	Inspect, Test, and Maintain Temperature Transmitters for Hazardous Liquid Leak Detection	195.444
45	Operate Pressure Relieving Devices for Launching and Receiving Facilities	195.416 195.426 195.452 195.591
63.1	Perform Start-up of a Liquid Pipeline (Field)	195.402 195.406 195.408
63.2	Perform Shutdown of a Liquid Pipeline (Field)	195.402 195.406 195.408
63.3	Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field)	195.402 195.406 195.408
63.4	Operate Valves Locally on a Liquid Pipeline System (Field)	195.402 195.406 195.408
101	Underwater—Measure Structure-to-electrolyte Potentials	195.573(a) 195.573(b) 195.575(c)
102	Underwater—Examine for Mechanical Damage	195.452(h)
103	Underwater—Examine for External Corrosion	195.452(h)
104	Underwater—Inspect the Condition of External Coating	195.452(h)
105	Underwater—Install Galvanic Anodes	195.577(b)
120	Underwater—Install Pipe-end Connectors	195.422
140	Underwater—Locate Line and Install Temporary Marker	195.410 195.442(c)(4 and 5)

Annex B
(informative)

Covered Task Standards

Annex B includes task standards for each task identified in Annex A (Covered Task List). All task standards follow a standardized format that includes the following sections: Task Description; Knowledge Component (including abnormal operating conditions specifically associated with the performance of the task); and Skill Component.

Task 1.1—Measure Structure-to-soil Potentials

1.0 Task Description

This task consists of taking a structure-to-soil potential reading during an annual survey or cathodic protection (CP) analysis.

The task begins with equipment selection. This task ends with documenting the readings as required by the operator's procedure.

This task does not include but may lead to the performance of other covered tasks such as:

— Repair or Replace Damaged Test Lead (reference Task 2.2).

2.0 Knowledge Component

The purpose of the task is to verify electrical continuity between structures and soil.

An individual performing this task shall have knowledge of:

a) equipment calibration (e.g. calibration certificates and/or field calibration);

b) CP systems;

c) types of reference cells to use in combination with a high-impedance volt-ohm meter (VOM):

   1) copper/copper sulfate ($Cu/CuSO_4$) half cells;

   2) saturated potassium chloride (KCl) calomel half cells;

   3) saturated silver/silver chloride (Ag/AgCl) half cells;

d) minimum requirements for negative voltage;

e) conditions that can cause an IR drop not associated with the structure-to-electrolyte boundary.

Terms applicable to this task:

data logger
A digital device used to record multiple structure-to-soil potentials.

electrolyte
A term used to describe a medium that allows for ion flow, and includes soil and water.

half cell
Another term for a reference electrode or reference cell.

IR drop
The voltage or potential difference as a result of current flow. From Ohm's Law, V = IR. When evaluating structure-to-soil measurements, IR drop is the voltage drop other than the drop across the structure-to-soil boundary.

volt-ohm meter
VOM
Another term for a voltmeter or voltage meter.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Damaged coating; scratches, dents, and gouges.	Implement mitigation measures per the operator's procedures.
Abnormal or erratic readings on test equipment.	Follow appropriate operator procedures.
Missing or damaged test points, leads, or stations.	Make the appropriate notifications for repair or replacement.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Select the proper instrumentation (test leads, voltmeter or data logger, and reference electrode) to be used and verify proper operation.	Incorrect or faulty equipment will not provide accurate results and shall be repaired, replaced, or calibrated, as required.
2	Identify the correct test point locations where measurements will be taken.	The reference electrode shall be correctly located to obtain accurate results. A structure may have several locations for taking measurements.
3	Connect the test leads to the voltmeter or data logger and reference electrode.	Damaged equipment or improper connection of equipment will lead to inaccurate potential measurements. If test points, leads, and/or stations are missing or broken, repair the test leads or equipment as needed according to Task 2.2.
4	Measure the structure-to-soil potential.	This step takes the actual potential difference between the soil and the structure being tested.
5	Field-analyze readings and check polarity to ensure that they are within the desired range of readings.	Readings should be reviewed as they are taken to ensure that measurements fall within the desired range with the correct polarity. This is not meant to be an engineering analysis or to account for IR drop considerations. This may include a comparison to historical data at that location. If readings are outside desired range or are erratic or floating, implement mitigation measures per the operator's procedures.
6	Document the readings as required by the operator's procedures.	Documentation is critical to future analysis and identification of problem areas.

Task 1.2—Conduct Close Interval Survey

1.0 Task Description

This task consists of using equipment to obtain and record structure-to-soil potential readings at specific intervals along the length of a located pipeline.

The task begins with identifying the test point locations where connections will be made. The task ends when the readings are documented as required by the operator's procedures.

Data analysis is not part of this covered task.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Structure-to-soil Potentials (reference Task 1.1);

— Locate Line (reference Task 14.1).

2.0 Knowledge Component

The purpose of this task is to verify electrical continuity between structures and soil (electrolyte) along the length of a pipeline section being surveyed.

An individual performing this task shall have knowledge of:

a) types of close interval surveys; these may include, but are not limited to, the following:

   1) "on" survey;

   2) interrupted survey;

   3) depolarized survey;

b) cathodic protection (CP) systems and components comparable to AMPP/NACE Certification Level CP 2; this knowledge includes, but is not limited to, the following:

   1) the specific survey being conducted and the designated spacing between readings; spacing determines the amount of data collected and the accuracy of the data profile;

   2) the location of the pipeline and appurtenances (road crossings, test stations, river crossings, foreign crossings, casings, valves, isolation devices, rectifiers, galvanic anodes, aerial markers, bonds, pump stations, etc.) typically found in alignment sheets or system mapping should be marked on the survey for validation of the line and its location.

Terms applicable to this task:

current interrupter
A device that stops/interrupts the transfer of an electric charge used to cycle rectifiers, anodes, bonds, etc., on and off. This may include remote monitoring units with current interruption capabilities.

data logger
A digital device used to record multiple structure-to-soil (electrolyte) potentials.

depolarized (off) survey
Measures the potential difference between the structure and the soil (electrolyte) after the CP current has been switched off long enough for the structure-to-soil to stabilize.

electrolyte
A term used to describe a medium that allows for ion flow, which includes soil and water.

“instant off” potential
The polarized half-cell potential of an electrode taken immediately after the CP current is stopped. This process closely approximates the potential without IR drop.

interrupted (on/off) survey
Measures the potential difference between the structure and the soil (electrolyte) as the CP current is switched on and off.

IR drop
The voltage or potential difference as a result of current flow. From Ohm’s Law, V = IR. When evaluating survey measurements, IR drop is the voltage drop other than the drop across the structure-to-soil (electrolyte) boundary.

“on” survey
Measures the potential difference between the structure and the soil (electrolyte) as the CP current is applied.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Missing or broken test points, leads, or stations.	Repair the test leads or equipment as needed.
Abnormal or erratic readings on test equipment.	Follow appropriate operator procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the test point locations where connections will be made.	To confirm that potentials taken are on the intended pipeline and are the most accurate readings.
2	Select the instrumentation to include survey wire, voltmeter, data logger, reference electrodes, test leads, etc. to be used. Verify that components function properly.	Damaged, incorrect, or faulty equipment will not provide accurate results and shall be repaired, replaced, or calibrated, as required. Make appropriate notifications if there are missing, damaged, or malfunctioning components.
3	Verify that current sources are operational (on for “on”/interrupted surveys and turned off/disconnected for depolarized survey).	If a current source is not operational, make appropriate notifications per the operator’s procedures.
4	For interrupted surveys, install current interrupters and/or utilize remote monitoring units with current interruption capabilities at all identified current sources. They should be set at the operator-determined time cycle and synchronized.	Current interrupters are necessary to obtain accurate “instant off” potentials. Time cycle selection is important to prevent excessive depolarization of the structure when performing an interrupted survey. Synchronization is important to get an accurate “instant off” potential.
5	Connect the voltmeter or data logger to the survey wire, test leads, and reference electrode.	Improper connection of equipment will lead to inaccurate potential measurements.

Step	Action	Explanation
6	Place the reference electrode directly above the pipeline being surveyed.	The reference electrode shall be in contact with the electrolyte and as close to the structure as possible to obtain accurate results.
7	Measure the structure-to-soil (electrolyte) potential according to the desired intervals for this survey.	This step takes the actual potential difference between the soil and the structure at specified intervals to establish a potential profile of the pipeline. If readings are outside desired range, erratic, or floating, or the polarity is reversed, implement mitigation measures per the operator's procedures.
8	Verify that data are recorded.	Readings should be continuous; a lack of data may be a sign of equipment failure or faulty electrode location.
9	Document the readings as required by the operator's procedures.	Documentation is critical to future analysis and identification of problem areas.

Task 1.3—Test to Detect Interference

1.0 Task Description

This task consists of testing a cathodically protected structure for interference from other sources.

This task begins with testing for direct current (DC) or alternating current (AC) interference. The task ends when the readings are documented as required by the operator's procedures.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Structure-to-soil Potentials (reference Task 1.1);

— Obtain a Voltage and Current Output Reading from a Rectifier to Verify Proper Performance (reference Task 3).

2.0 Knowledge Component

The purpose of this task is to assess structures in proximity to each other and their respective cathodic protection (CP) systems.

An individual performing this task shall have knowledge of:

a) CP systems and components comparable to AMPP/NACE Certification Level CP 2; this knowledge shall include, but is not limited to, the following:

   1) determining interference by analyzing abnormal DC and/or AC measurements (current or potentials);

   2) communicating with foreign structure owners for collaboration of testing (working with other cathodic system owners enables the interruption of their systems and coordination for testing for both cathodic systems);

   3) interrupting a CP system to detect its influence on other structures (installation of current interrupters, or remote monitoring units with current interruption capabilities, on either or both systems is necessary to determine the extent of system interference);

   4) troubleshooting CP systems;

   5) documenting the readings and recommendations for future reference.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Missing or broken test points, leads, or stations.	Repair the test leads or equipment as needed.
Abnormal or erratic readings on test equipment.	Follow appropriate operator procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Select instrumentation, test leads, and reference electrodes. Verify that components function properly.	Incorrect equipment and/or improper usage will not provide accurate results. Damaged, incorrect, or faulty equipment will not provide accurate results and shall be repaired, replaced, or calibrated, as required. Make appropriate notifications if there are missing, damaged, or malfunctioning components.
2	Assess the area for other CP systems or sources of electrical interference.	Potential sources of electrical interference can be the sources of cathodic interference.
3	Measure the structure-to-soil (electrolyte) potential.	This step takes the actual potential difference between the soil and the structure pipe being tested.
4	Field-analyze readings to ensure that the readings fall within the desired range.	Readings should be reviewed as they are taken to ensure that readings fall within the desired range. This may include a comparison to historical data at that location. If readings are outside the desired range, check for possible causes such as reversed polarity, open bonds, shorted diodes, or changes in cathodic system. Take appropriate action per the operator's procedures.
5	Interrupt rectifiers to determine if interference exists.	Interrupting one of the structure's CP systems can help detect its influence on other structures.
6	Document all results. If interference is found, take corrective action.	Documentation is critical to future analysis and identification of problem areas. Corrective action may involve making notifications.

Task 1.4—Inspect and Perform Electrical Test of Bonds

1.0 Task Description

This task consists of the visual and electrical inspection of connections related to the electrical connection (bond) of two or more structures.

This task begins with identifying the location of the bond(s). This task ends with the collection of data.

This task does not include but may lead to the performance of other covered tasks such as:

— Repair or Replace Damaged Test Lead (reference Task 2.2).

2.0 Knowledge Component

The purpose of this task is to test for electrical continuity and the direction and magnitude of current flow between two or more structures.

An individual performing this task shall have knowledge of:

a) how to identify the location and type of bond that is currently in place;

b) types of bonds that may include critical and noncritical interference bonds (other bonds that may be inspected include continuity bonds);

c) voltmeters, multimeters, and/or data loggers;

d) shunts [bond currents are measured by taking a millivolt reading across a shunt that has a defined resistance; the current passing through the shunt (bond) is calculated by dividing the voltage reading by the shunt's resistance].

Terms applicable to this task:

continuity bond
A connection, usually metallic, that provides electrical continuity between structures that can conduct electricity.

critical bonds
Bonds whose failure would jeopardize the integrity of a pipeline.

interference bond
An intentional metallic connection, between metallic systems and contact with a common electrolyte, designed to control electrical current interchange between the systems.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Missing or broken test points, leads, or stations.	Repair the test leads or equipment as needed.
Abnormal or erratic readings on test equipment.	Follow appropriate operator procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the bond locations where measurements will be taken.	To confirm that potentials and current measurements are taken at the correct location.
2	Conduct a visual inspection of the bond test station for physical damage to the bond station, a burned or damaged shunt, loose connections, disconnected wires, arcing across terminal, etc.	Faulty equipment can cause inaccurate results. Repair or request a repair and document. If the shunt is burned or damaged, measure the current to ensure that it is not underrated.
3	Select the instrumentation, including voltmeter or data logger, test leads, or reference electrode. Verify that components function properly.	Incorrect equipment and/or improper usage will not provide accurate results. Damaged, incorrect, or faulty equipment will not provide accurate results and shall be repaired, replaced, or calibrated, as required. Make appropriate notifications if there are missing, damaged, or malfunctioning components.
4	Make connections with the test equipment to take and record readings.	Equipment that is improperly connected, scaled, or has incorrect settings may yield faulty data. Repair/replace any damaged tests leads or equipment according to Task 2.2.
5	Measure the potentials for each of the structures at the bond location, if required.	This step allows for comparison of the pipe-to-soil (electrolyte) potentials of each structure.
6	Identify the shunt type and size.	This step is required to calculate current flow.
7	Measure the direction and magnitude of current flow between the structures.	A change in current magnitude or current direction may indicate a need for further testing.
8	Field-analyze the readings to confirm that they are within a desired range of readings, including a check of the polarity.	Readings should be reviewed as they are taken to verify that measurements fall within the desired range with the correct polarity; this is not meant to be an engineering analysis. This may include a comparison to historical data at that location. If readings are outside desired range or are erratic or floating, implement mitigation measures per the operator’s procedures.
9	Document readings as required by the operator’s procedures.	Documentation is critical to future analysis and identification of problem areas.

Task 1.5—Inspect and Test Electrical Isolation

1.0 Task Description

This task consists of the inspection and testing of electrical isolation.

The task begins with identification of the isolation device. This task ends when measurements have been taken and recorded.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Structure-to-soil Potentials (reference Task 1.1).

2.0 Knowledge Component

The purpose of this task is to ensure that electrical isolation is adequate.

An individual performing this task shall have knowledge of:

a) isolation devices (which may include insulated flanges, couplings, unions, monolithic insulating pipe joints, and nonmetallic pipe and structural members);

b) casings (which need to be electrically isolated from the carrier pipe so as not to shield the carrier pipe from cathodic protection);

c) proper use of equipment [which may include a reference electrode and voltmeter/data logger or isolation (flange) tester; most tests for isolation are based on potential differences in structures using a reference electrode and voltmeter/data logger];

NOTE Using the ohmmeter setting to check the effectiveness of an isolation device is not reliable because of the parallel resistance paths through the soil (electrolyte).

d) isolation (flange) testers (which are based on high radio frequency and can be used to validate the isolation of flange joints or for troubleshooting shorted joints; these testers are not typically used for isolation joints other than flanges).

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Missing or broken test points, leads, or stations.	Repair the test leads or equipment as needed.
Abnormal or erratic readings on test equipment.	Follow appropriate operator procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the isolation locations and isolation device where measurements will be taken.	This step is to confirm that measurements are taken at the correct location.
2	Conduct visual inspection of the isolation location for physical damage to the test station, a burned or damaged shunt, loose connections, disconnected wires, arcing across a terminal, etc.	This step verifies that there is no visual damage. Implement mitigation measures per the operator's procedures.
3	Select the instrumentation, including voltmeter/ data logger, isolation (flange) tester, test leads, or reference electrode. Verify that components function properly.	Incorrect equipment will not provide accurate results. Damaged, incorrect, or faulty equipment will not provide accurate results and shall be repaired, replaced, or calibrated, as required. Make appropriate notifications if there are missing, damaged, or malfunctioning components.
4	Make connections with the test equipment to take and record readings.	Improper usage will not provide accurate results.
5	If using a reference electrode, measure the potential for each of the structures. The reference electrode should remain in the same location during the measurements.	This step allows for a comparison of pipe-to-soil (electrolyte) potentials to help determine if structures are isolated. If the difference in potential is approximately 100 mV or greater, the isolation is effective. If the reading is less than 100 mV, further testing may be necessary. If readings are outside the desired range or are erratic or floating, implement mitigation measures per the operator's procedures.
6	Check for continuity on flanges using an isolation/flange tester.	Verifies electrical isolation (or lack of continuity) between flanges.
7	Document the readings as required by the operator's procedures.	Documentation is critical to future analysis and identification of problem areas.

Task 2.1—Verify Test Lead Continuity

1.0 Task Description

This task consists of the electrical inspection of test leads connected to a structure.

This task begins with identification of the test lead wire. This task ends when a determination is made about whether valid data may be obtained using the test lead wire.

This task does not include but may lead to the performance of other covered tasks such as:

— Measure Structure-to-soil Potentials (reference Task 1.1);

— Repair or Replace Damaged Test Lead (reference Task 2.2);

— Install Test Leads by Nonexothermic Welding Methods (reference Task 2.3);

— Install Test Leads by Exothermic Welding Methods (reference Task 2.4).

2.0 Knowledge Component

The purpose of this task is to test for electrical continuity between a structure and test station.

An individual performing this task shall have knowledge of:

a) interpretation of structure-to-soil (electrolyte) potential measurements taken at a test station [which may not meet expected results (lower than anticipated, unstable, or erratic) and may be indicative of a broken test lead];

b) multimeters (which are used to measure resistance between a structure and a test-lead wire to determine if continuity exists).

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Abnormal or erratic readings on test equipment.	Follow appropriate operator procedures.
Missing or damaged test points, leads, or stations.	Make the appropriate notifications for repair or replacement.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the test lead to be tested.	This step is to confirm that measurements are taken on the intended test lead.
2	Select the proper instrumentation (multimeter, data logger, reference electrodes, etc.) to be used and verify the proper operation.	Incorrect or faulty equipment will not provide accurate results. Damaged, incorrect, or faulty equipment will not provide accurate results and shall be repaired, replaced, or calibrated, as required. Make appropriate notifications if there are missing, damaged, or malfunctioning components.
3	Connect the test equipment to the structure, as required, to perform the test.	Improper connection of equipment will lead to inaccurate potential or continuity measurements.
4	Measure the structure-to-soil (electrolyte) potential and/or continuity.	This step determines the potential and/or continuity of the structure and test lead. A potential may be compared with historical data to determine continuity. If test lead wire, test points, and/or test stations are damaged, missing, or loose, implement mitigation measures per the operator's procedures.
5	Document all required information per the operator's procedures.	Up-to-date records are essential for maintaining a corrosion control system.

Task 2.2—Repair or Replace Damaged Test Lead

1.0 Task Description

This task consists of the repair or replacement of test leads connected to a structure.

The task begins when test lead damage has been identified. This task ends when repair or replacement has been completed.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Structure-to-soil Potentials (reference Task 1.1);

— Verify Test Lead Continuity (reference Task 2.1);

— Install Test Leads by Nonexothermic Welding Methods (reference Task 2.3);

— Install Test Leads by Exothermic Welding Methods (reference Task 2.4);

— Observe Excavation Activities (reference Task 32);

— Perform Backfilling (reference Task 39).

2.0 Knowledge Component

The purpose of this task is to repair or replace leads that do not exhibit continuity.

An individual performing this task shall have knowledge of:

— Measurement of a pipe-to-soil (electrolyte) potential taken at a test station that does not meet expected results (lower than anticipated, unstable, or erratic) may be indicative of a damaged test lead.

Terms applicable to this task:

test lead
A connection to the structure being tested, usually a wire in a supporting stand or test station, with an easy connection point for structure-to-soil (electrolyte) measurements.

Abnormal operation conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of damage (e.g. mechanical damage and corrosion) to an underground pipeline facility.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Continuity cannot be verified.	Repair or replace test lead. Make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify test lead damage. Perform a visual inspection of the aboveground wire and components. If the test station is intact, continuity shall be verified.	The test lead connection may be loose, corroded, or disconnected; the wire may be broken; or the test station may be damaged or moved.
2	If the test lead needs to be repaired, this may require reconnecting the lead to the test station or faceplate by stripping the insulation and reconnecting.	This step corrects the damage if it can be repaired above ground or in the immediate area of test station.
3	If replacement is required, connect a new lead to the structure by exothermic weld or nonexothermic connection, and connect the lead to the test station or faceplate as applicable.	If a structure appurtenance is not available, excavation is necessary to expose the pipe. The lead should be routed loosely to relieve soil stress during backfill and then connected to the test station or termination point. This step requires the completion of Task 2.3—Install Test Leads by Nonexothermic Welding Methods, or Task 2.4—Install Test Leads by Exothermic Welding Methods.
4	Verify that the test leads function properly and are no longer damaged.	Checking the test lead repair is done by taking a structure-to-soil potential and/or by verifying continuity.
5	Document actions and readings according to the operator's procedures.	Proper documentation is critical to future analysis and identification of problem areas.

Task 2.3—Install Test Leads by Nonexothermic Welding Methods

1.0 Task Description

This task consists of making an electrical connection by mechanical means that may include magnetic coupling, conductive epoxy, clamp, and/or split bolt connectors.

The task begins after the test point is properly located. This task ends when the installation is documented.

The performance of this covered task may require the performance of other covered tasks such as:

— Verify Test Lead Continuity (reference Task 2.1);

— Prepare Surface for Coating Using Hand and Power Tools (reference Task 7.2);

— Apply Coating Using Hand Application Methods (reference Task 7.5).

2.0 Knowledge Component

The purpose of this task is to install test leads on a structure by methods other than exothermic welding.

An individual performing this task shall have knowledge of:

a) proper connection preparations, such as cleaning metallic surfaces and/or connecting wires;

b) proper size clamps or split bolt connectors for a given wire size;

c) manufacturer's specifications (if using a conductive epoxy);

d) manufacturer's recommended safety procedures.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of damage (e.g. mechanical damage and corrosion) to an underground pipeline facility.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Continuity cannot be verified.	Repair or replace test lead. Make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the location where the test lead will be installed.	This step confirms that work is done on the intended pipeline or pipe component.
2	Determine the size of wire to be used.	The normal gauge of a general test wire is per the operator’s specifications. If the test station is to be used for an interference bond between two facilities, the wire gauge will be greater to eliminate any unwanted wire resistance.
3	Determine the method to attach the wire to the pipeline or facility.	The actual method used will be based on the existing structure.
4	Prepare the pipe surface for wire installation according to the manufacturer’s or the operator’s specifications.	If foreign materials are not removed, they could cause a failure to bond reducing or eliminating electrical continuity.
5	Install the wires to the structure using magnetic connection, epoxy adhesive, or clamp method verifying electrical continuity.	The actual connection is dependent on the operator requirements and the test lead location.
6	Document installation as required by the operator’s procedures.	Up-to-date records are essential for maintaining a corrosion control system.

Task 2.4—Install Test Leads by Exothermic Welding Methods

1.0 Task Description

This task consists of installation of test leads on a structure by exothermic weld.

The task begins after the test point is properly located. This task ends when documentation of the connection is complete.

Exothermic welding, generally known as thermite welding, is a process using a graphite mold into which a charge-containing mixture of copper oxide and aluminum starting powder is poured. The mixture is ignited with a flint gun or electronic device, melts, and drops down, welding the wire to the structure.

Pin brazing is a means of thermite welding that involves using electrical current to melt solder to provide a connection.

The performance of this covered task may require the performance of other covered tasks such as:

— Prepare Surface for Coating Using Hand and Power Tools (reference Task 7.2);

— Apply Coating Using Hand Application Methods (reference Task 7.5);

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2).

2.0 Knowledge Component

The purpose of this task is to install test leads by exothermic welding methods such as thermite welding and pin brazing.

An individual performing this task shall have knowledge of:

a) the proper size mold and charge for different sizes of wires and structures;

b) different alloy charges (which are used for steel and cast/ductile iron structures);

c) hazards associated with melting materials and using extreme heat;

d) contact between hot molten metal and moisture or contaminants may result in spewing of hot material; moisture and contaminants in mold and materials being welded are to be avoided; the exothermic weld device shall be used according to the manufacturer's procedure; this process involves heat above 2500 °F, and all safety concerns shall be addressed;

e) manufacturer's specifications for the pin brazing method [this includes the use of equipment that uses lower temperatures (approximately 600 °F)].

Terms applicable to this task:

alloy charges
A charge is the mixture of a copper alloy and magnesium starting powder.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Burn-through of the pipe wall causing a release and/or fire.	Stop all hot work. Respond according to the operator's emergency response procedures.
Discovery of damage (e.g. mechanical damage and corrosion) to an underground pipeline facility.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Continuity cannot be verified.	Repair or replace test lead. Make appropriate notifications.
Insufficient wall thickness for exothermic welding.	Stop task and make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps.

Step	Action	Explanation
1	Identify the location where the test lead will be installed.	This step confirms that work is performed on the intended location.
2	Remove a window of paint or coating from the section of pipe to be welded.	An exothermic weld needs to adhere to bare pipe.
3	Verify that actual wall thickness has been determined and meets minimum operator requirements.	Sufficient wall thickness is necessary to maintain pipe integrity and personnel safety.
4	Prepare and inspect the pipe surface to receive an exothermic weld.	Verify that the surface profile meets manufacturer or operator specifications. If foreign materials are not removed, they could cause the exothermic weld to fail.
5	Remove sufficient insulation from the wire and crimp the copper sleeve to bare the wire, as required.	Insulation shall be removed to ensure proper adhesion to the pipe. Some smaller gauge wires require a copper sleeve.
6	Select and prepare the proper weld mold with a properly sized charge. If using pin brazing, this step does not apply.	Different wire sizes and applications require the use of different molds and weld charge. Selecting the proper size charge is important to prevent burn-through of the pipe wall. If burn through occurs, stop hot work and follow the operator's emergency response procedures.
7	Insert the wire and place the graphite mold on the desired location to be welded. Insert the appropriate charge into the mold. If using pin brazing, this step does not apply.	Centering the wire in the mold helps ensure proper adhesion.
8	Ignite the charge to create the exothermic weld. Hold the graphite mold firmly in place until the weld sets according to the manufacturer's specification. If using pin brazing, this step varies. For this method, the wire is held in place as the pin brazing current is applied.	This begins the weld process. NOTE Charges may be ignited electronically or with a sparking device. Pin brazing uses electric current to melt solder material to adhere the wire to structures.
9	Verify the integrity of the weld and electrical continuity.	Carefully remove the slag with a hammer and wire brush. Verify adhesion of weld. File the sharp edges off of the exothermic weld.
10	Document installation according to the operator's procedures.	Documents are essential for maintaining a corrosion control system.

Task 3—Obtain a Voltage and Current Output Reading from a Rectifier to Verify Proper Performance

1.0 Task Description

This task consists of measuring and documenting the electrical output of a rectifier.

The task begins with the identification of the rectifier. This task ends with the measurement of a rectifier output and documentation of data.

This task does not include data analysis.

2.0 Knowledge Component

The purpose of this task is to verify the proper performance of a rectifier.

An individual performing this task shall have knowledge of:

a) cathodic protection (CP) systems and components comparable to AMPP/NACE Certification Level CP 1;

b) voltmeters;

c) clamp-on ammeters;

d) calculating current from shunt factor and voltage measurement [current output may be calculated based on shunt factor (ratio) and voltage drop across the shunt];

e) validation of display meters with observed readings and with remote read devices, if applicable;

f) proper rectifier output polarity.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Reading outside of expected parameters, such as reverse polarity or inoperable rectifier.	Take action, if qualified, or notify appropriate personnel of the observed condition for further analysis and/or repair.
Energized rectifier shell/case.	Make appropriate notifications per the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the rectifier.	—
2	Determine the voltage by connecting a voltmeter across the output terminals of the rectifier. Connect the positive lead to the rectifier positive terminal. Connect the negative lead to the rectifier negative terminal.	Obtaining accurate voltage and polarity are essential to maintaining CP. If the polarity is reversed, take action, if qualified, and make appropriate notifications per the operator's procedures.
3	Obtain the shunt factor by reading the value labeled on the shunt and dividing the amp value by the mV value.	Obtaining a shunt factor is essential to calculate current from millivolt reading obtained from a shunt.
4	Determine the current on a pre-installed shunt by reading the millivolt drop across the shunt and multiplying by the shunt factor.	Obtaining accurate current is essential to determining the effectiveness of a CP system. If the rectifier is inoperable, make appropriate notification per the operator's procedures.
5	Check voltage and current readings against display meters and/or remote monitoring devices, if applicable.	Validating remote devices and display meters is necessary to ensure that accurate data are being received.
6	Document all required readings per the operator's procedures.	Documents are essential to maintaining a corrosion control system.

Task 4.1—Troubleshoot Rectifier

1.0 Task Description

This task consists of checking rectifier components.

This task begins when a rectifier is found inoperable. This task ends when the faulty rectifier component is identified for replacement and documentation is completed.

This task does not include but may lead to the performance of other covered tasks such as:

— Repair or Replace Defective Rectifier Components (reference Task 4.2);

— Adjust Rectifier (reference Task 4.3).

2.0 Knowledge Component

The purpose of this task is to identify faulty rectifier components.

An individual performing this task shall have knowledge of:

a) troubleshooting a rectifier and components comparable to AMPP Certification Level CP 1;

b) basic electricity, electrical circuits, and electrical schematics;

c) the operation of rectifiers and the principles of converting alternating current (AC) to direct current (DC);

d) component operation such as AC supply, circuit breakers or fuse, transformers, rectifier elements (selenium stack or diode array), shunts, adjustment links, DC output terminals, remote monitoring units (RMUs), and surge protection.

Terms applicable to this task:

rectifier
A device used to convert AC to DC.

remote monitoring unit
RMU
A device that transmits rectifier readings to a remote site via wireless media.

transformer
A device used to change available voltage or current levels to desired power needs. Adjustment links (taps) are used as connectors on the secondary side of the transformer to allow different voltage settings to be selected for a desired output.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
A component is found in an inoperable condition.	Notify the appropriate personnel to take actions as specified by the operator's procedures.
An RMU is not communicating.	Notify the appropriate personnel to take actions as specified by the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Check for proper operation of components to determine faulty component.	Proper operation of components is necessary for rectifier operation. Consult or refer to the manufacturer's manual for detailed information.
2	Check the AC voltage input to confirm it is adequate for proper operation.	This verifies that there is power to the transformer input. If AC voltage input is inadequate, check circuit breaker or fuse. If the circuit breaker or fuse is faulty, identify it for replacement. This may include checking connections to lightning arrestors and surge protection.
3	Check AC voltage output from the transformer.	If there is no AC voltage output, then the transformer is identified for replacement.
4	Check the DC voltage output at the rectifying element (selenium stack or diode array).	If no DC voltage output is present, then the rectifying element (selenium stack or diode array) is faulty and identified for replacement.
5	Check the DC voltage output to confirm that it is adequate for proper operation.	If the DC voltage output is inadequate, check the circuit breaker or fuse. If the circuit breaker or fuse is faulty, identify it for replacement.
6	Check all cables, wires, and wiring connections.	Identify any faulty cables, wires, or connections that need to be replaced.
7	Document faulty components according to the operator's procedures.	Documentation is critical to future analysis and identification of problem areas.

Task 4.2—Repair or Replace Defective Rectifier Components

1.0 Task Description

This task consists of repairing or replacing defective rectifier components.

This task begins after a faulty component has been identified. The task ends when the rectifier is operational and documentation is complete.

This task does not include but may lead to the performance of other covered tasks such as:

— Troubleshoot Rectifier (reference Task 4.1).

2.0 Knowledge Component

The purpose of this task is to repair defective rectifiers and return them to operational service.

An individual performing this task shall have knowledge of:

a) rectifier components such as alternating current (AC) supply, circuit breakers, transformers, rectifier elements (stack), shunts, display meters, adjustment links, direct current (DC) output terminals, remote monitoring units (RMUs), and surge protection;

b) rectifier operation and the principles of converting AC to DC.

Terms applicable to this task:

rectifier elements or stacks
Devices designed to allow current flow in one direction only. These stacks are used to convert AC to DC.

remote monitoring unit
RMU
A device that transmits rectifier readings to a remote site via wireless media.

shunts
Calibrated resistor links that allow current measurement in a rectifier.

transformer
A device used to change available voltage or current levels to desired power needs. Adjustment links (taps) are used as connectors on the secondary side of the transformer to allow different voltage settings to be selected for a desired output.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
A component is found in an inoperable condition.	Notify the appropriate personnel to take actions as specified by the operator's procedures.
An RMU is not communicating.	Notify the appropriate personnel to take actions as specified by the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	De-energize, install lockout/tagout, and verify the external AC supply to the rectifier is off.	Lockout/tagout devices prevent electrical current during repair. Failure to install these devices may lead to electrical shock and personnel injury.
2a	If the AC breaker is at fault, repair or replace according to the manufacturer/operator's procedures.	Proper operation of the rectifier's AC breaker is essential to protect the rectifier components during power surges, electrical shorts, or component failures. General repair procedures may include the following: — disconnect wires from the supply to the breaker; — disconnect wires from the breaker to the rectifier; — replace the defective breaker with a new breaker, if necessary; — connect wires from the breaker to the rectifier; — connect wires from the AC supply to the breaker.
2b	If AC fuses are faulty, repair or replace according to the manufacturer/operator's procedures.	Proper operation of the rectifier's AC fuses is essential to protect the rectifier components during power surges, electrical shorts, or component failures. General repair procedures may include the following: — remove the fuse or fuses; — replace the defective fuse or fuses with a correct size fuse.
2c	If the transformer is faulty, repair or replace according to the manufacturer/operator's procedures.	Transformers are required to reduce the primary AC voltage to a lower adjustable AC voltage. General repair procedures may include: — disconnect wires from the rectifier AC breaker to the transformer; — disconnect wires from the transformer to the coarse and fine tap panels; — replace the defective transformer with a new transformer; — connect wires from the transformer to the coarse and fine tap panel; — connect wires from the transformer to the AC rectifier breaker.

Step	Action	Explanation
2d	If the rectifying element is faulty, repair or replace according to the manufacturer/operator's procedures.	Rectifier stacks are required to change AC to DC. General repair procedures may include the following: — disconnect wires from the fine and coarse tap panel to the stack; — disconnect wires from the rectifier element to the positive and negative DC output terminals; — if the stack is selenium, remove the stack and replace it with a new stack; — if the stack is silicon, remove the defective diodes and replace with new diodes; — connect wires from the stack to the positive and negative DC output terminals; — connect wires from the fine and coarse tap panel to the stack.
2e	If the DC fuses are faulty, repair or replace according to the manufacturer/operator's procedures.	Proper operation of the rectifier's DC fuses is essential to protect rectifier components during power surges, electrical shorts, or component failure. General repair procedures may include the following: — remove the fuse or fuses; — replace the defective fuse or fuses with a correct size fuse.
3	Verify that all replaced components are operational.	If replaced components are inoperable, make appropriate notifications.
4	Complete all required documentation according to the operator's procedures.	Up-to-date records are essential for maintaining a corrosion control system.

Task 4.3—Adjust Rectifier

1.0 Task Description

This task consists of making rectifier adjustments.

This task begins with the identification of the rectifier in need of adjustment. The task ends with proper adjustment of the rectifier and completion of documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Structure-to-soil Potentials (reference Task 1.1);

— Obtain a Voltage and Current Output Reading from a Rectifier to Verify Proper Performance (reference Task 3).

2.0 Knowledge Component

The purpose of this task is to adjust the rectifier to maintain the cathodic protection (CP) system.

An individual performing this task shall have knowledge of:

a) CP systems and components comparable to AMPP Certification Level CP 2;

b) basic electricity, electrical circuits, and electrical schematics;

c) rectifier operation and adjustment methods (typically a mechanical adjustment link on the transformer output);

d) use of voltmeter and electrical measurements;

e) measuring the structure-to-soil potential (direct current and alternating current) (reference Task 1.1). These measurements are used to determine CP and necessary current adjustments to the rectifier.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Inability to achieve target output.	Notify appropriate personnel for CP system analysis.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify rectifier needing adjustment.	—
2	Determine the action to be taken.	Rectifiers are part of an overall CP system and shall be adjusted based on system requirements. Adjustments (increases/decreases) made to one rectifier may impact other system components. Adjustments should be based on indicators such as pipe-to-soil readings, historical data, or design criteria.
3	Adjust the fine tap setting in progressive steps until the desired settings have been achieved.	When the required output current is obtained, the adjustment is complete. NOTE Power should be off before making these adjustments. Tap settings are current-carrying connections and should be tightened prior to reenergizing the rectifier.
4	If the fine tap setting reaches its limit, adjust the fine tap to the appropriate setting and adjust the coarse tap setting by 1 tap.	Incremental adjustments will prevent the current from exceeding design limits. NOTE Power should be off before making these adjustments. Tap settings are current-carrying connections and should be tightened prior to reenergizing the rectifier. Repeat step until desired settings have been achieved.
6	Complete all required documentation per the operator's procedures.	Up-to-date records are essential for maintaining a corrosion control system.

Task 5.1—Examine for Mechanical Damage on Buried or Submerged Pipe

1.0 Task Description

Each time a pipeline is exposed, the operator shall perform an inspection/examination of the pipe and the coating for evidence of damage and/or abnormalities. This task is to verify whether mechanical damage, such as dents, gouges, etc., exist on the pipeline and to ensure that proper documentation and reporting have occurred.

This task begins after the pipeline surface has been prepared for inspection. This task ends after inspection results are documented and reported.

This task does not include but may lead to the performance of other covered tasks such as:

— Examine for External Corrosion on Buried or Submerged Pipe (reference Task 5.2);

— Inspect the Condition of External Coating on Buried or Submerged Pipe (reference Task 5.3);

— Coating tasks (reference Task 7.2, Task 7.3, Task 7.4, Task 7.5, Task 7.6, and Task 7.7);

— Measure Pit Depth with Pit Gauge (reference Task 8.1);

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2);

— Measure Corroded Area (reference Task 8.3).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) identification of characteristics of mechanical damage and corrosion;

b) types of coating and the ways that it can mask mechanical or corrosion damage.

Terms applicable to this task:

mechanical damage
Visible physical damage to the metallic surface of the pipeline that, at a minimum, may include one or more of the defects listed below:

— **buckle**
A bend, bulge, or kink that can cause flattening or changes in the curvature of the pipe.

— **dent**
A depression in the surface that has been created by external forces on the pipeline with no visual evidence of metal loss.

— **gouge**
A groove in which metal has been removed or displaced from the surface.

— **scratch**
A thin, shallow cut or mark on the surface.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of damage (e.g. mechanical damage and corrosion) to an underground pipeline facility.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Unexpected hazardous liquid or carbon dioxide encountered when visually observing pipe for integrity issues.	Eliminate ignition source(s) and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Visually observe the exposed pipe for integrity issues, such as evidence of a release or significant metal deformation.	Confirms the pipeline is safe for operation and continued task performance. If the observation identifies integrity issues that are not safe, discontinue the task and make immediate notifications.
2	Confirm that the pipeline surface has been prepared for the mechanical damage inspection.	Proper surface preparation is critical to identifying and locating all types of mechanical damage present on the exposed pipe.
3	Inspect the exposed pipeline to determine if mechanical damage exists.	Inspection for mechanical damage is critical to identifying potential risks that need further assessment to avoid future leaks or failures.
4	Identify the type(s) and location(s) of mechanical damage.	The type(s) and location(s) of the damage are used to determine later actions, such as whether repairs are needed and, if so, what kind of repair is needed. There are a variety of methods to describe the location of the damage. One of the more common methods is to locate the damage circumferentially with respect to a clock face. The location of the seam weld and the longitudinal distance to the nearest girth weld are also typically reported.
5	Make notifications per the operator's procedures.	Follow the operator's policies/procedures for appropriate documentation, notification protocol, and actions required.

Task 5.2—Examine for External Corrosion on Buried or Submerged Pipe

1.0 Task Description

Each time a pipeline is exposed, the operator shall perform an inspection/examination of the pipe and the coating for evidence of corrosion. The inspection verifies whether external corrosion exists on the pipeline.

This task begins after the pipeline surface has been prepared for inspection. This task ends after inspection results are documented and reported.

This task does not include but may lead to the performance of other covered tasks such as:

— Examine for Mechanical Damage on Buried or Submerged Pipe (reference Task 5.1);

— Inspect the Condition of External Coating on Buried or Submerged Pipe (reference Task 5.3);

— Coating tasks (reference Task 7.2, Task 7.3, Task 7.4, Task 7.5, Task 7.6, and Task 7.7);

— Measure Pit Depth with Pit Gauge (reference Task 8.1);

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2);

— Measure Corroded Area (reference Task 8.3).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) identify characteristics of mechanical damage and corrosion;

b) types of coating and the ways that it can mask mechanical or corrosion damage.

Terms applicable to this task:

general corrosion
An electrochemical reaction that takes place uniformly over the surface of steel, thereby causing general thinning of the component that could lead to eventual failure of the material.

localized corrosion
Individual areas of pitting or general corrosion areas at discrete sites that may also contain pitting. Areas of localized corrosion in the area of girth or longitudinal welds should be identified and documented.

pitting
An electrochemical reaction that creates metal loss of the outer surface in small, crater-like depressions that have the potential to cause rapid wall loss.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of damage (e.g. mechanical damage and corrosion) to an underground pipeline facility.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Unexpected hazardous liquid or carbon dioxide encountered when visually observing pipe for integrity issues.	Eliminate ignition source(s) and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Visually observe the exposed pipe for integrity issues such as evidence of a release or significant metal deformation.	Confirms the pipeline is safe for operation and continued task performance. If the observation identifies integrity issues that are not safe, discontinue the task and make immediate notifications.
2	Confirm that the pipeline surface has been prepared for the external corrosion inspection.	Proper surface preparation is critical to identifying and locating all types of external corrosion present on the exposed pipe.
3	Examine the exposed pipe for any areas of external corrosion.	Inspection for external corrosion is critical to identifying potential risks that need further assessment to avoid future leaks or failures.
4	Identify the type(s) and location(s) of any corrosion on the pipeline.	The type(s) and location(s) of the corrosion are used to determine later actions such as whether repairs are needed and, if so, what kind of repair is needed. There are a variety of methods to describe the location of the corrosion. One of the more common methods is to locate the corrosion circumferentially with respect to an analog clock face. The location of the seam weld and the longitudinal distance to the nearest girth weld are also typically reported.
5	Make notifications per the operator’s procedures.	Follows the operator’s policies/procedures for appropriate documentation, notification protocol, and actions required.

Task 5.3—Inspect the Condition of External Coating on Buried or Submerged Pipe

1.0 Task Description

Each time the pipeline is exposed, the operator shall perform an inspection/examination of the pipe and the coating. The inspection should verify whether the coating is intact (free from damage and/or degradation) and is adequately bonded to the pipe's surface.

This task begins after the coated pipeline is exposed. This task ends after coating inspection results are documented and reported.

This task does not include but may lead to the performance of other covered tasks such as:

— Examine for Mechanical Damage on Buried or Submerged Pipe (reference Task 5.1);

— Examine for External Corrosion on Buried or Submerged Pipe (reference Task 5.2);

— Coating tasks (reference Task 7.2, Task 7.3, Task 7.4, Task 7.5, Task 7.6, and Task 7.7).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

This section intentionally left blank.

Terms applicable to this task:

bonding
The joining of the coating system and the pipeline in a manner where they are adhered or united by means of adhesive, heat, or pressure.

coating abnormalities:

— **coating disbondment**
Failure of the bond between the coating and the pipe's surface.

— **cracking—as it relates to coatings**
A physical separation to otherwise bonded coating that has an appearance of fissures.

— **holiday**
An undesirable discontinuity or break in the coating system. Electronic testing devices detect flaws in the protective coating.

coating abnormality causes
Change or failure of the coating attributed to one or several of the following:

— formulation-related (e.g. checking, cracking, discoloration, and similar phenomena);

— improper coating selection;

— incompatibility with the surface over which it is applied;

— improper or poor surface preparation;

— improper application (e.g. inadequate thickness, pinholes, overspray, improper drying, and improper curing);

— adhesion-related, structural surface issues (e.g. sharp edges, crevices, skip welds, and back-to-back angles);

— exterior forces (e.g. chemical exposure, abrasion, reverse impact, and severe weathering).

pipeline coating types
Pipeline coating types include the following:

— asphalt coatings;

— coal tar coatings;

— extruded coatings;

— fusion-bonded epoxy coatings;

— petrolatum coating products;

— shrink sleeve products;

— tape coatings.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of damage (e.g. mechanical damage and corrosion) to an underground pipeline facility.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Unexpected hazardous liquid or carbon dioxide encountered when visually observing pipe for integrity issues.	Eliminate ignition source(s) and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Visually observe the exposed pipe for major integrity issues, such as evidence of a release or significant metal deformation.	Helps ensure that the pipeline is safe for operation and continued task performance. If the observation identifies integrity issues that are not safe, discontinue the task and make immediate notifications.
2	Identify the type of existing coating.	It is necessary to be able to identify the type of coating that exists on the pipe so that a proper coating inspection can be conducted.
3	Examine the exposed coated pipe and determine if there are any flaws or abnormalities in the coating.	Inspection of the coating is critical to identifying potential risks that need further assessment to avoid future leaks or failures.
4	Identify the type and location of coating damage, if any.	The type and location of the damage are used to determine later actions, such as whether repairs are needed and, if so, what kind of repair is needed. There are a variety of methods to describe the location of the damage. One of the more common methods is to locate the damage circumferentially with respect to an analog clock face. The location of the seam weld and the longitudinal distance to the nearest girth weld are also typically reported.
5	Make notifications per the operator’s procedures.	Follow the operator’s policies/procedures for appropriate documentation, notification protocol, and actions required.

Task 7.1—Perform Visual Inspection of Atmospheric Coatings

1.0 Task Description

This task consists of the visual inspection of aboveground pipeline components normally exposed to atmospheric conditions.

This task begins with the identification of the component to be inspected. This task ends when the component has been visually inspected and all required information is documented per operator procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Perform Coating Inspection (reference Task 7.7).

This task does not include but may lead to the performance of other covered tasks such as:

— Measure Pit Depth with Pit Gauge (reference Task 8.1);

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2);

— Measure Corroded Area (reference Task 8.3).

2.0 Knowledge Component

The purpose of this task is to visually inspect exposed pipeline components to identify signs of atmospheric corrosion.

An individual performing this task shall have knowledge of:

This section intentionally left blank.

Terms applicable to this task:

alligatoring
Pronounced wide cracking over the surface of a coating, which has the appearance of alligator hide.

atmospheric corrosion
Types of rust (spotting, pin point, pitting, perforation, etc.).

blistering
A dome-shaped projection on the surface of a coating resulting from the local loss of adhesion and lifting of the film from an underlying coat or from the base substrate.

blushing
Whitening and loss of gloss of a coating, usually organic, caused by moisture.

chalking
The development of loose, removable powder (pigment) at the surface of an organic coating, usually caused by weathering.

checking
The development of slight breaks in a coating that do not penetrate to the underlying surface.

cracking
Fracture of a material along a path that produces a linear discontinuity (without complete separation).

disbondment
The loss of adhesion between a coating and the substrate.

mechanical damage
physical damage
Damage resulting from abrasion or impacts to the surface of the coated surface.

orange peel
The dimpled appearance of a dried coating resembling the surface of a navel orange.

peeling
Detachment or partial detachment of a coating from the substrate or undercoat.

pinhole
A minute hole through a coat or coats that exposes an underlying coat or the substrate.

sags
Nonuniform downward flow of a wet-applied coating under the force of gravity that results in an uneven coating having a thick lower edge.

soil stress
Typically created by gravel/backfill pressure as it settles around a transitional zone (air-to-soil); the result is often a “bag and sag” in the coating.

wrinkling
Formation of a surface appearance in a coating resembling the skin of a dried prune, usually caused by application shortcomings.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of damage (e.g. mechanical damage and corrosion) or anomaly to a pipeline facility.	Make the appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Confirm the correct location for inspection.	Validates that the correct pipeline component is being inspected.
2	Identify and confirm type of surface to be evaluated (coating/paint/bare).	This helps determine the equipment and methods to be used for the evaluation.
3	Perform visual inspection of coating.	Critical areas of inspection would be: — at soil-to-air interfaces; — under thermal insulation; — under disbonded coatings; — at pipe supports; — in splash zones; — at deck penetrations; — in spans over water.
4	Inspect pipeline components for any atmospheric corrosion.	Identify any areas of rust, spotting, pin point, pitting, or perforation.
5	Make notifications per the operator’s procedures.	Up-to-date records are essential for maintaining corrosion control data.

Task 7.2—Prepare Surface for Coating Using Hand and Power Tools

1.0 Task Description

This task consists of preparing the surface for coating using hand and power tools.

The task begins with visually inspecting the surface area to be prepared in order to determine the proper method to use. This task ends when the surface is ready for coating application and all required information is recorded per the operator's procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Inspect the Condition of External Coating on Buried or Submerged Pipe (reference Task 5.3);

— Visual Inspection of Atmospheric Coating (reference Task 7.1);

— Perform Coating Inspection (reference Task 7.7).

2.0 Knowledge Component

The purpose of this task is to prepare surface for coating.

An individual performing this task shall have knowledge of:

a) surface conditions and which type of tool is needed for surface preparation;

b) coating removal, cleaning, and preparation of pipe to accept coating repair;

c) coating manufacturer's specifications for application or repairs to the coating.

Terms applicable to this task:

hand power tool cleaning
The removal of any loose rust, loose mill scale, and loose paint to a degree specified by using a chipping power tool, a power sander, or a wire wheel, etc.

hand tool cleaning
The removal of any loose mill scale, loose rust, and loose paint to a degree specified by hand chipping, scraping, or sanding. Hand cleaning tools include wire brushes, files, scrapers, knives, chisels, chipping hammers, rags, etc.

hand wash
The removal of oil, dirt, soil, grease, and other contaminants by hand with solvent and/or detergents, etc.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Presence of atmospheric/surface corrosion, pitting, etc., when preparing the surface.	Document as required. Notify appropriate personnel.
Unexpected hazardous liquid or carbon dioxide encountered when preparing surfaces for coating.	Eliminate ignition source(s) and notify appropriate personnel.
Mechanical damage, such as dents, gouges, scrapes, etc., is identified.	Notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Visually inspect the surface area to be prepared to determine the proper method to use.	This is necessary to determine if hand tool cleaning, power tool cleaning, and/or hand washing is required. It also determines the proper steps and tools for cleaning and surface preparation.
2	Remove contaminants from specified area, if present.	This is necessary to avoid grease or oil causing contamination of tools and surface. NOTE Utilize appropriate personal protective equipment to protect from contact or injuries from solvents/detergents, dust, projectiles, and hand/power tools.
3	Remove existing coating, if present.	Address hazardous coatings (e.g. containing asbestos or lead) in accordance with regulatory requirements and operator procedures. NOTE If coating to be applied meets existing coating, the transition may be made by feathering the existing coating at the interface.
4	Verify that surface preparation meets operator standards or specifications.	—
5	Make notifications per the operator's procedures.	Up-to-date records are essential for maintaining corrosion control data.

Task 7.3—Prepare Surface for Coating by Abrasive Water Blasting

1.0 Task Description

This task consists of preparing the surface by different types of abrasive water blasting.

The task begins with identification of the area to be blasted. This task ends when the surface is ready for coating application and all required information has been documented per the operator's procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Inspect the Condition of External Coating on Buried or Submerged Pipe (reference Task 5.3);

— Visual Inspection of Atmospheric Coating (reference Task 7.1);

— Perform Coating Inspection (reference Task 7.7).

2.0 Knowledge Component

The purpose of this task is to prepare surface for coating.

An individual performing this task shall have knowledge of:

a) equipment setup logistics and possible environmental concerns;

b) coating removal, cleaning, and preparation of pipe to accept coating repair;

c) hazards related to high-pressure discharge;

d) coating manufacturer's specifications for application or repairs to the coating;

e) surface preparation standards for water blast cleaning.

Three types of abrasive water blasting, including the following:

a) grit blast with shroud—grit is emitted in center of a water shroud;

b) sand injected water blast—sand or other medium is blended in water stream at nozzle;

c) slurry blast—water and grit mixed together in constantly agitated reservoir.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Presence of atmospheric/surface corrosion, pitting, etc., when preparing the surface.	Document as required. Notify appropriate personnel.
Unexpected hazardous liquid or carbon dioxide encountered when preparing surfaces for coating.	Eliminate ignition source(s) and notify appropriate personnel.
Mechanical damage, such as dents, gouges, scrapes, etc., is identified.	Notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify area to be abrasive water blasted.	This is necessary to determine where to set up equipment.
2	Set up equipment logistically per job requirements.	Confirms safe and efficient operations.
3	Remove contaminants from specified area, if present.	This is necessary to avoid grease or oil causing contamination of tools and surface. NOTE Utilize appropriate personal protective equipment to protect from contact or injuries from solvents/detergents, dust, projectiles, and hand/power tools.
4	Remove existing coating or mill scale, rust, or weld slag, etc., to achieve specified profile.	Address hazardous coatings (e.g. containing asbestos or lead) in accordance with regulatory requirements and operator procedures. NOTE If coating to be applied meets existing coating the transition may be made by feathering the existing coating at the interface.
5	Ensure that surface preparation meets operator standards or specifications.	—
6	Make notifications per the operator's procedures.	Up-to-date records are essential for maintaining corrosion control data.

Task 7.4—Prepare Surface for Coating by Abrasive Blasting Methods Other Than Water

1.0 Task Description

This task consists of preparing the surface by abrasive blasting other than water.

The task begins with the identification of the area to be prepared and with equipment setup. This task ends when all required information has been documented per the operator's procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Inspect the Condition of External Coating on Buried or Submerged Pipe (reference Task 5.3);

— Visual Inspection of Atmospheric Coating (reference Task 7.1);

— Perform Coating Inspection (reference Task 7.7).

2.0 Knowledge Component

The purpose of this task is to prepare surface for coating.

An individual performing this task shall have knowledge of:

a) equipment setup logistics and possible environmental concerns associated with the handling and disposal of spent blast media and coating material;

b) coating removal, cleaning, and preparation of pipe to accept the coating application;

c) hazards related to high-pressure discharge;

d) coating manufacturer's specifications for application or repairs;

e) safety and environmental procedures associated with the handling and disposal of spent blast media and coating material;

f) surface preparation standards for abrasive blast cleaning;

g) types of abrasive blasting including, but not limited to, the following:

   1) grit/shot blast;

   2) walnut shell;

   3) aluminum oxide;

   4) crushed slag;

   5) glass bead;

   6) soda blast.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Presence of atmospheric/surface corrosion, pitting, etc., when preparing the surface.	Document as required. Notify appropriate personnel.
Unexpected hazardous liquid or carbon dioxide encountered when preparing surfaces for coating.	Eliminate ignition source(s) and notify appropriate personnel.
Mechanical damage, such as dents, gouges, scrapes, etc., is identified.	Notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the area to be abrasive blasted.	This step is necessary to determine where to set up equipment.
2	Set up equipment logistically per job requirements.	This step confirms safe and efficient operations.
3	Remove contaminants from specified area, if present.	This step is necessary to avoid grease or oil causing contamination of the tools and surface. NOTE Appropriate personal protective equipment should be utilized to provide protection from contact or injuries from solvents/ detergents, dust, projectiles, and hand/power tools.
4	Remove existing coating, mill scale, rust, or weld slag, etc., to achieve specified profile.	Address hazardous coatings (e.g. containing asbestos or lead) in accordance with regulatory requirements and the operator's procedures. NOTE If coating to be applied meets existing coating, the transition may be made by feathering the existing coating at the interface.
5	Ensure that surface preparation meets the operator's standards or specifications.	—
6	Make notifications per the operator's procedures.	Up-to-date records are essential for maintaining corrosion control data.

Task 7.5—Apply Coating Using Hand Application Methods

1.0 Task Description

This task consists of application of coating to a pipeline component by hand.

This task begins with determining the type of coating to be used. This task ends after all required information is documented per the operator's procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Prepare Surface for Coating Using Hand and Power Tools (reference Task 7.2);

— Prepare Surface for Coating by Abrasive Water Blasting (reference Task 7.3);

— Prepare Surface for Coating by Abrasive Blasting Methods Other Than Water (reference Task 7.4);

— Perform Coating Inspection (reference Task 7.7).

This task does not include but may lead to the performance of other covered tasks such as:

— Inspect the Condition of External Coating on Buried or Submerged Pipe (reference Task 5.3);

— Visual Inspection of Atmospheric Coating (reference Task 7.1).

2.0 Knowledge Component

The purpose of this task is to apply protective coating to pipeline components.

An individual performing this task shall have knowledge of:

a) methods for applying coating by hand, including:

   1) roller;

   2) brush;

   3) wrap;

   4) melting—hot sticks.

Terms applicable to this task:

sags
Nonuniform downward flow of a wet-applied coating under the force of gravity that results in an uneven coating having a thick lower edge.

wrinkling
Formation of a surface appearance in a coating resembling the skin of a dried prune, usually caused by application shortcomings.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Pipeline surface not properly prepared for coating (e.g. contaminated surface).	Stop task activities and notify appropriate personnel.
Weather conditions change and are no longer suitable for coating application.	Stop task activities and make appropriate notifications per the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Confirm what type of coating is applicable to the specified pipeline component.	Check that the coating to be applied is compatible with the existing coating system.
2	Assemble the tools and equipment necessary for application as required by coating specification.	Coating procedures are dictated by the scope of work for the particular job. This should include type of coating, surface cleanliness, thickness of coating application, and applicable atmospheric conditions. NOTE Utilize appropriate personal protective equipment to protect from contact with coating materials as applicable depending on coating system used.
3	Prepare coating for application.	If applicable, mix coating according to the manufacturer's coating specification. Confirm that coating has not exceeded shelf life.
4	Confirm that weather conditions are suitable for coating operations.	Temperature of pipeline component and dew point are critical to ensure proper adhesion.
5	Apply coating per specifications.	Check that coating applied has adequate coverage and thickness, if required.
6	Make notifications per the operator's procedures.	Up-to-date records are essential for maintaining corrosion control data.

Task 7.6—Apply Coating Using Spray Applications

1.0 Task Description

This task consists of applying coating to a pipeline component by spray method.

This task begins with determination of the type of coating to be used. This task ends when all required information is recorded per the operator's procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Prepare Surface for Coating Using Hand and Power Tools (reference Task 7.2);

— Prepare Surface for Coating by Abrasive Water Blasting (reference Task 7.3);

— Prepare Surface for Coating by Abrasive Blasting Methods Other Than Water (reference Task 7.4);

— Perform Coating Inspection (reference Task 7.7).

This task does not include but may lead to the performance of other covered tasks such as:

— Inspect the Condition of External Coating on Buried or Submerged Pipe (reference Task 5.3);

— Visual Inspection of Atmospheric Coating (reference Task 7.1).

2.0 Knowledge Component

The purpose of this task is to apply protective coating to pipeline components.

An individual performing this task shall have knowledge of:

a) methods of applying coating by spraying, including:

   1) high volume/low pressure;

   2) airless spray.

Terms applicable to this task:

orange peel
The dimpled appearance of a dried coating resembling the surface of a navel orange.

overspray
Dry, flat, pebbly surface resulting from paint particles falling outside spray pattern.

sags
Nonuniform downward flow of a wet-applied coating under the force of gravity that results in an uneven coating having a thick lower edge.

wrinkling
Formation of a surface appearance in a coating resembling the skin of a dried prune, usually caused by application shortcomings.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Pipeline surface not properly prepared for coating (e.g. contaminated surface).	Stop task activities and notify appropriate personnel.
Weather conditions change and are no longer suitable for coating application.	Stop task activities and make appropriate notifications per the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Determine what type of coating is applicable to the specified pipeline component.	Check that the coating to be applied is compatible with the existing coating system.
2	Assemble the tools and equipment necessary for application as required by coating specification.	Verify that the proper type of spray nozzle is selected and that the orifice corresponds to requirements for the particular coating. Coating procedures are dictated by the scope of work for the particular job. This should include type of coating, surface cleanliness, mil thickness of coating application, and applicable atmospheric conditions. NOTE Utilize appropriate personal protective equipment in accordance with regulatory requirements and operator procedures.
3	Prepare coating for application.	If applicable, mix coating according to coating specification. Ensure that coating has not exceeded shelf life.
4	Ensure that weather conditions are suitable for coating operations.	Temperature of pipeline component and dew point are critical to ensure proper adhesion.
5	Apply coating per specification.	Check that coating applied has adequate coverage and thickness, if required.
6	Make notifications per the operator's procedures.	Up-to-date records are essential for maintaining corrosion control data.

Task 7.7—Perform Coating Inspection

1.0 Task Description

This task consists of inspecting the coating and measuring coating thickness after application.

This task begins when surface preparation is complete. This task ends when inspection of applied coating is completed and required information is documented per the operator's procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Prepare Surface for Coating Using Hand and Power Tools (reference Task 7.2);

— Prepare Surface for Coating by Abrasive Water Blasting (reference Task 7.3);

— Prepare Surface for Coating by Abrasive Blasting Methods Other Than Water (reference Task 7.4);

— Apply Coating Using Hand Application Methods (reference Task 7.5);

— Apply Coating Using Spray Applications (reference Task 7.6).

2.0 Knowledge Component

The purpose of this task is to validate that coating has been properly applied to pipeline components.

An individual performing this task shall have knowledge of:

This section intentionally left blank.

Terms applicable to this task:

Barcol hardness test
A hardness value obtained by measuring the resistance of rubbers, plastics, or coatings to indentation by a steel impresser under spring load.

dry film thickness
DFT
The thickness of a coating after it has completely dried or cured, usually measured in mils (1 mil = 0.001 in.).

holiday test
Testing of a coating system for holidays (a discontinuity in a coating that exposes unprotected surface) using an instrument that applies a voltage between the external surface of the coating and a conductive substrate; also known as jeeping or pinhole testing.

orange peel
The dimpled appearance of a dried coating resembling the surface of a navel orange.

overspray
Dry, flat, pebbly surface resulting from paint particles falling outside spray pattern.

sags
Nonuniform downward flow of a wet-applied coating under the force of gravity that results in an uneven coating having a thick lower edge.

surface profile
The irregular peak and valley profile on a bare surface that can result from operations such as abrasive blast cleaning or power tool cleaning; also known as anchor profile.

Tooke gauge
A precision tool for inspection and thickness measurement of single or multiple coats on any substrate and for microscopic observation and measurement of substrate and film defects.

wet film thickness
WFT
The thickness of the coating measured immediately after application before any appreciable solvent has evaporated or drying has taken place. This is usually measured in mils (1 mil = 0.001 in.).

wrinkling
Formation of a surface appearance in a coating resembling the skin of a dried prune, usually caused by application shortcomings.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of anomaly (e.g. uneven coating, holiday) on a pipeline facility.	Make the appropriate notifications.
Weather conditions change and are no longer suitable to perform coating inspection.	Stop task activities; make appropriate notifications per the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Complete weather and surface temperature testing.	This includes use of a sling psychrometer, surface temperature indicator, and ambient temperature gauge.
2	Verify the surface profile is met according to the coating specification.	This confirms that there is a sufficient anchor profile for the coating to adhere to.
3	After coating is applied, inspect coating using applicable method(s).	Determine that coating meets specifications. Inspections may include, but are not limited to: — wet film thickness (WFT) test; — dry film thickness (DFT) test; — pinhole/holiday/jeeping test; — adhesion test; — Tooke test; — Barcol hardness test.
4	Make notifications per the operator's procedures.	Up-to-date records are essential for maintaining corrosion control data.

Task 8.1—Measure Pit Depth with Pit Gauge

1.0 Task Description

This task consists of measuring the wall loss that can occur from mechanical damage or corrosion utilizing a mechanical pit gauge, dial gauge, or equivalent instrument. In the case where the pipeline has been opened, internal corrosion can be assessed in the same manner.

This task begins when the steel surface of the pipe is exposed and prepared for inspection. This task ends when measurements are documented and proper notifications are made.

This task does not include but may lead to the performance of other covered tasks such as:

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2);

— Measure Corroded Area (reference Task 8.3).

2.0 Knowledge Component

The purpose of this task is to measure and document pipe wall loss.

An individual performing this task shall have knowledge of:

— pit gauges.

Terms applicable to this task:

wall loss
Removal of metal caused by either mechanical damage (e.g. gouge or groove) or corrosion (e.g. general or pitting).

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of unexpected damage that presents an imminent hazard.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Unexpected hazardous liquid or carbon dioxide encountered when visually observing pipe for integrity issues.	Eliminate ignition source(s) and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Visually observe the exposed pipe for integrity issues such as evidence of a release or significant metal deformation.	Confirms that the pipeline is safe for operation and continued task performance. If the observation identifies integrity issues that are not safe, discontinue the task and make immediate notifications.
2	Clean and remove debris from the area to be measured.	The presence of debris interferes with obtaining accurate readings.

Step	Action	Explanation
3	Calibrate the pit gauge or verify that the gauge is working properly.	Ensures accurate measurement by verifying that the pin on the depth indicating arm has not been damaged.
4	Position gauge flush and longitudinally across area to be measured, holding firmly against the surface and ensuring that the pit gauge is supported on noncorroded surfaces.	Ensures that measurement is from the pipe surface. NOTE If the surface is irregular due to surface conditions such as girth weld, a bridging bar may be used for a platform reference for the gauge.
5	Move the depth indicator until it contacts the deepest part of the wall loss.	Necessary to determine maximum wall loss.
6	Read and record depth and longitudinal length measurements.	Measurements are used to evaluate the impact on operating pressure. Measurements are typically recorded in mils (thousandths of an inch).
7	Repeat several measurements to verify the deepest area of wall loss.	Verifies overall average of wall loss depth.
8	Make notifications per the operator's procedures.	Follow the operator's policies/procedures for appropriate documentation, notification protocol, and actions required.

Task 8.2—Measure Wall Thickness with Ultrasonic Meter

1.0 Task Description

This task consists of the use of an ultrasonic thickness meter to measure wall thickness.

This task begins when a steel pipe surface is exposed and prepared for inspection. This task ends when measurements are documented and proper notifications are made.

This task does not include but may lead to the performance of other covered tasks such as:

— Measure Pit Depth with Pit Gauge (reference Task 8.1);

— Measure Corroded Area (reference Task 8.3).

2.0 Knowledge Component

The purpose of this task is to accurately collect and record a wall thickness reading on the pipeline or related appurtenance.

An individual performing this task shall have knowledge of:

— ultrasonic thickness meters.

Terms applicable to this task:

calibrate
The process of ensuring an instrument's accuracy by comparing the instrument's reading to a known wall thickness. Some instruments may require adjusting the sound velocity to match the material being measured.

couplant
A substance (typically a liquid or gel) used to transmit the sound waves between the transducer and pipeline during ultrasonic examination.

nominal thickness
The expected wall thickness determined by alignment sheets or other records.

transducer
A device or element that transmits a signal from the outer surface and receives that signal from the backwall (inner wall surface) to obtain a measurement of wall thickness.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected hazardous liquid or carbon dioxide encountered when visually observing pipe for integrity issues.	Eliminate ignition source(s) and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Visually observe the exposed pipe for integrity issues such as evidence of a release or significant metal deformation.	Confirms that the pipeline is safe for operation and continued task performance. If the observation identifies integrity issues that are not safe, discontinue the task and make immediate notifications.
2	Assemble, check, and calibrate ultrasonic thickness meter for proper operation.	Proper assembly and calibration are required to obtain accurate readings.
3	Prepare, clean, and remove debris from surface to be measured.	Debris interferes with accurate readings and needs to be removed.
4	Apply a couplant to the area to be measured.	The use of a couplant is necessary to maintain consistent contact and allow sound waves to be transmitted with the surface for accurate readings.
5	Measure wall thickness by placing the transducer firmly into the couplant and ensuring that it is oriented to the pipe surface according to the manufacturer's instructions.	Proper placement of the transducer is necessary to obtain accurate readings.
6	Observe meter display to obtain a measurement of wall thickness.	Confirms that the unit of measure is correct and that the display indicates a stable reading was obtained.
7	Repeat several measurements to confirm nominal wall thickness.	Verifies overall wall thickness and ensures measurements are not affected by internal corrosion or laminations.
8	Document the findings and make notifications per the operator's procedures.	Follow the operator's policies/procedures for appropriate documentation, notification protocol, and actions required.

Task 8.3—Measure Corroded Area

1.0 Task Description

This task consists of measuring corroded areas.

This task begins when the steel pipe surface has been exposed and prepared for inspection. This task ends when measurements are documented and proper notifications are made.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Pit Depth with Pit Gauge (reference Task 8.1);

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2).

2.0 Knowledge Component

The purpose of this task is to obtain measurements to verify pipeline integrity.

An individual performing this task shall have knowledge of:

— methods for creating a visual representation of the pipeline segment after the corrosion has been identified that includes all areas of localized corrosion.

Terms applicable to this task:

general corrosion
An electrochemical reaction that takes place uniformly over the surface of the steel, thereby causing a general thinning of the component that can lead to eventual failure of the material.

pitting
An electrochemical reaction that creates metal loss of the outer surface in small, crater-like depressions that have the potential to cause rapid wall loss.

interaction
If two or more locations of localized corrosion are in close proximity, the combination of effects may cause a loss of wall strength and shall be recognized. The distance between areas and the dimensions of the localized corrosion determine the wall strength required based on pipe type, nominal wall thickness, and diameter.

localized corrosion
Individual areas of pitting or general corrosion areas at discrete sites that may also contain pitting. Areas of localized corrosion in the area of girth or longitudinal welds should be identified and documented.

profile
Graphic (depth and length) representation of the affected area and/or individual pit measurements (“peaks and valleys”) that includes a level of detail necessary to provide a profile of the pipe surface (this is sometimes called a “river bottom profile”).

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Abnormal readings on test equipment.	Follow appropriate operator procedures.
Unexpected hazardous liquid or carbon dioxide encountered when visually observing pipe for integrity issues.	Eliminate ignition source(s) and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Visually observe the exposed pipe for integrity issues such as evidence of a release or significant metal deformation.	Confirms that the pipeline is safe for operation and continued task performance. If the observation identifies integrity issues that are not safe, discontinue the task and make immediate notifications.
2	Obtain proper tools for the work assignment.	Tools may include a tape measure, pit gauge, ultrasonic gauge, metallic ruler, bridging bar, scanning device, or other measuring devices to take accurate measurements.
3	Prepare, clean, and remove debris from the surface to be measured.	Coatings, primer, and surface deposits may interfere with accurate readings and need to be removed.
4	Create a representation of the pipe surface to be inspected so that corroded areas on the pipeline can be accurately documented. Identify the long seam and the nearest girth weld as reference points and identify corrosion in proximity.	Typically, the pipeline is represented on paper as split at 12:00 or 6:00 (of an analog clock face) and flattened to represent the pipe as a rectangle. The format is determined based on the operator’s policy.
5	Overlay a grid on each area of localized corrosion.	Grids are used to represent areas of general corrosion to provide additional detail for assessment.
6	Measure longitudinal length of each area of localized corrosion.	This measurement is required for assessment of pipeline integrity.
7	Measure circumferential width of each area of localized corrosion.	Used to properly identify the localized corrosion on the overall representation.
8	Measure the distance between each area of localized corrosion.	Used to properly identify the localized corrosion on the overall representation. This is also used to determine the interaction between discrete areas of localized corrosion.
9	Obtain profile measurements of the corrosion region.	The profile measurements can be represented as the remaining wall thickness or actual pit/general corrosion depth.
10	Obtain and determine nominal wall thickness.	—
11	Identify areas of greatest wall loss within each area of localized corrosion and obtain pit depth measurements.	—
12	Document the findings and make notifications per the operator’s procedures.	Follow the operator’s policies/procedures for appropriate documentation, notification protocol, and actions required. Denote all areas of localized corrosion, distances between those areas, and pit depth readings on the representation.

Task 9.1—Install Bonds

1.0 Task Description

This task consists of installing a cathodic protection (CP) bond.

This task begins with identifying the structures to be connected. This task ends with validating the effectiveness of the bond and documenting the readings.

This task does not include but may lead to the performance of other covered tasks such as:

— Test to Detect Interference (reference Task 1.3);

— Install Test Leads by Nonexothermic Welding Methods (reference Task 2.3);

— Install Test Leads by Exothermic Welding Methods (reference Task 2.4).

2.0 Knowledge Component

The purpose of this task is to electrically connect two or more structures to improve CP systems and prevent possible structure damage caused by interference.

An individual performing this task shall have knowledge of:

a) CP systems and components comparable to AMPP Certification Level CP 2;

b) types of bonds, including critical and noncritical;

c) installing interference bond facilities at the location of current discharge, if possible;

d) shunts and blocking diodes.

Terms applicable to this task:

blocking diodes
These may be necessary to prevent current flow in the opposite direction, such as when bonding to DC traction systems.

bonds
Electrical connections between structures. Exothermic (thermite) welding, pin brazing, or other mechanical connections may be used to connect bond wires/cables and test leads to the structures. Bond leads and test leads are terminated in a test station to allow inspection.

critical bonds
These are determined by an operator’s procedures and are defined as bonds that, if disconnected, may be detrimental to one or more structures.

shunts
Commonly used between the structures to determine the current amplitude and polarity between the structures.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Inability to achieve target polarity and/or current.	Notify appropriate personnel for CP system analysis.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the structures to be connected.	Structures to be bonded shall be properly identified and marked for connections.
2	Install the test leads and bond cables/wires on both structures at the location of current discharge.	Test leads are not used for current-carrying connections. In addition to bond cables/wires being installed, test lead wires may also be installed on both structures to avoid taking potentials on a current-carrying connection.
3	Attach the test leads and bond cables/wires by exothermic (thermite) weld, pin brazing, or other method, which yields a permanent, low-resistance connection.	A very low-resistance path for current return is required for optimal current transfer.
4	Terminate the test leads and bond cables/wires inside of the test box/station that is accessible to both structures.	Affected parties need to be able to monitor the bond.
5	Install shunts for measurement of current flow and resistors (as required to limit current interchange) inside of the test box/station.	It is important to monitor the magnitude and direction of current flow.
6	Install blocking diodes, as required.	Occasionally, it becomes necessary to prevent current flow in the opposite direction, such as when bonding to DC transit systems.
7	Conduct tests to determine the effectiveness of the installed interference bond.	It is important to determine that all negative effects of the interference have been mitigated.
8	Document readings as required by the operator’s procedures.	Documentation and communication of the bond installation is critical to future testing.

Task 9.2—Install Galvanic Anodes

1.0 Task Description

This task consists of installing galvanic anodes that provide cathodic protection (CP) for buried or submerged metallic structures.

This task begins with determining the most suitable locations for the galvanic anodes within design considerations. The task ends when installation documentation is complete.

The performance of this covered task may require the performance of other covered tasks such as:

— Observe Excavation Activities (reference Task 32);

— Perform Backfilling (reference Task 39).

This task does not include but may lead to the performance of other covered tasks such as:

— Install Test Leads by Nonexothermic Welding Methods (reference Task 2.3);

— Install Test Leads by Exothermic Welding Methods (reference Task 2.4).

2.0 Knowledge Component

The purpose of this task is to provide a galvanic anode to operate with a CP system.

An individual performing this task shall have knowledge of:

a) CP systems and components comparable to AMPP Certification Level CP 2;

b) connection methods (connections are made in a test station with a lead connected to the structure being protected and across a shunt for measurement and testing; isolation of galvanic anodes may be necessary for additional testing of the structure);

c) galvanic anodes and their applications (galvanic anodes may be used for direct CP, shielding of electrical interference, spot protection, or alternating current mitigation; applications may be in various soil conditions, underwater or offshore, or where power for impressed systems is unavailable).

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Indications of a leak (e.g. soil discoloration, smell, dead vegetation) when installing the anode bed.	Stop all activity related to this task and notify operator personnel, as required.
A component is found in an inoperable condition.	Notify the appropriate personnel to take actions as specified by the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Determine the most suitable location along the pipeline within design considerations.	A location that has high subsurface moisture content is preferred. Moisture in the electrolyte is essential for proper operation of the anode.
2	Install the anode by placing in an augered hole or horizontal excavation.	Vertical anodes can be located in augered holes while horizontal anodes may require backhoe excavation. Excavations should be sufficiently deep so that ground water levels will not dry out. Anode holes should be at least as deep as the pipeline. Care needs to be exercised to minimize damage to the anode or its prepackaged backfill. NOTE Manufacturer/operator procedures may require the anode to be soaked or wetted prior to installation. NOTE Anodes shall be removed from the manufacturer's protective packaging before installation.
3	Wet the anode prior to backfilling.	Galvanic anodes are typically supplied in special backfill (hydrated gypsum, bentonite clay, and sodium sulfate). This backfill shall be wet for the anodes to start discharging current.
4	Uncoil the anode lead wire and extend fully, being careful not to damage or kink wire.	The anode lead wire (pigtail) comes coiled at one end of the anode bag. Care shall be taken to ensure that this lead wire is not damaged.
5	Connect the anode lead wire directly to the pipe for a direct connection, and install shunt, and a resistor (if necessary), inside of the test stations.	Connection to the pipe is necessary for anode operation; connection to the pipe via a shunt is important to monitor the magnitude of current flow.
6	Backfill carefully with native soil backfill. Use rock-free backfill to pad the anode and the anode lead wire.	Care shall be taken in the backfill process to ensure that the anode and its lead wire are not damaged.
7	Document installation as required by the operator's procedures.	Documentation is necessary to maintain record of installed anode locations.

Task 9.3—Install Rectifiers

1.0 Task Description

This task consists of installation of impressed current cathodic protection (CP) rectifiers.

This task begins with verifying the rectifier is appropriate for the location and service. This task ends with documentation of the installation.

This task does not include but may lead to the performance of other covered tasks such as:

— Adjust Rectifier (reference Task 4.3);

— Install Test Leads by Nonexothermic Welding Methods (reference Task 2.3);

— Install Test Leads by Exothermic Welding Methods (reference Task 2.4);

— Install Impressed Current Groundbeds (reference Task 9.4).

2.0 Knowledge Component

The purpose of this task is to install CP rectifiers to protect facilities against external corrosion.

An individual performing this task shall have knowledge of:

a) CP systems and components comparable to AMPP Certification Level CP 2;

b) basic electricity and electrical circuits;

c) rectifier types, including air cooled, oil cooled, explosion proof, solar powered, etc.;

d) mounting requirements (pole mount and rack mount);

e) positive and negative terminal termination requirements.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
A component is found in an inoperable condition.	Notify the appropriate personnel to take actions as specified by the operator's procedures.
A rectifier housing is energized.	Notify the appropriate personnel to take actions as specified by the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify that the rectifier is appropriate for the location and service.	Rectifiers are available for nonhazardous and for hazardous locations. They can be air cooled, oil cooled, or explosion proof. They can be supplied for either single phase or three-phase service with input voltages as high as 480 volts AC. Rectifiers can be designed for a myriad of DC output voltage and current configurations.
2	Mount the rectifier securely at the designated location.	Rectifiers may be mounted on poles, posts, walls, panels, concrete pads, etc., and shall be mounted securely using appropriately sized fasteners. Insecure fastening could lead to damage and bodily injury. NOTE Installation shall meet all applicable building and electrical codes.
3	Connect the alternating current (AC) power feed wires through an appropriately sized conduit or approved armored cable in accordance with the applicable sections of the *National Electrical Code*, the *National Electrical Safety Code*, and local electric and building codes.	The AC supply to a rectifier is usually made through a safety switch or circuit breaker panel. It is important to consult the applicable codes and requirements to prevent electrical shock. The AC conduit is usually connected to the "knockout" supplied for that purpose.
4	Terminate the AC feed wires at terminals on circuit breaker or AC input connection wires.	Refer to the installation portion of the rectifier manual for AC termination.
5	Connect the direct current (DC) conduits to the rectifier.	DC conduits are used to house the DC output cables from their termination at the DC output terminals to a point underground from which the cables usually run directly buried to the groundbed (positive) and structure (negative). NOTE In hazardous areas, seal conduits may be required below the rectifier.
6	Install the DC cables from the anode groundbed and the structure in their respective conduits, and terminate on their respective terminals.	It is imperative that care be taken during this phase of the installation. Termination at the proper terminal is essential. Crossing the wires (connecting the anode groundbed to the negative and the structure to the positive) can have disastrous consequences. NOTE The positive cable is connected to the anodes, and the negative is connected to the structure.
7	Test and verify that cables are correctly installed.	Use the appropriate test meter (e.g. multimeter) to confirm proper polarity connections. Incorrect cable connections will cause the pipeline or structure that is intended to be protected to become an anode causing it to rapidly corrode.
8	Document installation as required by the operator's procedures.	Documentation is necessary to maintain record of rectifier installation.

Task 9.4—Install Impressed Current Groundbeds

1.0 Task Description

This task consists of installing impressed current groundbeds.

This task begins with verification that site location, material, and method of installation all comply with design requirements. The task ends when the impressed current anodes are installed and documentation has been completed as required.

The performance of this covered task may require the performance of other covered tasks such as:

— Observe Excavation Activities (reference Task 32);

— Perform Backfilling (reference Task 39).

The performance of this covered task may require the performance of other covered tasks such as:

— Adjust Rectifier (reference Task 4.3);

— Install Rectifiers (reference Task 9.3).

2.0 Knowledge Component

The purpose of this task is to provide cathodic protection (CP) for buried or submerged metallic structures.

An individual performing this task shall have knowledge of:

a) CP systems and components comparable to AMPP Certification Level CP 2;

b) connection methods;

c) impressed current anodes are connected together to form an anode bed; connections are made based on configuration and design of the bed, which may include a termination box with a lead connected to the positive lead of the rectifier; shunts may be used for measurement and testing of individual anodes; isolation of individual anodes may be necessary for additional testing of the anodes;

d) impressed current anodes (which are installed in special backfill, such as coke breeze or other fill material);

e) header cables (which is a cable or wire to which the anode lead wires are connected);

f) splice connections (which is the electrical connection between the anode lead wire and the header cable/wire or between anodes; these splice connections shall be carefully insulated to protect the connection from oxidation);

g) rectifier adjustment (which is performed after the anode system is energized to set CP levels).

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Anode lead cable/wire is damaged.	Notify the appropriate personnel to take actions as specified by the operator's procedures.
Unexpected production of water in anode installation.	Notify the appropriate personnel to take actions as specified by the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify that the location and materials are in accordance with design criteria.	Impressed current anodes are usually installed in a right-of-way that is separated from the pipeline. Locations are selected using criteria such as soil resistivity, topography, proximity to other structures, and geography.
2	Lay out the number, spacing, and configuration of the anodes at a selected location in accordance with design criteria (i.e. remote vs. distributed).	Remote (deep well or conventional): installed vertically or horizontally as designed for the location and typically more than a 100 ft away from pipeline. Distributed: located in close proximity to the structure and typically installed a minimum of 10 ft from the structure.
3	Excavate a vertical hole or horizontal ditch for anode installation.	Excavation techniques may include ditching, augering, drilling, etc. Anodes are also installed as a replacement for expended anodes. Anodes shall be installed in the soil or submerged in water that is electrically continuous with the pipeline backfill (common electrolyte.) NOTE If coke breeze or other fill material is required by design to enhance current flow, it shall be installed during the installation of the anodes.
4	Carefully install anode in the excavated hole, and confirm that anodes are placed flat in horizontal installations or centered in the bore for vertical installations.	Anodes should be lowered carefully into the excavations, being careful not to damage the anode, its lead wire, or the lead wire to anode connection. Any damage will result in premature failure. NOTE To prevent damage to the anode, do not lift or lower the anode by its lead wire.
5	Install the anode header cable between the groundbed and the rectifier.	Care shall be observed during this process, as any damage to the cable insulation will lead to premature failure of the groundbed. Direct current will be discharged at any breaks in the cable insulation.
6	Backfill the vertical hole or horizontal ditch.	Anodes shall be installed in the soil or submerged. Backfill material shall be free of rocks and debris to prevent damage to cable insulation.
7	Document installation as required by the operator's procedures.	Documentation is necessary to maintain record of groundbed installation. Documentation shall include the number of anodes and the manner or spacing of installation.

Task 9.5—Repair Shorted Casings

1.0 Task Description

This task consists of electrically isolating the pipe and pipe casing after a short is detected. An electrical short between the casing and the pipe draws protection away from the pipe and may not allow adequate protection in the cased area.

This task begins when the pipeline casing end(s) has been exposed. The task ends when the pipeline casing is tested for isolation and proper documentation is completed per the operator's procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Structure-to-soil Potentials (reference Task 1.1);

— Inspect the Condition of External Coating on Buried or Submerged Pipe (reference Task 5.3);

— Install Test Leads by Nonexothermic Welding Methods (reference Task 2.3);

— Install Test Leads by Exothermic Welding Methods (reference Task 2.4);

— Locate Line (reference Task 14.1);

— Observe Excavation Activities (reference Task 32);

— Perform Backfilling (reference Task 39).

2.0 Knowledge Component

The purpose of this task is to provide cathodic protection (CP) for the pipe.

An individual performing this task shall have knowledge of:

a) casing systems (which includes end seals, insulators, and vent connections);

b) casings are oversized pipe required in some instances to reduce external load on the pipeline, such as railroad crossings, interstate highways, etc.;

c) end seals are kits composed of rubber, vinyl, or other composites to seal the pipeline/casing interface to prohibit water and contaminants from infiltrating the casing;

d) isolating spacers are installed on the pipeline to prevent metallic contact with the casing; spacers shall have sufficient mechanical strength to withstand installation and to maintain isolation;

e) vent connections are made to provide an atmospheric outlet to the casing to prevent pressure buildup and access to test the casing atmosphere; one vent is attached on the bottom of the pipe and one is attached on the top to allow insertion of nonconductive material;

f) metallic shorts (which are caused by metal-to-metal contact between the pipe and casing);

g) electrolytic shorts (which are caused by material in casing that provides a current path between the pipe and casing such as water or soil).

Terms associated with this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexplained hydrocarbon encountered.	Stop all activity related to this task and notify operator personnel, as required.
Pipeline damage discovered while repairing shorted casings.	Take action, if qualified, and notify personnel of observed condition, as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Clear a workable area and support the pipeline as needed.	This provides sufficient working room for seal work, coating repair, etc. Supporting the pipeline may be necessary to prevent sagging or future damage. Factors that could affect the support could include things such as diameter, length, product, etc.
2	Remove the end seal.	This exposes the carrier pipe at the casing end.
3	Inspect the ends of the carrier pipe and casing to determine whether metallic contact is visible.	Inspect for the location of metal contact, which may be near the end seal or at another location in the casing. If no metallic contact is found, an electrolytic condition may be the cause of elevated potentials on the casing.
4	If pipe has settled, then center the carrier pipe within the casing, if possible.	This is to confirm that there is no contact between the carrier pipe and casing. If the pipe has to be lifted, then follow the operator's procedures for moving in-service pipe. On long casings, cutting off excess casing may eliminate the casing short. NOTE Pipeline/casing support shall be performed in accordance with engineering procedures or work plans to prevent damage to pipeline.
5	If the pipeline is coated, confirm that the coating is bonded to carrier pipe.	Coating is necessary for good CP and isolation.
6	Install casing insulator (isolating spacers) and centering cradle while providing adequate support.	Isolating spacers are used to maintain electrical isolation of the carrier pipe from the casing. Adequate support reduces strain on a pipeline that could cause a pipeline rupture or metallic contact between the carrier pipe and casing.
7	If an electrolytic condition exists, removal of the electrolytic material in the casing may be required, if possible.	Excess material in casing should be removed (blown out) if possible while end seals are removed. Resolution of an electrolytic condition may not be necessary. If electrolytic condition exists, follow the operator's procedures.
8	Replace the end seal.	End seals prohibit water and contaminants from infiltrating the casing.
9	Install the test leads as required and conduct a pipe-to-casing potential difference test.	Test leads on both the carrier pipe and casing may be required for testing casing isolation. NOTE A pipe-to-casing potential difference test is used to determine that pipe and casing are isolated. If isolation is not achieved, follow additional remediation steps per the operator's procedures.
10	Document repair as required by the operator's procedure.	Up-to-date records are essential for maintaining corrosion control data.

Task 9.6.1—Install Electrical Insulating Device—Piping Isolation

1.0 Task Description

This task consists of installing nonmetallic spacers or shields on aboveground pipeline segments.

The task begins when the required installation location of the isolation device is identified. This task ends when isolation device has been installed, tested, and documented according to the operator's procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Inspect and Test Electrical Isolation (reference Task 1.5).

2.0 Knowledge Component

The purpose of this task is to isolate aboveground pipeline segments and equipment from buried structures with nonmetallic spacers or shields to ensure proper functioning of cathodic protection (CP) systems.

An individual performing this task shall have knowledge of:

a) CP systems;

b) electrical isolation;

c) electrical isolation devices, such as nonmetallic spacers or shields.

Terms associated with this task:

This section intentionally left blank.

Abnormal operation conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Presence of corrosion, pitting, etc.	Document as required and notify appropriate personnel.
Unexpected hazardous liquid or carbon dioxide encountered.	Stop all activity related to this task and notify operator personnel, as required, and eliminate ignition sources.
Pipeline damage: dents, gouges, scrapes, etc.	Notify appropriate personnel.
Abnormal or erratic readings.	Take appropriate action to mitigate improper installation.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the location where the isolation device is required.	This step verifies that the installation will be appropriately mounted, enclosed, and compatible with the location of the installation.
2	Install the piping system so that it is not in physical contact with any foreign electrically conductive or metallic structure.	The CP design shall include and account for such structures if electrical isolation is impractical to achieve. Cathodically protected pipelines installed aboveground and supported with steel supports should be electrically isolated from the supports. Conductive or metallic structures may include casings, valve culverts, concrete caisson steel, cable trays, supporting pipe stanchions, bridge structures, pilings, or reinforcing steel in concrete.
3	Align and install the electrical isolation device between pipe interfaces and metallic structures using nonmetallic spacers or shields.	The proper installation of these materials ensures that crevice corrosion does not result from ingress of dust and moisture between the insulation material/pipe interfaces. Follow the operator's procedure to maintain appropriate pipe support during installation of isolation devices. The material should be properly sized, and has appropriate compression/abrasion resistance in conjunction with having effective dielectric properties.
5	Verify isolation with the appropriate isolation tester.	NOTE The completion of this step may be completed by another individual qualified in Task 1.5—Inspect and Test Electrical Isolation.
6	Record all required documentation per the operator's procedures.	Proper documentation is critical to future analysis and identification of problem areas.

Task 9.6.2—Install Electrical Insulating Device—Casing Isolation

1.0 Task Description

This task consists of installing nonmetallic spacers or shields inside casings.

The task begins when the required installation location of the isolation device is identified. This task ends when the isolation device has been installed, tested, and documented according to the operator's procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Inspect and Test Electrical Isolation (reference Task 1.5);

— Perform Coating Inspection (reference Task 7.7).

2.0 Knowledge Component

The purpose of this task is to isolate pipeline segments and equipment from casings to ensure proper functioning of cathodic protection (CP) systems.

An individual performing this task shall have knowledge of:

a) CP systems;

b) electrical isolation;

c) electrical isolation devices, such as casing isolators/spacers.

Terms associated with this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Presence of corrosion, pitting, etc.	Document as required and notify appropriate personnel.
Unexpected hazardous liquid or carbon dioxide encountered.	Stop all activity related to this task and notify operator personnel, as required, and eliminate ignition source.
Abnormal or erratic readings.	Take appropriate action to mitigate improper installation.
Pipeline damage: dents, gouges, scrapes, etc.	Notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the location where the isolation device is required.	When metallic casings are used as part of the underground piping system (such as at roadways, railway crossings, watercourse crossings, etc.), the electrical isolation of the carrier pipeline from such casings is accomplished by the use of adequate and approved insulating spacing capable of high compressive strength and end-seal materials.
2	Verify that the annular space is cleared of any debris and contaminants.	This step confirms the removal of all organic materials or electrolytes from the annular space between the casing and the carrier pipe and it is completely free of contaminants prior to installation of the insulating spacers.
3	Install the nonmetallic spacers or shields.	Casing isolating spacers are specified to have the required mechanical strength for the installation. Follow the operator's procedure and the manufacturer's specification.
4	Verify that the annular space is cleared of any debris and contaminants and verify that spacers are secured.	This step confirms that all foreign debris has been removed before sealing.
5	Install the end seals.	Water/debris penetration is effectively prevented when the end seals are correctly installed. NOTE Install the casing end seals according to the manufacturer's instructions and in the quantity recommended by the manufacturer or design engineer.
6	Verify isolation with the appropriate isolation tester.	NOTE The completion of this step may be completed by another individual qualified in Task 1.5—Inspect and Test Electrical Isolation.
7	Record all required documentation per the operator's procedures.	Proper documentation is critical to future analysis and identification of problem areas.

Task 9.6.3—Install Electrical Insulating Device—Isolation Joints

1.0 Task Description

This task consists of installing an isolation joint.

The task begins when the required installation location of the isolation device is identified. This task ends when isolation device has been installed, tested, and documented according to the operator's procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Inspect and Test Electrical Isolation (reference Task 1.5);

— Perform Welding (reference Task 42.7).

2.0 Knowledge Component

The purpose of this task is to isolate pipeline segments and equipment with an isolation joint to ensure proper functioning of cathodic protection (CP) systems.

An individual performing this task shall have knowledge of:

a) CP systems;

b) electrical isolation;

c) electrical isolation devices, such as monolithic-style insulating joints.

Terms associated with this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Presence of corrosion, pitting, etc.	Document as required and notify appropriate personnel.
Unexpected hazardous liquid or carbon dioxide encountered.	Stop all activity related to this task and notify operator personnel, as required, and eliminate ignition sources.
Abnormal or erratic readings.	Take appropriate action to mitigate improper installation.
Pipeline damage: dents, gouges, scrapes, etc.	Notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the location where the isolation device is required.	This step verifies that the installation will be appropriately mounted, enclosed, and compatible with the location of the installation.
2	Verify the type of isolation device required, such as monolithic-style insulating joints that are typically welded in place.	This step requires certain types of isolation devices where the isolation point location shall be buried or the fluid inside the pipe is electrically conductive, such as produced water. Isolating joints for pipelines should be adequate for the maximum pressure and temperature conditions encountered on the particular installation. NOTE Assembling isolating joints and testing them both hydrostatically and electrically before installation in the pipeline is preferred.
3	Install bond wires/cables on both sides of the section of pipe to be removed.	This step enables electrical continuity to avoid arcing.
4	Install the isolation device.	NOTE The completion of this step may be completed by another individual qualified in Task 42.7—Perform Welding.
5	Remove the bonding devices and verify isolation with the appropriate isolation tester.	The use of a digital multimeter can give a false indication of isolation. NOTE The completion of this step may be completed by another individual qualified in Task 1.5—Inspect and Test Electrical Isolation.
6	Record all required documentation per the operator's procedures.	Proper documentation is critical to future analysis and identification of problem areas.

Task 9.6.4—Install Electrical Insulating Device—Lightning Protection and Electrical Grounding

1.0 Task Description

This task consists of installing electrical insulating devices for lightning protection and electrical grounding.

The task begins when the required installation location of the isolation device is identified. This task ends when isolation device has been installed, tested, and documented according to the operator's procedure.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Structure-to-soil Potentials (reference Task 1.1);

— Test to Detect Interference (reference Task 1.3);

— Inspect and Test Electrical Isolation (reference Task 1.5).

2.0 Knowledge Component

The purpose of this task is to isolate pipeline segments and equipment from lightning protection or electrical ground fault system to ensure proper functioning of cathodic protection (CP) systems.

An individual performing this task shall have knowledge of:

a) CP systems;

b) electrical isolation;

c) grounding systems;

d) various electrical isolation devices, such as a polarization cell replacement (PCR) or a solid-state decoupling (SSD) device.

Terms associated with this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Presence of corrosion, pitting, etc.	Document as required and notify appropriate personnel.
Unexpected hazardous liquid or carbon dioxide encountered.	Stop all activity related to this task and notify operator personnel, as required, and eliminate ignition sources.
Pipeline damage: dents, gouges, scrapes, arc burns, etc.	Notify appropriate personnel.
Abnormal or erratic readings.	Take appropriate action to mitigate improper installation.
Unintentional activation of a safety/control device (e.g. unauthorized removal of power) that results in a loss of control of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition. Notify the control center or local operations.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the location where the isolation device is needed.	This step verifies that the installation will be appropriately mounted, enclosed, and compatible with the location of the installation.
2	Install all insulating devices in accordance with the manufacturer's specifications.	For lightning and ground fault protection, the equipment typically consists of either a PCR or an SSD device that is bonded sufficiently and oppositely on both sides of the insulating flange. For electrical grounding, provision for electrical isolation through an approved electrical device (PCR or SSD) that is rated for the service shall be made at main line valves, densitometers, flow-meters, pressure transmitters, and other sites where such structures will be in bare metal contact to the soil.
3	Verify isolation with the appropriate isolation tester.	NOTE The completion of this step may be completed by another individual qualified in Task 1.5—Inspect and Test Electrical Isolation. For electrical grounding, conduct testing on all utility (electrical, telephone, etc.) supply or feeder cables to identify direct current flow to the foreign structures. This may require the completion of Task 1.1—Measure Structure-to-soil Potentials, and Task 1.3—Test to Detect Interference.
4	Record all required documentation per the operator's procedures.	Proper documentation is critical to future analysis and identification of problem areas.

Task 10.1—Insert and Remove Coupons

1.0 Task Description

This task consists of the removal of corrosion coupons to submit for testing.

This task begins with the verification that the isolation valve has been closed. This task ends when the coupon has been submitted for testing and required information is recorded per the operator's procedure.

This task does not include but may lead to the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

The purpose of this task is to monitor internal corrosion.

An individual performing this task shall have knowledge of:

This section intentionally left blank.

Terms applicable to this task:

corrosion
The chemical or electrochemical reaction between a material (usually a metal) and its environment that produces a deterioration of the material and its properties.

coupon
A sample of clean and pre-weighed metal of a known surface area inserted into a pipeline system to monitor corrosion rate and inhibitor effectiveness (coupons come in a variety of metals and configurations, such as flush, flat, and rod).

coupon holder assembly
A device utilized to hold and isolate the coupon from surrounding metals.

isolation or service valve
A device utilized to isolate the coupon and plug assembly from pipeline contents.

localized corrosion
Types of corrosion in which there is an intense attack at localized sites on the surface of a component. The most common type of localized corrosion is pitting. Other types of corrosion that may cause localized corrosion include crevice corrosion, cavitation, and impingement.

pitting
An electrochemical reaction that creates metal loss of the outer surface in small, crater-like depressions that have the potential to cause rapid wall loss.

retrieval tool/extractor tool
A device used to remove and replace coupons.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Damage or malfunction to coupon holder assembly causing leak or prevention of coupon insertion or retraction.	Stop process and make notification.
Obvious corrosion is present in the visual inspection (pitting or localized corrosion).	Make notifications per the operator's procedures.
Malfunction of isolation/service valve.	Stop process and make notification.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify that the isolation valve is closed and secure.	This isolates the coupon and coupon holder assembly from pipeline contents.
2	Remove fitting cap slowly, if equipped.	This provides access to the coupon. Fitting caps are typically installed at locations where portable retrievers or direct access procedures are used.
3	Remove coupon and coupon holder assembly according to the manufacturer's and operator's procedures.	Coupon holders and retrieval tools vary with manufacturer. NOTE Do not touch the coupon with bare hands or allow it to come in contact with external contaminants. External contaminants, such as acid, present on human hands can affect weight loss of the coupon.
4	Remove coupon from coupon holder and conduct visual inspection of coupon.	If obvious corrosion is present in the visual inspection (pitting or localized corrosion), make notifications per the operator's procedures. NOTE Do not touch the coupon with bare hands or allow it to come in contact with external contaminants. External contaminants, such as acid, present on human hands can affect weight loss of the coupon.
5	Place removed coupon directly in protective packaging, and document visual characteristics of coupon, removal date, and remover's name.	NOTE Do not touch the coupon with bare hands or allow it to come in contact with external contaminants. External contaminants, such as acid, present on human hands can affect weight loss of the coupon.
6	Clean and prepare coupon holder and ancillary equipment for coupon installation.	Proper preparation is essential to accurately measure future corrosion. Follow the manufacturer's or operator's procedures to prevent contamination of the coupon.
7	Properly document the new coupon's serial number or identification, its associated protective packaging, date of installation, location of installation, and installer's name.	Each coupon comes with its own protective package. It shall be returned with its package and the required documentation to ensure accurate results.
8	Install coupon into coupon holder.	Proper installation of coupon secures it in place and electrically isolates it from coupon holder. Follow the manufacturer's or operator's procedures to prevent contamination of the coupon.
9	Install coupon holder and coupon according to the manufacturer's and operator's procedures. Perform this function slowly to prevent damage to the coupon and plug assembly.	New coupon is placed to continue measuring future corrosion. NOTE Coupon holders and retrieval tools vary with the manufacturer. Consult the manufacturer and operator installation procedures.

Step	Action	Explanation
10	Replace fitting cap according to the manufacturer's and operator's procedures, if equipped.	Fitting caps are typically installed at locations where portable retrievers or direct access procedures are used.
11	Notify an individual who is qualified to open the isolation valve.	Exposes new coupon to pipeline contents.
12	Check for signs of leakage.	When the coupon installation is complete and the isolation valve is opened, monitor the site for any possible leaks.
13	Submit removed coupon and properly store new coupon protective packaging according to the operator's procedures.	Packaging for new coupon shall be stored properly so it can be used when the coupon is removed.
14	Document all required information per the operator's procedures.	Up-to-date records are essential to maintaining a corrosion control system.

Task 10.2—Monitor Probes (Online)

1.0 Task Description

This task consists of connecting a data logger and recording readings from monitor probes.

This task begins when the secondary containment cover is opened. This task ends when the reading has been obtained, verified, and documented.

2.0 Knowledge Component

The purpose of this task is to monitor for metal loss.

An individual performing this task shall have knowledge of:

This section intentionally left blank.

Terms applicable to this task:

bio probes
Bio probes are used to monitor sample elements for sessile bacteria growth.

electrical resistance probe
ER probe
ER probes determine metal loss over time by measuring the increase of the electronic resistance of an electrode as its cross-sectional area is reduced by corrosion.

galvanic probe
GP probe
Galvanic probes measure the change in current generated between brass and steel electrodes. When the two electrodes are immersed in electrolyte, a current is generated. Changes in the electrolyte or other variables such as temperature, velocity, pH, oxygen, or inhibitor characteristics are reflected by changes in the current output of the probes and recorded by a data acquisition system.

hydrogen probe
HP probe
Hydrogen probes monitor hydrogen permeation in steels.

linear polarization resistance probe
LPR probe
LPR probes work on the principle of voltage change over time. One element is polarized positively and the time it takes to return to its normal state is measured with reference to the second element. The element is then polarized negatively and the time it takes to return to its normal state is measured. Two curves are generated, one for the positive polarization and one for the negative polarization. The curves are plotted and the point at which they cross is defined as "the imbalance," which is subsequently interpreted as the tendency to pit.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Abnormal readings on test equipment.	Follow appropriate operator procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Locate probe site and remove any secondary containment covers to gain access to the probe.	Secondary containment covers are often used to protect against a release.
2	Confirm the probe terminals are acceptable for use.	Verify that probes are not damaged or corroded, which may result in inaccurate monitoring results.
3	Connect the data cords from the data logger to the appropriate terminal of the probe. Turn the data logger on and obtain the reading.	Necessary for accurate corrosion measurement. NOTE Data recorders and monitor probes vary by manufacturer. Follow the manufacturer's operating procedures.
4	Confirm the data logger readings are appropriate and document the reading.	Documentation of measurements is necessary for corrosion monitoring and mitigation. If the data logger readings are not consistent with the probe manufacturer's readings, and all external components are in good working order, confirm that the data logger is functioning properly. Otherwise, there may be a problem with the probe itself.
5	Disconnect the data logger leads from the probe.	—
6	Dress secondary container cover with anti-seize compound and place cap back on probe adapter.	—
7	Document all required information per the operator's procedures.	Up-to-date records are essential for maintaining a corrosion control system.

Task 11—Monitor and Control the Injection Rate of the Corrosion Inhibitor

1.0 Task Description

The tasks consist of monitoring and controlling the injection rate of corrosion inhibitor.

When corrosion inhibitors are used to mitigate internal corrosion, the operator shall inject the inhibitor in sufficient quantities to ensure design coverage of the inhibitor.

This task begins with a visual observation of the injection system. The task ends when proper documentation and notification are completed.

2.0 Knowledge Component

The purpose of this task is to monitor corrosion inhibitor injection rates and adjust these rates to ensure that the proper amount of inhibitor is being injected.

An individual performing this task shall have knowledge of:

This section intentionally left blank.

Terms applicable to this task:

corrosion
The chemical or electrochemical reaction between a material, usually a metal, and its environment that produces a deterioration of the material and its properties.

inhibitor
A chemical substance or combination of substances that, when in proper concentrations, forms an environment that prevents or reduces corrosion.

mils per year
MPY
The rate of corrosion measured in 0.001 in. per year.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Damage or malfunction to injection system causing leak.	Stop process and make notification.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Visually inspect tank and injection system to verify that the injection system is operating and inspect for signs of leakage.	Verifies operation and integrity of the system.
2	Verify that the volume of inhibitor is sufficient to last until the next inspection.	—

Step	Action	Explanation
3	Monitor inhibitor injection rate to determine if the inhibitor rate meets the requirements based on the pipeline flow rate.	Follow the operator’s policies and procedures to determine the flow of the inhibitor. This may include measuring changes in the volume of inhibitor using a sight glass.
4	Adjust injection rate as necessary to meet established pipeline flow rate.	Follow the operator’s policies and procedures when adjusting the injection rate of the inhibitor.
5	Make notifications per the operator’s procedures.	Follow the operator’s policies and procedures for proper documentation and notification.

Task 12—Perform Visual Inspection of Internal Pipe Surface

1.0 Task Description

This task consists of visually inspecting the internal pipe surface.

This task begins after the pipe has been opened and prepared for inspection. This task ends with proper documentation of observations.

This task does not include but may lead to the performance of other covered tasks such as:

— Measure Pit Depth with Pit Gauge (reference Task 8.1);

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2).

2.0 Knowledge Component

The purpose of this task is to identify evidence of corrosion whenever the pipe has been opened to the atmosphere.

An individual performing this task shall have knowledge of:

This section intentionally left blank.

Terms applicable to this task:

general corrosion
An electrochemical reaction that takes place uniformly over the surface of the steel, thereby causing a general thinning of the component that can lead to eventual failure of the material.

localized corrosion
Individual areas of pitting or general corrosion areas at discrete sites that may also contain pitting. Areas of localized corrosion in the area of girth or longitudinal welds should be identified and documented.

mechanical damage
Visible physical damage to the metallic surface of the pipeline that, at a minimum, may include one or more the defects listed below:

— **buckle**
A bend, bulge, or kink that can cause flattening or changes in the curvature of the pipe.

— **dent**
A depression in the surface that has been created by external forces on the pipeline with no visual evidence of metal loss.

— **gouge**
A groove in which metal has been removed or displaced from the surface.

— **scratch**
A thin, shallow cut or mark on the surface.

pitting
An electrochemical reaction that creates metal loss of the outer surface in small, crater-like depressions that have the potential to cause rapid wall loss.

scale
Deposit of a solid on the pipe wall.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of damage (e.g. mechanical damage and corrosion) or anomaly to a pipeline facility.	Stop task activities, move to a safe location (if required), and notify appropriate personnel.
Unexpected fluids, solids, or hazardous product encountered when visually observing internal pipe surface.	Stop task activities, move to a safe location (if required), and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Confirm that pipe is in a condition to allow an internal inspection. If pipe is removed, pipe orientation shall be properly marked. Removed and upstream/downstream pipe should be marked according to the operator's procedures.	Correctly orienting the pipe provides key information to corrosion patterns observed on the internal diameter of the pipe. Hydrocarbon shall be removed to accurately view the internal surface of the pipe.
2	Visually inspect all internal pipe surfaces for which visual inspection is possible, including the removed component section, and observable portions of pipe upstream and downstream of the removed component or access point.	If anomalies are identified, additional tasks may be required to evaluate the issues.
3	Record all required documentation per the operator's procedures.	Up-to-date records are essential for maintaining a corrosion control system. Special care should be taken in recording the patterns and location of general corrosion, pitting, mechanical damage, and/or scale buildup.

Task 14.1—Locate Line

1.0 Task Description

This task includes establishing the location of a pipeline and may also include determining the depth of the cover. This task requires the use of maps, mapping software, drawings, and locating equipment. A variety of line locating tools and methods can be used to locate a line; this task is not specific to any one tool or method.

This task begins when the need to locate a line has been identified. This task ends when the line has been located and, if required, depth of cover has been determined and documented.

This task does not include but may lead to the performance of other covered tasks such as:

— Install, Inspect, and Maintain Permanent Marker (reference Task 14.2);

— Install, Inspect, and Maintain Temporary Marker (reference Task 14.5);

— Observe Excavation Activities (reference Task 32).

2.0 Knowledge Component

This task is performed to verify the location of pipeline.

An individual performing this task shall have knowledge of:

a) pipeline maps, alignment maps, mapping software, construction drawings, and GPS;

b) methods used to locate pipe (e.g. potholing, daylighting, probing, electronic line locating, hand digging);

c) signal interference or unexpected changes in frequency and depth readings; electronic line locator readings may be impacted by pipeline depth, other underground utilities, adjacent structures, cathodic protection systems, type of soil, soil density, and overhead power lines;

d) One-Call notification system and One-Call laws (may vary from state to state).

Terms applicable to this task:

depth of cover
The vertical distance from the top of pipe to the soil or water sediment interface.

electronic line locator
A device designed and used to locate pipelines below the earth's surface.

One-Call notification system
A communication system in which a call center receives notices from excavators of intended excavation activities and transmits the notices to operators of underground pipeline facilities and other underground facilities that participate in the system.

One-Call ticket
Documentation of the One-Call request. It includes assigned number identification for tracking the ticket and all associated documentation.

NOTE One-Call laws vary from state to state.

potholing
daylighting
The practice of exposing a pipeline to verify its location.

probing
The practice of contacting the pipeline with a bar or rod to verify the presence or absence of a pipeline or underground structure. When probing, take care to avoid damaging pipeline coating.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of unintentionally exposed pipeline.	Notify appropriate pipeline personnel.
Pipeline location does not match pipeline maps.	Notify map owner and follow the operator's procedure to update map.
Line locating equipment is inoperable or not properly calibrated.	Stop task activities, determine cause of malfunction and required calibration settings, and remediate per manufacturer's recommendations or specifications.
The right-of-way is inaccessible.	Make appropriate notifications according to the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Obtain/verify necessary permits, waivers, access requirements, a One-Call ticket, or a line-locating request, as applicable.	Refer to operator, state, and local requirements.
2	Determine the approximate location of the pipeline section, by using the most current drawings, maps, or GPS.	Drawings and pipeline maps are used to assist in locating the pipeline.
3	Check to ensure that locating equipment is in proper working order in accordance with the manufacturer's recommendations.	Equipment needs to be operating properly for an accurate locate. Ensure that the locating equipment is properly charged and calibrated according to manufacturer's specifications. If equipment is not working properly, stop task activities, determine cause of malfunction, and remediate per manufacturer's recommendations.
4	Conduct a visual assessment to determine site conditions that could affect task performance.	Some rights-of-way or site conditions may impede task completion. Examples may include physical obstructions, traffic, soil conditions, hazards, standing water, trenches, etc.
5	Use appropriate line locating equipment and methods to determine the location of the line.	Determine pipeline location by appropriate locating method according to the operator's procedures.
6	Use appropriate equipment and methods to measure the depth of cover, if required, and document the depth.	Depth of cover can be determined with a probe rod or other equipment. Operator procedures or job specifications will dictate whether depth of cover needs to be established.

Task 14.2—Install, Inspect, and Maintain Permanent Marker

1.0 Task Description

This task consists of installing, inspecting, and maintaining permanent pipeline markers in required locations.

The task begins with verification that the line has been located. The task ends when the pipeline route is accurately marked with permanent marker(s).

The performance of this covered task may require the performance of other covered tasks such as:

— Locate Line (reference Task 14.1).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) permanent markers visually communicate the approximate location of the pipeline; line markers shall meet the specifications outlined in applicable regulations;

b) location requirements for marker installation;

c) information and design requirements for markers;

d) One-Call notification system and One-Call laws (may vary from state to state).

Terms applicable to this task:

potholing
daylighting
The practice of exposing a pipeline to verify its location.

probing
The practice of contacting the pipeline with a bar or rod to verify the presence or absence of a pipeline or underground structure. When probing, take care to avoid damaging pipeline coating.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of unintentionally exposed pipeline.	Notify appropriate pipeline personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify that the line has been located.	Ensures accurate placement of the marker.
2	Determine proper marker location(s), visibility, and orientation.	Markers warn the public and helps prevent damage to the pipeline.
3	Verify that the marker is in good condition, contains the correct information, and is appropriate for the location and product.	Replace the marker if it is missing, damaged, or the incorrect information is shown. Markers need to have the correct product identification and information as required by regulation.
4	Securely install the mounting apparatus and marker, per the manufacturer's specifications.	Ensure that markers have a good solid foundation. **Caution—When applicable, probe or pothole prior to installing a post to help ensure that the pipeline is not damaged.**
5	Confirm proper visibility, orientation, and installation of the permanent marker.	Ensures that information on marker is visible, and the marker is installed in accordance with the regulatory requirements.

Task 14.5—Install, Inspect, and Maintain Temporary Marker

1.0 Task Description

This task consists of installing, inspecting, and maintaining temporary pipeline markers.

The task begins when a One-Call ticket or line-locating request is received. The task ends when the line is accurately marked and appropriate documentation or notifications are complete.

The performance of this covered task may require the performance of other covered tasks such as:

— Locate Line (reference Task 14.1).

This task does not include but may lead to the performance of other covered tasks such as:

— Observe Excavation Activities (reference Task 32).

2.0 Knowledge Component

Operators shall provide temporary marking of buried pipelines in the area of excavation activity, as far as practical, before the activity begins. Temporary markers visually communicate the location of the pipeline on the surface in the right-of-way.

An individual performing this task shall have knowledge of:

a) types of temporary markers;

b) temporary marker locations;

c) ANSI uniform color code;

d) One-Call notification system and One-Call laws (may vary from state to state).

Terms applicable to this task:

One-Call notification system
A communication system in which a call center receives notices from excavators of intended excavation activities and transmits the notices to operators of underground pipeline facilities and other underground facilities that participate in the system.

One-Call ticket
Documentation of the One-Call request. It includes assigned number identification for tracking the ticket and all associated documentation.

NOTE One-Call laws vary from state to state.

white lining
Designating the ground of an area to be excavated using white paint, white flags, white stakes, or any combination of these.

NOTE State laws and best practices may vary from state to state.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of unintentionally exposed pipeline.	Make appropriate notifications according to the operator's procedures.
Misplaced permanent line marker.	Make appropriate notifications according to the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps.

Step	Action	Explanation
1	Receive a One-Call ticket or other line-locating request.	The individual shall be able to use the One-Call ticket, or other line-locating request, to determine at a minimum: — the date the locate shall be completed by; — the area to be marked.
2	Verify that the line has been located within the proposed excavation area.	Ensures accurate placement of the marker. If there is difficulty determining the proposed excavation area, ensure that the One-Call center or excavator is contacted for clarification of the proposed excavation area.
3	Adequately mark the pipeline so that its location is accurately known.	Temporary marker(s) should be located directly over the pipeline. When a temporary marker cannot be located directly over the pipeline, an offset marker shall be installed according to the operator and state requirements. As needed, inspect the accuracy of temporary marker placement and replace them as needed to maintain visual indication of pipeline location.
4	Complete appropriate notifications and documentation according to the One-Call or operator procedures.	Making notifications allows the next required activity to begin.

Task 15.1—Perform Visual Inspection of Surface Conditions of Right-of-way

1.0 Task Description

This task consists of performing an inspection of surface conditions in, or adjacent to, the pipeline right-of-way. Methods of inspection may include walking, driving, aerial, or other appropriate means of traversing the right-of-way.

The task begins with accurately identifying the right-of-way to be inspected. The task ends with completion of the required documentation.

2.0 Knowledge Component

The purpose of the inspection is to identify and observe for indications of leaks, construction activity, and other factors affecting safety and operation.

An individual performing this task shall have knowledge of:

a) immediate threat to persons, property, or the environment;

b) indications of a release:

   1) vapor cloud or frost ball on or near a right-of-way;

   2) sheen on or bubbles in the water on a right-of-way;

   3) dead vegetation or wet spot;

   4) odor of hazardous gas or liquids;

   5) audible cues (hissing, roaring, etc.);

   6) fire in the right-of-way;

c) exposure that could immediately damage or affect the stability of a pipeline;

d) fire or explosion on or near the right-of-way.

Conditions that could impact the safety or integrity of the pipeline include the following:

a) construction or excavation equipment or other signs of construction activity on or near a right-of-way;

b) soil movement, such as a landslide, mudslide, sinkhole, subsidence, or settling;

c) sagging aboveground pipe at a span;

d) damaged, leaning, or failing pipe support system;

e) unusual materials, equipment, and foreign objects on or near the right-of-way;

f) damage to pipeline facilities or suspicious activity that might indicate vandalism or unlawful actions.

Conditions that could impact the pipeline, resulting in a response that would include reporting or maintenance:

a) vegetation overgrowth or excessive canopy that may obstruct view of right-of-way;

b) damaged or missing line marker(s);

c) damage to coatings or insulation on aboveground pipe or components.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
This section intentionally left blank.	This section intentionally left blank.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Accurately identify the right-of-way to be inspected from alignment sheets, GPS, and pipeline maps.	Ensures that the correct line is being inspected and dictates the mode of inspection (aerial patrol, walking the right-of-way, and vehicle patrol).
2	Perform the visual inspection/patrol of the right-of-way.	Make proper notification of any abnormal conditions according to the operator's procedures.
3	Report right-of-way inspection results.	Follow the operator's procedures.
4	Complete required documentation.	Follow the operator's procedures.

Task 16.1—Inspect Navigable Waterway Crossing

1.0 Task Description

This task includes the locating and inspection of the below surface pipeline crossings of navigable waterways. Activities would include determining the pipeline depth of cover within the navigable waterway and denoting any other conditions that may result in damage to the pipeline. The activities of this task apply only to the area of the pipeline that is below the water surface.

This task begins after locating the pipeline at water edge of each bank or shoreline and ends when the inspection of conditions and determination of depth of cover of the pipeline that is within the navigable waterway is documented.

The performance of this covered task may require the performance of other covered tasks such as:

— Locate Line (reference Task 14.1).

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Visual Inspection of Surface Conditions of Right-of-way (reference Task 15.1).

2.0 Knowledge Component

The purpose of this task is to determine pipeline depth of cover, potential pipe exposures, and any other conditions that may result in damage to the pipe within the navigable waterway.

An individual performing this task shall have knowledge of:

— specialized locating equipment to determine depth of cover.

Conditions that could impact the safety or integrity of the pipeline include the following:

— vessel anchored over the pipeline;

— visible sheen or other indications of product release;

— waterway bank erosion;

— debris lodged against pipeline;

— pipe movement or suspended pipeline.

Terms applicable to this task:

depth of cover
The vertical distance from the top of pipe to the soil or water sediment interface.

navigable waterway
A waterway where substantial likelihood of commercial navigation exists.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Response
This section intentionally left blank.	*This section intentionally left blank*.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Locate pipeline adjacent to navigable waterway crossing.	Establishes a reference point.
2	Determine the depth of the submerged pipeline by using a probe or specialized electronic equipment.	Determines the amount of cover and verifies the condition of the crossing.
3	Inspect the conditions of the underwater right-of-way.	Make proper notification of any abnormal conditions according to the operator's procedures.
4	Complete required documentation.	Complete appropriate documentation according to the operator's procedures.

Task 19.1—Perform Valve Body Winterization or Corrosion Inhibition

1.0 Task Description

This task involves the activities required to protect a valve against freezing and/or internal corrosion.

This task begins with the verification of the valve number/nameplate. This task ends with the completion of the required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

This task prepares valves to continue functioning properly in freezing conditions and/or corrosive environments.

An individual performing this task shall have knowledge of:

a) injection equipment;

b) valve types:

   1) single-seated valves;

   2) double-seated valves;

c) valve operation.

Terms applicable to this task:

body bleed
depressurization
The action of opening a body drain or vent to bleed off (reduce) internal body pressure or double-seated valves in either the full open or closed position.

body or body cavity
The principal pressure-containing part of a valve where the closure element and seals are located.

drain and vent plug
A mechanical device used to vent or bleed off internal valve body pressure.

leak-by
For double-seated valves, this is an internal valve leak condition in a gate or ball valve where hazardous liquid can leak past either the upstream or the downstream seal into the valve body, thereby pressurizing the valve body.

leak-through
A condition in a gate or ball valve where hazardous liquid can leak past both valve seats, causing the valve to leak from the high-pressure side to the low-pressure side when it is closed. For single-seated valves, such as check valves, a condition where hazardous liquid can leak by the valve seat, causing the valve to internally leak when it is in the closed position.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.
Valve inoperable—Valve does not operate as intended or does not fully close/open. EXAMPLES: — valve indicator does not show the intended position; — unexpected pressure and flow outcomes; — inoperable operator/actuator or hand wheel. Excessive differential pressure across valve prohibits its operation.	Make the condition safe to the extent possible and according to the operator's procedures. Assess condition for safety, environmental, or physical damage. Reactions could include the following: — retry operation; — relieve excessive differential pressure; — shut down system (if qualified). Make appropriate notifications.
A valve fails to seal properly.	Notify the appropriate personnel to take actions as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the valve identifier.	Ensure that the proper valve is located.
2	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any maintenance.	This step ensures that the task has been scheduled and communicated and that the operational status has been confirmed.
3	Position the valve to isolate the valve body from the line pressure, if required.	The individual shall follow the manufacturer's recommendations and/or the operator's procedures.
4	Depressurize the valve body; drain nonpetroleum material (such as water or sediment) from the valve body. Flush until clean product is observed, then close the drain valve.	This step confirms that all nonpetroleum material has been removed from the valve so leak-by or leak-through can be observed if present.
5	Check for leak-by and leak-through sealing of valve.	The individual shall follow the manufacturer's recommendations and/or the operator's procedures. NOTE If that the valve fails to seal, proper notification shall be communicated as per the operator's procedure.
6	Connect the injection equipment, if required.	Follow the operator's procedures for the valve type and injection equipment.
7	Operate the injection equipment and inject appropriate antifreeze or corrosion inhibitor.	The individual shall follow the manufacturer's recommendations and/or the operator's procedures.
8	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notification to personnel that the valve can be put back into service.
9	Document task results as per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 19.2—Perform Valve Lubrication

1.0 Task Description

This task involves the activities required to lubricate the components of a valve.

This task begins with the verification of the valve number/nameplate. This task ends with the completion of the required documentation.

2.0 Knowledge Component

This preventative maintenance task lubricates the components of a valve to provide reliable operation.

An individual performing this task shall have knowledge of:

a) How to determine valve types. Common types of valves include the following:

   1) ball;

   2) gate;

   3) butterfly;

   4) plug;

   5) globe.

b) How to determine valve actuator/operator types. Common types of valve actuators/operators include the following:

   1) mechanical/hand;

   2) hydraulic;

   3) electronic;

   4) pneumatic.

c) How to properly lubricate valves.

d) Different types of lubricating equipment:

   1) manual;

   2) high-pressure.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.
Valve inoperable—Valve does not operate as intended or does not fully close/open. EXAMPLES: — valve indicator does not show the intended position; — unexpected pressure and flow outcomes; — inoperable operator/actuator or hand wheel. Excessive differential pressure across valve prohibits its operation.	Make the condition safe to the extent possible and according to the operator's procedures. Assess condition for safety, environmental, or physical damage. Reactions could include the following: — retry operation; — relieve excessive differential pressure; — shut down system (if qualified). Make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the valve identifier.	Ensure that the proper valve is located. If the valve identifier is missing, replace per the operator's specifications.
2	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any maintenance.	This step ensures that the repair has been scheduled and communicated and that the operational status has been confirmed.
3	Lubricate the valve stem, bearings, and associated components with the appropriate lubricant.	The individual shall follow the manufacturer's recommendations and/or the operator's procedures. If unable to lubricate one or more components, follow the manufacturer's recommendations and/or the operator's procedures.
4	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notification to personnel that the valve can be put back into service.
5	Document task results as per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 19.3—Perform Valve Seat Sealing

1.0 Task Description

This task involves verification of valve sealing and the injection of seat sealing products into a valve.

This task begins with the identification of the valve. This task ends with the completion of the required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

Valve seat sealing is performed to complete a positive seal and prevent leak-by and leak-through conditions.

An individual performing this task shall have knowledge of:

a) How to determine valve types. Common types of valves include the following:

   1) ball;

   2) gate;

   3) butterfly;

   4) plug;

   5) globe.

b) How to determine valve actuator/operator types. Common types of valve actuators/operators include the following:

   1) mechanical/hand;

   2) hydraulic;

   3) electronic;

   4) pneumatic.

c) How to properly seal valves.

d) Operation of high-pressure sealant injection equipment.

Terms applicable to this task:

leak-by
For double-seated valves, this is an internal valve leak condition in a gate or ball valve where hazardous liquid can leak past either the upstream or the downstream seal into the valve body, thereby pressurizing the valve body.

leak-through
A condition in a gate or ball valve where hazardous liquid can leak past both valve seats, causing the valve to leak from the high-pressure side to the low-pressure side when it is closed. For single-seated valves, such as check valves, a condition where hazardous liquid can leak by the valve seat, causing the valve to internally leak when it is in the closed position.

sealant
Material injected into the valve seats to provide a temporary seal.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.
Valve inoperable—Valve does not operate as intended or does not fully close/open. EXAMPLES: — valve indicator does not show the intended position; — unexpected pressure and flow outcomes; — inoperable operator/actuator or hand wheel. Excessive differential pressure across valve prohibits its operation.	Make the condition safe to the extent possible and according to the operator's procedures. Assess condition for safety, environmental, or physical damage. Reactions could include the following: — retry operation; — relieve excessive differential pressure; — shut down system (if qualified). Make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the valve identifier.	Ensure that the proper valve is located. If the valve identifier is missing, replace per the operator's specifications.
2	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any maintenance.	This step ensures that the task has been scheduled and communicated and that the operational status has been confirmed.
3	Verify the valve is closed according to the manufacturer's instructions.	This step ensures that the valve is in the proper position to accept the sealant. Manual control of the valve shall be established to prevent inadvertent actuation of the valve during the performance of this task.
4	Position the valve to isolate the valve body from the line pressure.	The individual shall follow the manufacturer's recommendations and/or the operator's procedures.
5	Depressurize the valve body and drain nonpetroleum material (such as water or sediment) from the valve body, then close the drain valve.	The individual shall follow the manufacturer's recommendations and/or the operator's procedures.
6	Identify the appropriate type and amount of injection sealant at the proper injection pressure.	Sealants vary by manufacturer and application. This step ensures that the proper type and amount of sealant is used without damaging the valve.

Step	Action	Explanation
7	Inject appropriate sealant into seats.	This step ensures that the valve can be properly sealed to prevent leak-by and leak-through.
8	Check for leak-by and leak-through sealing of valve.	The individual shall follow the manufacturer's recommendations and/or the operator's procedures. NOTE In the event the valve fails to seal, proper notification shall be communicated as per the operator's procedure.
9	After confirming that a tight seal has been established, flush sealant from the injection ports and seats with grease cleaner/penetrant.	Sealants will dry out if not properly flushed and could plug injection passages.
10	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notification to personnel that the valve sealing is complete.
11	Document task results as per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 19.4—Perform Valve Stem Packing Maintenance

1.0 Task Description

This task involves identification of a valve stem seal and the injection of injectable packing into the valve stem seal gland.

This task begins with verification of the valve identifier. This task ends with the completion of the required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

Valve stem packing maintenance is performed to prevent leak-out and maintain proper valve function and integrity.

An individual performing this task shall have knowledge of:

a) How to determine valve types. Common types of valves include the following:

   1) ball;

   2) gate;

   3) butterfly;

   4) plug;

   5) globe.

b) How to determine valve actuator/operator types. Common types of valve actuators/operators include the following:

   1) mechanical/hand;

   2) hydraulic;

   3) electronic;

   4) pneumatic.

c) How to properly insert packing.

d) Operation of valve stem packing equipment.

Terms applicable to this task:

energized
The act of maintaining the pressure of the injectable packing material.

injectable packing
Bulk material injected into the stem seal gland to provide a temporary or permanent seal.

stem seal
Seal surrounding the valve stem that prevents leakage.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.
Valve inoperable—Valve does not operate as intended or does not fully close/open. EXAMPLES: — valve indicator does not show the intended position; — unexpected pressure and flow outcomes; — inoperable operator/actuator or hand wheel. Excessive differential pressure across valve prohibits its operation.	Make the condition safe to the extent possible and according to the operator's procedures. Assess condition for safety, environmental, or physical damage. Reactions could include the following: — retry operation; — relieve excessive differential pressure; — shut down system (if qualified). Make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the valve identifier.	Ensure that the proper valve is located. If the valve identifier is missing, replace per the operator's specifications.
2	Identify the type of valve stem seal.	This step determines the type of packing maintenance required.
3	Identify the appropriate type of injectable packing to be injected.	Stem packing varies per manufacturer and application.
4	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any maintenance.	This step ensures that the task has been scheduled and communicated and that the operational status has been confirmed.
5	Insert the appropriate amount of injectable packing into valve stem packing gland.	Ensure that the insertion pressure does not exceed the manufacturer's instructions.
6	Operate the valve to observe stem movement.	This step ensures that the valve operates properly with no visible leakage and that the packing remains intact. If compressed packing or gaps are observed, repeat Step 5.
7	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notification to personnel that the maintenance is complete.
8	Document task results as per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 19.5—Adjust Actuator/Operator, Electric

1.0 Task Description

This task involves setting/adjustment of valve actuator limit switches and torque switches.

This task begins with verification of the valve identifier. This task ends with the completion of the required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

This task is performed to set the actuator limits and torque switch values to define the open and closed limits for the valve.

An individual performing this task shall have knowledge of:

a) How to determine valve types. Common types of valves include the following:

   1) ball;

   2) gate;

   3) butterfly;

   4) plug;

   5) globe.

b) Electric MOV (motor-operated valve) actuator types.

Terms applicable to this task:

function test
Operate the valve to ensure that it is performing its intended function as designed; this may include manually operating the valve or by the use of mechanical assistance, such as an actuator/operator.

hand clutch
A mechanical means of disengaging the motor drive and engaging the hand wheel.

limit switch
A switch designed to cut off power automatically at or near the limit of travel of a moving object controlled by electrical means.

mechanical stop
A fixed or adjustable rigid mechanical device that prevents a valve actuator/operator from exceeding a fixed limit in the open or closed position.

seat
The part of a valve against which a closure element (gate, plug, ball, or clapper) makes contact contributing to a tight shut-off.

NOTE In many ball and gate valves, the seat is a floating member containing a soft seating element (usually an O-ring).

torque switch
A switch designed to sense the amount of torque being applied to a machine by an electric motor and to cut off power if torque exceeds a preset limit, preventing damage to the motor.

valve actuator
A valve component that converts hydraulic, pneumatic, or electrical energy into mechanical motion to open and close a valve.

valve operator
A mechanical valve component that utilizes motion to open and close a valve.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected valve movement.	Return the valve to the proper position, if safe to do so. Immediately notify the control center (or appropriate field personnel) and execute applicable procedures.
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the valve identifier.	Ensure that the proper valve is located. If the valve identifier is missing, replace per the operator’s specifications.
2	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any maintenance.	This step ensures that the task has been scheduled and communicated and that the operational status has been confirmed.
3	Verify the proper isolation of the valve and actuator prior to performing an adjustment.	The valve actuator should be placed in local control to prevent remote operation of the valve. Operation of the valve shall not adversely affect operations.
4	Verify the proper valve position, i.e. open or closed.	—
5	Properly set the limit switches.	Follow the manufacturer’s recommendations and/or the operator’s procedures.
6	Properly set the torque switches.	Follow the manufacturer’s recommendations and/or the operator’s procedures.
7	Perform function testing to check the operation of the valve as per applicable procedures, including remote operation, if capable. Verify the valve status indication at all display points throughout the system.	This step ensures that the valve and status are in proper working order. If the valve is not in proper working order, investigate cause and rectify or notify the appropriate personnel to take actions as required.
8	Notify the control center, local operations (if applicable), and any affected personnel per the operator’s procedures.	This communication provides notification to personnel that the valve adjustment is complete.
9	Document inspection results as per the operator’s procedures.	Documentation provides historical data for future maintenance of the valve.

Task 19.6—Adjust Actuator/Operator, Pneumatic

1.0 Task Description

This task includes the setting/adjustment of the pneumatic actuator adjustment mechanisms and components.

This task begins with verification of the valve identifier. This task ends with the completion of the required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

This task is performed to properly set the adjustment mechanisms for full open and closed positions.

An individual performing this task shall have knowledge of:

a) How to determine valve types. Common types of valves include the following:

   1) ball;

   2) gate;

   3) butterfly;

   4) plug;

   5) globe.

b) Pneumatic MOV (motor-operated valve) actuator types.

Terms applicable to this task:

function test
Operate the valve to ensure that it is performing its intended function as designed; this may include manually operating the valve or by the use of mechanical assistance, such as an actuator/operator.

hand clutch
A mechanical means of disengaging the motor drive and engaging the hand wheel.

mechanical stop
A fixed or adjustable rigid mechanical device that prevents a valve actuator/operator from exceeding a fixed limit in the open or closed position.

seat
The part of a valve against which a closure element (gate, plug, ball, or clapper) makes contact contributing to a tight shut-off.

NOTE In many ball and gate valves, the seat is a floating member containing a soft seating element (usually an O-ring).

travel switch
A switch designed to cut off air automatically at or near the limit of travel of a moving object.

valve actuator
A valve component that converts hydraulic, pneumatic, or electrical energy into mechanical motion to open and close a valve.

valve operator
A mechanical valve component that utilizes motion to open and close a valve.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.
Unexpected valve movement	Return the valve to the proper position, if safe to do so. Immediately notify the control center (or appropriate field personnel) and execute applicable procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps.

Step	Action	Explanation
1	Verify the valve identifier.	Ensure that the proper valve is located. If the valve identifier is missing, replace per the operator's specifications.
2	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any maintenance.	This step ensures that the task has been scheduled and communicated and that the operational status has been confirmed.
3	Verify the proper isolation of the valve and actuator prior to performing adjustment.	The valve actuator should be placed in local control to prevent remote operation of the valve. Operation of the valve shall not adversely affect operations.
4	Verify the proper valve position, i.e. open or closed.	—
5	Properly set the adjustment mechanisms for full open and closed positions.	Follow the manufacturer's recommendations and/or the operator's procedures. If unable to achieve full open or full closed, investigate cause and rectify or notify the appropriate personnel to take actions as required.
6	Verify that the position status indication matches the valve position.	Follow the manufacturer's recommendations and/or the operator's procedures.
7	Perform function testing to check the operation of the valve as per applicable procedures, including remote operation if capable. Verify valve status indication at all display points throughout the system.	This step ensures that the valve and actuator are in proper working order.
8	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notification to personnel that the valve adjustment is complete.
9	Document inspection results as per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 19.7—Adjust Actuator/Operator, Hydraulic

1.0 Task Description

This task involves setting/adjustment of a hydraulic actuator adjustment mechanism and component.

This task begins with verification of the valve identifier. This task ends with the completion of the required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

This task is performed to properly set the adjustment mechanisms for full open and closed positions.

An individual performing this task shall have knowledge of:

a) How to determine valve types. Common types of valves include the following:

   1) ball;

   2) gate;

   3) butterfly;

   4) plug;

   5) globe.

b) Hydraulic MOV (motor-operated valve) actuator types.

Terms applicable to this task:

function test
Operate the valve to ensure that it is performing its intended function as designed; this may include manually operating the valve or using mechanical assistance, such as an actuator/operator.

mechanical stop
A fixed or adjustable rigid mechanical device that prevents a valve actuator/operator from exceeding a fixed limit in the open or closed position.

seat
The part of the valve against which the closure element (gate, plug, ball, or clapper) makes contact contributing to a tight shut-off.

NOTE In many ball and gate valves, the seat is a floating member containing a soft seating element (usually an O-ring).

travel switch
A switch designed to cut off hydraulic power at or near the limit of travel of a moving object.

valve actuator
A valve component that converts hydraulic, pneumatic, or electrical energy into mechanical motion to open and close a valve.

valve operator
A mechanical valve component that utilizes motion to open and close a valve.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.
Unexpected valve movement.	Return the valve to the proper position, if safe to do so. Immediately notify the control center (or appropriate field personnel) and execute applicable procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the valve identifier.	Ensure that the proper valve is located. If the valve identifier is missing, replace per the operator's specifications.
2	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any maintenance.	This step ensures that the task has been scheduled and communicated and that the operational status has been confirmed.
3	Verify the proper isolation of the valve and actuator prior to performing an adjustment.	The valve actuator should be placed in local control to prevent remote operation of the valve. Operation of the valve shall not adversely affect operations.
4	Verify the proper valve position, i.e. open or closed.	—
5	Properly set the adjustment mechanisms for full open and closed positions.	Follow the manufacturer's recommendations and/or the operator's procedures. If unable to achieve full open or full closed, investigate cause and rectify or notify the appropriate personnel to take actions as required.
6	Verify that the position status indication matches the valve position.	Follow the manufacturer's recommendations and/or the operator's procedures.
7	Perform functional testing to check the operation of the valve as per applicable procedures, including remote operation if capable. Verify the valve status indication at all display points throughout the system.	This step ensures that the valve and actuator are in proper working order.
8	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notification to personnel that the valve adjustment is complete.
9	Document inspection results as per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 20—Inspect Mainline Valves

1.0 Task Description

This task involves performing an inspection to ensure a mainline valve is in good working order, which means the mainline valve's performance meets all the necessary functions. The task also includes verification that the proper security controls are in place.

This task begins with identification of the valve to be inspected. This task ends with completion of required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

This task confirms that valves will operate as intended for system operations.

An individual performing this task shall have knowledge of:

a) How to determine valve types. Common types of valves include the following:

  1) ball;

  2) gate;

  3) butterfly;

  4) plug;

  5) globe.

b) How to determine valve actuator/operator types. Common types of valve actuators/operators include the following:

  1) mechanical/hand;

  2) hydraulic;

  3) electronic;

  4) pneumatic.

c) DOT regulatory and operator valve inspection requirements.

Terms applicable to this task:

functionality test
This test consists of a partial or full opening or closing of the valve within operational parameters, either locally and/or remotely as applicable.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.
Valve is not functioning properly.	Notify the appropriate personnel to take actions as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the valve to be inspected and confirm that the valve is correctly labeled.	This step confirms that the valve is identified and labeled consistent with the operator's documentation.
2	Notify the control center, local operations (if applicable), and any affected personnel prior to performing inspection.	This step confirms that the inspection has been scheduled and communicated and that the operational status has been confirmed.
3	Inspect the valve security and access control.	This step verifies appropriate control and accessibility of valve, e.g. gates, fences, signs, barbed wire, locks, manhole covers, chains, doors, or valve enclosures.
4	Inspect the condition of the valve.	This step confirms that there are no visible leaks, damage, or corrosion of the valve, components, or flanges.
5	Inspect the valve position indicator.	This step confirms that the position indicator is intact, operational, and correctly identifies valve position.
6	Perform functional testing to check all modes of operation of the valve as per applicable procedures, including remote operation if capable.	This step confirms that the valve is in proper working order. NOTE Performance of this step requires a person to be qualified to operate the valve.
7	Reestablish proper valve status.	This step confirms that the valve is in the proper operating position.
8	Reestablish proper security and access controls.	This step confirms that the valve and/or valve site are secured against unauthorized access and operation.
9	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notification to personnel that the valve inspection is complete.
10	Document the inspection results as per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 21.1—Repair Valve Actuator/Operator, Pneumatic

1.0 Task Description

This task involves disassembly, diagnosis of component failure, repair or replacement, and reassembly of a pneumatic valve actuator.

This task begins with the identification of the valve actuator to be repaired. This task ends with the completion of the required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Adjust Actuator/Operator, Pneumatic (reference Task 19.6);

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

This task addresses the repair of a pneumatic actuator according to the applicable procedures and is conducted to maintain the integrity and function of the valve actuator.

An individual performing this task shall have knowledge of:

a) Applicable manufacturer's and/or operator's procedures for the equipment being repaired.

b) How to determine valve types. Common types of valves include the following:

   1) ball;

   2) gate;

   3) butterfly;

   4) plug;

   5) globe.

c) Pneumatic MOV (motor-operated valve) actuator types.

Terms applicable to this task:

function test
Operate the valve to ensure that it is performing its intended function as designed; this may include manually operating the valve or by the use of mechanical assistance, such as an actuator/operator.

hand clutch
A mechanical means of disengaging the motor drive and engaging the hand wheel.

mechanical stop
A fixed or adjustable rigid mechanical device that prevents a valve actuator/operator from exceeding a fixed limit in the open or closed position.

seat
The part of a valve against which a closure element (gate, plug, ball, or clapper) makes contact contributing to a tight shut-off.

NOTE In many ball and gate valves, the seat is a floating member containing a soft seating element (usually an O-ring).

travel switch
A switch designed to cut off air automatically at or near the limit of travel of a moving object.

valve actuator
A valve component that converts hydraulic, pneumatic, or electrical energy into mechanical motion to open and close a valve.

valve operator
A mechanical valve component that utilizes motion to open and close a valve.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected valve movement.	Return the valve to the proper position, if safe to do so. Immediately notify the control center (or appropriate field personnel) and execute applicable procedures.
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the valve actuator to be repaired.	This step confirms that the valve actuator is identified.
2	Notify the control center, local operations (if applicable), and any affected personnel, prior to performing any test if required by the operator's procedures.	This step confirms that the repair has been scheduled and communicated and that the operational status has been confirmed.
3	Verify the proper isolation of the valve and actuator prior to repair or disassembly.	The valve actuator should be placed in local control to prevent remote operation of the valve. Operation of the valve shall not adversely affect operations.
4	Diagnose and disassemble the actuator following applicable procedures.	Follow applicable manufacturer's and/or operator's procedures for the actuator.
5	Repair or replace worn or damaged parts.	Follow applicable manufacturer's and/or operator's procedures for the actuator.
6	Reassemble the actuator per applicable procedures.	Follow the manufacturer's instructions for the applicable actuator.
7	Perform a function test to ensure proper actuator operation and integrity.	This step ensures that the pneumatic source does not leak and the actuator operates properly.
8	Adjust actuator/operator (if required).	Follow the manufacturer's recommendations and/or the operator's procedures.
9	Reestablish the proper actuator status.	This step confirms that the actuator performs in all modes of operation.
10	Reestablish proper access controls.	Return the valve to normal operating status.
11	Perform the necessary notifications upon completion of the repair.	This communication provides notification to personnel that the valve repair is complete.
12	Document the repair results per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 21.2—Disassemble/Reassemble Valves

1.0 Task Description

This task involves the disassembly and reassembly of valves, diagnosis of valve component failure, and repair or replacement of parts.

This task begins with the identification of the valve to be disassembled and reassembled. This task ends with the completion of required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

This task does not include but may lead to the performance of other covered tasks such as:

— Conduct Pressure Test (reference Task 41).

2.0 Knowledge Component

This task addresses the assembly/disassembly of a valve according to the applicable procedures and is conducted to maintain the integrity and function of the valve.

An individual performing this task shall have knowledge of:

a) How to determine valve types. Common types of valves include the following:

   1) ball;

   2) gate;

   3) butterfly;

   4) plug;

   5) globe.

b) Applicable manufacturer’s and/or operator’s procedures for the equipment being repaired.

Terms applicable to this task:

function test
Operate the valve to ensure that it is performing its intended function as designed; this may include manually operating the valve or by the use of mechanical assistance, such as an actuator/operator.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.
Valve is not functioning properly.	Notify the appropriate personnel to take actions as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the valve to be disassembled and reassembled and confirm that it is correctly labeled.	This step confirms that the valve is identified and labeled consistent with the operator's documentation.
2	Notify the control center, local operations (if applicable), and any affected personnel, prior to performing any test if required by the operator's procedures.	This step confirms that the repair has been scheduled and communicated and that the operational status has been confirmed.
3	Verify that the valve has been isolated according to applicable procedures.	This step prevents release of hazardous energy and ensures worker safety.
4	Disassemble the valve according to applicable procedures.	Follow applicable manufacturer's and/or operator's procedures for the valve.
5	Diagnose and repair or replace worn or damaged parts per the applicable procedures.	Follow applicable manufacturer's and/or operator's procedures for the valve.
6	Reassemble the valve according to applicable procedures.	Follow applicable manufacturer's and/or operator's procedures for the valve.
7	Perform a function test to ensure proper valve operation and integrity.	This step ensures that the valve operates properly and does not leak after reassembly. The individual shall follow applicable manufacturer's or operator's procedures for the valve.
8	Perform the necessary notifications upon completion of the valve repair.	This communication provides notification to personnel that the valve repair is complete.
9	Document the repair results as per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 21.3—Perform Internal Inspection of Valves

1.0 Task Description

This task involves the on-site internal inspection of a valve body and its components.

This task begins with verification of the valve identifier. The task ends with completion of the required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

This task does not include but may lead to the performance of other covered tasks such as:

— Disassemble/Reassemble Valves (reference Task 21.2).

2.0 Knowledge Component

The purpose of this task is to inspect the valve and associated internal components to identify operational issues and make arrangements for necessary repairs.

An individual performing this task shall have knowledge of:

— Applicable manufacturer's and/or operator's procedures for the equipment being assembled or disassembled.

Terms applicable to this task:

body
body cavity
The principal pressure-containing part of a valve in which the closure element and seals are located.

drain and vent plug
A mechanical device used to vent or bleed off internal valve body pressure.

packing
The pliable sealing material inserted into a valve stem stuffing box, which when compressed by a gland provides a tight seal about the stem.

seat
The part of the valve against which the closure element (gate, plug, ball, or clapper) makes contact contributing to a tight shut-off. In many ball and gate valves, the seat is a floating member containing a soft seating element (usually an O-ring).

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the valve identifier.	This step confirms that the valve is identified and labeled consistent with the operator's documentation.
2	Notify the control center, local operations (if applicable), and any affected personnel, prior to performing any test if required by the operator's procedures.	This step confirms that the repair has been scheduled and communicated and that the operational status has been confirmed.
3	Verify that the valve has been isolated according to applicable procedures.	The valve actuator should be placed in local control to prevent remote operation of the valve. Operation of the valve shall not adversely affect operations.
4	Inspect the valve and components.	The individual shall follow the manufacturer's recommendations and/or the operator's procedures. Inspection can include the following: — components for condition and acceptable tolerances; — condition of seals/elastomers; — proper installation of seat/stem seals; — valve stem and nut/seats and seat pockets/seals for the extent of wear; — condition of closure device (gate, ball, plug, etc.); — fasteners (torqued to specified limits); — condition of valve body and coatings.
5	Perform the necessary notifications upon completion of inspection.	This communication provides notification to personnel that the valve inspection is complete.
6	Document the inspection results per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 21.4—Repair Valve Actuator/Operator, Hydraulic

1.0 Task Description

This task involves the disassembly, diagnosis of component failure, repair or replacement, and reassembly of a hydraulic valve actuator.

This task begins with the identification of the valve actuator to be repaired. The task ends with the completion of the required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Adjust Actuator/Operator, Hydraulic (reference Task 19.7);

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

This task addresses the repair of a hydraulic actuator according to the applicable procedures and is conducted to maintain the integrity and function of the valve actuator.

An individual performing this task shall have knowledge of:

a) How to determine valve types. Common types of valves include the following:

   1) ball;

   2) gate;

   3) butterfly;

   4) plug;

   5) globe.

b) Hydraulic MOV (motor-operated valve) actuator types.

c) Applicable manufacturer's and/or operator's procedures for the equipment being repaired.

Terms applicable to this task:

function test
Operate the valve to ensure that it is performing its intended function as designed; this may include manually operating the valve or by the use of mechanical assistance, such as an actuator/operator.

mechanical stop
A fixed or adjustable rigid mechanical device that prevents a valve actuator/operator from exceeding a fixed limit in the open or closed position.

seat
The part of the valve against which the closure element (gate, plug, ball, or clapper) makes contact contributing to a tight shut-off.

NOTE In many ball and gate valves, the seat is a floating member containing a soft seating element (usually an O-ring).

travel switch
A switch designed to cut off hydraulic power at or near the limit of travel of a moving object.

valve actuator
A valve component that converts hydraulic, pneumatic, or electrical energy into mechanical motion to open and close a valve.

valve operator
A mechanical valve component that utilizes motion to open and close a valve.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected valve movement.	Return the valve to the proper position, if safe to do so. Immediately notify the control room or (appropriate operations personnel) and execute applicable procedures.
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the valve identifier.	This step confirms that the valve is identified and labeled consistent with the operator's documentation.
2	Notify the control center, local operations (if applicable), and any affected personnel, prior to performing any test if required by the operator's procedures.	This step confirms that the repair has been scheduled and communicated and that the operational status has been confirmed.
3	Verify the proper isolation of the valve and actuator prior to repair or disassembly.	The valve actuator should be placed in local control to prevent remote operation of the valve. Operation of the valve shall not adversely affect operations.
4	Diagnose and disassemble the actuator following applicable procedures.	Follow applicable manufacturer's and/or operator's procedures for the valve.
5	Repair or replace worn or damaged parts.	Follow applicable manufacturer's and/or operator's procedures for the valve.
6	Reassemble the actuator per applicable procedures.	Follow applicable manufacturer's and/or operator's procedures for the valve.
7	Perform a functionality test to validate actuator operation and integrity.	Confirm the valve actuator operates properly.
8	Adjust actuator/operator.	Follow the manufacturer's recommendations and/or the operator's procedures.
9	Reestablish the proper actuator status.	This step confirms that the actuator performs in all modes of operation.
10	Reestablish proper access controls.	Return the valve to normal operating status.
11	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notification to personnel that the valve actuator repair is complete.
12	Document the repair results per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 21.5—Repair Valve Actuator/Operator, Electric

1.0 Task Description

This task involves the disassembly, diagnosis of component failure, repair or replacement, and reassembly of an electric valve actuator.

This task begins with the identification of the valve actuator to be repaired. This task ends with the completion of the required documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Adjust Actuator/Operator, Electric (reference Task 19.5);

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

This task addresses the repair of an electric actuator according to the applicable procedures and is conducted to maintain the integrity and function of the valve actuator.

An individual performing this task shall have knowledge of:

a) Applicable manufacturer's and/or operator's procedures for the equipment being repaired.

b) How to determine valve types. Common types of valves include the following:

   1) ball;

   2) gate;

   3) butterfly;

   4) plug;

   5) globe.

c) Electric MOV (motor-operated valve) actuator types.

Terms applicable to this task:

function test
Operate the valve to ensure that it is performing its intended function as designed; this may include manually operating the valve or by the use of mechanical assistance, such as an actuator/operator.

hand clutch
A mechanical means of disengaging the motor drive and engaging the hand wheel.

limit switch
A switch designed to cut off power automatically at or near the limit of travel of a moving object controlled by electrical means.

mechanical stop
A fixed or adjustable rigid mechanical device that prevents a valve actuator/operator from exceeding a fixed limit in the open or closed position.

seat
The part of a valve against which a closure element (gate, plug, ball, or clapper) makes contact contributing to a tight shut-off.

NOTE In many ball and gate valves, the seat is a floating member containing a soft seating element (usually an O-ring).

torque switch
A switch designed to sense the amount of torque being applied to a machine by an electric motor and to cut off power if torque exceeds a preset limit, preventing damage to the motor.

valve actuator
A valve component that converts hydraulic, pneumatic, or electrical energy into mechanical motion to open and close a valve.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected valve movement.	Return the valve to the proper position, if safe to do so. Immediately notify the control room (or appropriate operations personnel) and execute the applicable procedures.
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Damage to valve or valve component.	Notify the appropriate personnel to take actions as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the valve actuator to be repaired.	This step confirms that the valve is identified and labeled consistent with the operator's documentation.
2	Notify the control center, local operations (if applicable), and any affected personnel, prior to performing any test if required by the operator's procedures.	This step confirms that the repair has been scheduled and communicated and that the operational status has been confirmed.
3	Verify the proper isolation of the valve and actuator prior to repair or disassembly.	The valve actuator should be placed in local control to prevent remote operation of the valve. Operation of the valve shall not adversely affect operations.
4	Diagnose and disassemble the actuator following applicable procedures.	Follow applicable manufacturer's and/or operator's procedures.
5	Repair or replace worn or damaged parts.	Follow applicable manufacturer's and/or operator's procedures.
6	Reassemble the actuator.	Follow applicable manufacturer's and/or operator's procedures.
7	Perform a functionality test to ensure proper actuator operation and integrity.	This step ensures that the actuator operates properly.
8	Adjust actuator/operator.	Follow the manufacturer's recommendations and/or the operator's procedures.
9	Reestablish the proper actuator status.	This step confirms that the actuator performs in all modes of operation.
10	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notification to personnel that the valve actuator repair is complete.
11	Document the repair results per the operator's procedures.	Documentation provides historical data for future maintenance of the valve.

Task 22.1—Inspect Tank Pressure/Vacuum Breakers

1.0 Task Description

This task involves activities performed on an atmospheric tank pressure/vacuum (P/V) breaker vent to verify that it is functioning properly, is in good mechanical condition, and is adequate for its intended purpose.

This task begins with notification to the control center and/or local operations (if applicable) that the tank will be isolated for the inspection. This task ends with appropriate notifications and documentation that the P/V breaker has returned to a normal operating condition.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

A tank P/V vent device is typically a weight-loaded, pilot-operated, or spring-loaded valve, used to relieve excess pressure or vacuum in a tank to prevent damage to the tank. Overpressure or vacuum in a tank can be caused by liquid movement into or out of the tank, tank breathing due to weather changes, and other typical or atypical operating conditions.

An individual performing this task shall have knowledge of:

a) pallet weight;

b) tank P/V breaker/vent principles of operation;

c) calibration equipment and tools, including digital scales and calipers;

d) tank/vessel construction types—cone roof, internal floating, external floating roofs;

e) device set point;

f) bolting sequences.

Test equipment shall have a valid certification of calibration and shall be appropriate for the intended calibration range per manufacturer specifications.

Terms applicable to this task:

body
body cavity
The principal pressure-containing part of a P/V vent device where the closure element and seals are located.

diaphragm
A round, thin, flexible sealing device that is secured and sealed around its outer edge—and sometimes around a central hole in the diaphragm—with its unsupported area free to move by flexing.

pressure pallet
A moving, flat, circular plate (or pallet) that provides relief of internal tank pressure when the pressure exceeds design specifications.

static state
Static state refers to an inactive or shutdown pipeline where product is not flowing.

vacuum pallet
A moving, flat, circular plate (or pallet) that provides relief of internal tank vacuum when the vacuum exceeds the design amount.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Observe structural damage to tank or roof components.	Stop the task and notify/inform appropriate company personnel of the condition.
Debris or freestanding product exists on the roof.	Stop the task and notify/inform appropriate company personnel of the condition.
Component damage is observed (e.g. mechanical or corrosion damage).	Stop the task and notify/inform appropriate company personnel of the condition.
Improper position of a device isolation valve found when attempting to isolate.	Make the appropriate operator notifications and verify the proper valve position.
A component malfunctions or is inoperable.	Stop the task and notify/inform appropriate company personnel of the condition.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Notify the control center, local operations (if applicable), and any affected personnel, prior to performing any test if required by the operator's procedures.	This step confirms that the inspection has been scheduled and communicated and that the operational status has been confirmed.
2	Isolate the tank from the process system, if required.	Product in the tank may need to be in a static state prior to inspection.
3	Verify the device identifier, device type, and manufacturer.	This step confirms that the correct component is identified and that the appropriate inspection/repair procedures are followed.
4	Visually inspect the device and its associated equipment to determine: — appropriateness for intended service; — physical/mechanical condition; — presence of corrosion; — presence of leakage; — condition of the nozzle to gasket seal and its integrity.	Confirms the condition of the device. If maintenance, repair, or replacement is required, make appropriate notifications, or repairs, per the operator's and manufacturer's procedures.
5	Remove the device cover and examine P/V vent for signs of sticking, blockage, hydrocarbon, or corrosion fouling.	Sticking, blockage, hydrocarbon, or corrosion fouling can prevent the device from functioning properly. If maintenance, repair, or replacement is required, make appropriate notifications or repairs per the operator's and manufacturer's procedures.
6	Validate pallet weights.	Confirms that the correct pallet weights are installed per the manufacturer's specifications and the operator's design criteria.

Step	Action	Explanation
7	Move the pressure pallet and vacuum pallet, if applicable. Examine the pressure pallet and vacuum pallet seat for signs of hydrocarbon fouling, cracking, diaphragm damage, or other mechanical damage.	Confirms that the pressure pallet and vacuum pallet move freely, and the seat creates a tight seal.
8	Examine the outlet of the P/V device for blockage or fouling.	The amount of hydrocarbon vented and the amount of air drawn in during a vacuum cycle are decreased by blockage or fouling of the outlet of the device.
9	Reassemble the P/V device per the manufacturer's specifications and remove isolation, if required.	This step prepares the device for return to normal operation.
10	Apply a security seal to the P/V device, if required by the operator's procedure.	Security seal can include inspection information and results.
11	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	Provides notice that the device is operable and that the system is ready or has returned to normal operation.
12	Document inspection results per the operator's procedures.	Documentation provides historical data for future inspections of the device.

Task 22.2—Inspect, Test, and Calibrate Highly Volatile Liquid Tank Pressure-relief Valves

1.0 Task Description

This task involves inspection, testing, and calibration activities performed on a highly volatile liquid (HVL) tank pressure-relief valve to verify that the device is functioning properly, is in good mechanical condition, and is adequate for its intended purpose.

This task begins with notification to control center and local operations that work will begin on the tank relief valve. This task ends with notification and documentation that the relief valve has returned to a normal operating condition.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

This task does not include but may lead to the performance of other covered tasks such as:

— Maintain/Repair Relief Valves (reference Task 23.1).

2.0 Knowledge Component

Pressure-relief valves installed on HVL tanks protect the tank and personnel by opening at predetermined pressures and preventing excessive pressure in the tank. The valve is also designed to reclose after opening when normal pressure is restored, thereby preventing further flow of fluid or vapor.

This task is performed to ensure that the valve will function properly if the pressure in the HVL tank reaches the specified set pressure.

Work platforms, walkways, ladders, and other safety equipment may be needed for safe access to and egress from the pressure-relief valve. Calibrated pressure gauges and atmospheric monitoring equipment are typically needed for performance of this task.

An individual performing this task shall have knowledge of:

a) Types of tank pressure-relief valves and the corresponding principles of operation, including the following:

   1) spring loaded;

   2) snap-acting pilot;

   3) modulating pilot.

b) Calibration equipment and tools used in HVL pressure-relief valve inspection, including the following:

   1) analog pressure gauges;

   2) digital pressure gauges;

   3) calipers;

   4) micrometers.

c) Device set point, including the ability to understand manufacturer's specifications and operator's design criteria:

   1) manufacturer-specified reseating adjustments (spring-loaded valves);

   2) manufacturer-specified lift setting adjustments (pilot-operated valves).

d) Operator procedures for inspection, testing, and calibration of pressure-relieving devices and pressure-relief valves.

Terms applicable to this task:

backpressure
The pressure that exists at the outlet of a pressure-relief device as a result of the pressure in the discharge system. Backpressure is the sum of the superimposed and built-up backpressures.

blowdown
The difference between the set point and the closing pressure of a pressure-relief valve, expressed as a percentage of the set point or in pressure units.

closing pressure
The value of decreasing inlet static pressure at which the valve disc reestablishes contact with the seat, or at which lift becomes zero, as determined by seeing, feeling, or hearing.

set point
The inlet gauge pressure at which a pressure-relief valve is set to open under service conditions. The value of increasing inlet static pressure whereby there is a measurable lift of the disc or at which discharge of the fluid or vapor becomes continuous, as determined by seeing, feeling, or hearing. It is also known as "opening pressure" or "set pressure."

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unintentional activation of a safety/control device (e.g. abnormal shutdown, unintentional valve movement, high-pressure shutdown, etc.) that results in a loss of control or overpressure condition of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition. Notify the control room or local operations monitoring the facility.
Component damage is observed (e.g. mechanical or corrosion damage).	Stop the task and notify/inform appropriate company personnel of the condition.
Improper position of a device isolation valve found when attempting to isolate.	Make the appropriate operator notifications and verify the proper valve position.
A component malfunctions or is inoperable (e.g. isolation valve fails to isolate).	Stop the task and notify/inform appropriate company personnel of the condition.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Notify the control center, local operations (if applicable), and any affected personnel, prior to performing any test per the operator's procedures.	The control center and local operations (if applicable) shall be notified that work is to be performed on the relief valve.
2	Verify the device identifier, device type, and manufacturer.	This step confirms that the correct component is identified and that the appropriate inspection/repair procedures are followed.
3	Visually inspect the device and its associated equipment to determine: — appropriateness for intended service; — physical/mechanical condition; — presence of corrosion; — presence of erosion; — presence of leakage; — inlet and outlet (if applicable) flange connections; — integrity of the device and its associated piping support; — correct position and function of isolation valve.	Confirms the condition of the device. If maintenance, repair, or replacement is required, make appropriate notifications, or repairs, per the operator's and manufacturer's procedures.
4	Verify that test equipment has been calibrated prior to performing any calibrations.	This includes equipment such as pressure gauges, calipers, or micrometers that are used during the inspection, testing, and calibration of a pressure-relief valve. Test equipment shall have a valid certification of calibration and be appropriate for the intended calibration range.
5	Isolate the device from the process system and relieve trapped process pressure.	This will allow the correct test pressure and medium to be applied during calibration and prevent a loss of containment. Stop the task if the isolation valve does not function correctly and make appropriate notifications.
6	Connect test equipment and inspect all connections for leakage.	Loss of test pressure will result in inaccurate test results or calibration of the device.
7	Apply test medium pressure and determine the device set point or range and opening pressure "as found." Document the "as found" set point.	Using the "as found" value of a device set point and opening pressure prior to calibration helps determine the proper functionality and repeatability. This may need to be repeated multiple times per the operator's procedures. If the device is found to have an improper set point or opening pressure, it may have a problem maintaining its calibration within acceptable limits and tolerance, or a set point may have incorrectly been applied by a previous calibration. This step provides a historical record, verifies current device settings, and determines if a calibration is required.

Step	Action	Explanation
8	If device calibration is required, reapply the test medium (Step 7) to the desired set point or range and adjust it according to the device manufacturer's specifications and applicable operator's procedures. Repeat the test procedure to achieve calibration.	Establish repeatability to the desired set point and opening pressure. If it fails to maintain calibration, the device may need to be replaced.
9	Document the final set point value "as left" results per the operator's procedures.	Documentation of the final calibration provides an opportunity for a review to ensure that the correct set point(s) was established, and it provides historical data for future testing of the device.
10	Remove test equipment, remove isolation, and return the device to normal operating condition per the operator's procedures.	This step returns integrity to the system.
11	Apply a security seal to the valve, if required by the operator's procedure.	Security seals can include inspection information and results. Utilize the operator's procedures.
12	Notify the control center, local operations (if applicable), and any affected personnel, per the operator's procedures. Complete appropriate documentation, as required.	Provides notice that the device is operable and that the system is ready or has returned to normal operation. Documentation provides historical data for future testing of the device.

Task 23.1—Maintain/Repair Relief Valves

1.0 Task Description

This task involves disassembling and reassembling a relief valve, diagnosing a relief valve component failure, and repairing or replacing parts as necessary. This task addresses repairing a relief valve according to the applicable procedures and is conducted to maintain the valve's integrity and to verify that the valve's performance meets all the necessary functions.

This task begins with verification of the device number and identifier. This task ends with notification and documentation to appropriate personnel that the maintenance and repairs are complete.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4);

— Inspect, Test, and Calibrate Relief Valves (reference Task 23.2).

2.0 Knowledge Component

This task is performed in order to diagnose, clean, lubricate, and repair or replace the worn or damaged parts of a relief valve in the field without complete removal from the pipeline system.

An individual performing this task shall have knowledge of:

a) Types of relief valves may include but are not limited to the following:

   1) spring loaded;

   2) snap-acting pilot;

   3) modulating pilot;

   4) nitrogen loaded.

b) Manufacturer's specifications for the device set point.

c) Manufacturer-specified reseating adjustments (spring-loaded valves).

d) Manufacturer-specified lift setting adjustments (pilot-operated valves).

e) Components of a valve, including the following:

   1) actuator;

   2) adjusting screw;

   3) body;

   4) bonnet;

   5) disc;

   6) gaskets;

7) O-rings;

8) ports;

9) seat;

10) spindle;

11) spring;

12) trim.

Terms applicable to this task:

actuator
A mechanism or device to automatically or remotely control a valve from outside the body.

adjusting screw
A screw used to manipulate the opening and/or closing pressure of the disc or piston.

body
The outer casing around most or all of the valve that contains the internal parts or trim.

bonnet
A cover attached to the valve body that is commonly screwed or bolted to the valve body to hold the internal parts in place.

disc
A movable obstruction or piston inside the valve body that restricts flow through a port(s).

gaskets
The mechanical, resilient seals used to prevent the leakage of fluids or gases between two or more parts.

O-rings
A mechanical gasket with a round cross-section designed to be seated in a groove and compressed during assembly of two or more parts to create a seal.

ports
Passages that allow fluid to pass through the valve.

seat
The interior surface of the valve body against which a disc or piston contacts to form a leak-tight seal.

spindle
Valve part that transmits motion from the spring or actuator.

spring
Coiled steel valve part usually used to keep a disc shut against the seat.

trim
The internal parts of a valve, including the stem or spindle, seating surfaces, guides, and other elements.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product related to task performance.	Notify the appropriate personnel to take actions as required.
Unintentional activation of a safety/control device (e.g. abnormal shutdown, unintentional valve movement, high-pressure shutdown, etc.) that results in a loss of control or overpressure condition of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition. Notify the control center or local operations.
Improper position of a device isolation valve found when attempting to isolate.	Make the appropriate operator notifications and verify the proper valve position.
A component malfunctions or is inoperable (e.g. isolation valve fails to isolate).	Stop the task and notify/inform appropriate company personnel of the condition.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the device identifier, device type, and manufacturer.	This step confirms that the correct component is identified and confirms the appropriate inspection/ repair procedures to be followed.
2	Notify the control center, local operations (if applicable), and any affected personnel, prior to performing any maintenance per the operator's procedures.	This step confirms that the inspection has been scheduled and communicated and that the operational status has been confirmed.
3	Isolate the relief valve from the process system and relieve trapped process pressure.	This step allows the valve to be disassembled. Stop the task if the isolation valve does not function correctly and make appropriate notifications.
4	Disassemble the relief valve following applicable manufacturer's procedures.	This provides access to the internal components to be maintained.
5	Diagnose, clean, lubricate, and repair or replace the worn or damaged parts.	Follow the manufacturer's instructions and specifications for the applicable relief valve in order to properly inspect, diagnose, and repair the relief valve.
6	Assemble the relief valve per the manufacturer's procedures.	This prepares the relief valve for inspection, testing, and calibration. Inspection, testing, and calibrating the relief valve shall be completed prior to returning the relief valve to service.
7	Notify the control center or local operations (if applicable) and any affected personnel that maintenance and repairs are complete. Document repairs as required by the operator's procedures.	Documentation provides historical data for future maintenance of the device.

Task 23.2—Inspect, Test, and Calibrate Relief Valves

1.0 Task Description

This task involves the inspection, testing, and calibration activities performed on a pressure-relief valve in order to verify that a device is functioning properly, is in good mechanical condition, and is adequate for the application.

This task begins with verification of the device number and identifier. This task ends with notification and documentation to appropriate personnel that the inspection is complete.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

This task does not include but may lead to the performance of other covered tasks such as:

— Maintain/Repair Relief Valves (reference Task 23.1).

2.0 Knowledge Component

This task is performed to ensure that the relief valve will function properly if the pressure in the pipeline reaches the specified set point.

An individual performing this task shall have knowledge of:

a) Types of pressure-relief valves and the corresponding principles of operation, including the following:

   1) spring loaded pressure-relief valves;

   2) snap-acting pilot pressure-relief valves;

   3) modulating pilot pressure-relief valves.

b) Calibration equipment and tools used, including the following:

   1) analog pressure gauges;

   2) digital pressure gauges.

c) Device set point, including the ability to understand manufacturer's specifications and operator's design criteria:

   1) manufacturer-specified reseating adjustments (spring-loaded valves);

   2) manufacturer-specified lift setting adjustments (pilot-operated valves).

d) Operator procedures for inspection, testing, and calibration of pressure-relieving devices and pressure-relief valves.

e) Operator procedures for device set point:

   1) manufacturer-specified reseating adjustments (spring-loaded valves);

   2) manufacturer-specified lift setting adjustments (pilot-operated valves).

f) Different pressure types, including the following:

1) backpressure;

2) blowdown;

3) closing pressure;

4) set point.

Terms applicable to this task:

backpressure
The pressure that exists at the outlet of a pressure-relief device because of the pressure in the discharge system. Backpressure is the sum of the superimposed and built-up backpressures.

blowdown
The difference between the set point and the closing pressure of a pressure-relief valve, expressed as a percentage of the set point or in pressure units.

closing pressure
The value of decreasing inlet static pressure at which the valve disc reestablishes contact with the seat or at which lift becomes zero, as determined by seeing, feeling, or hearing.

set point
The inlet gauge pressure at which a pressure-relief valve is set to open under service conditions. The value of increasing inlet static pressure whereby there is a measurable lift of the disc or at which discharge of the fluid or vapor becomes continuous, as determined by seeing, feeling, or hearing. It is also known as "opening pressure" or "set pressure."

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product related to task performance.	Notify the appropriate personnel to take actions as required.
Unintentional activation of a safety/control device (e.g. abnormal shutdown, unintentional valve movement, high-pressure shutdown, etc.) that results in a loss of control or overpressure condition of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition. Notify controller or local operations monitoring the facility.
Component damage is observed (e.g. mechanical or corrosion damage).	Stop the task and notify/inform appropriate company personnel of the condition.
Improper position of a device isolation valve found when attempting to isolate.	Make the appropriate operator notifications and verify the proper valve position.
A component malfunctions or is inoperable (e.g. isolation valve fails to isolate).	Stop the task and notify/inform appropriate company personnel of the condition.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the device identifier, device type, and manufacturer.	This step confirms that the correct component is identified and that the appropriate inspection/repair procedures are followed.
2	Verify that test equipment has been calibrated prior to performing any calibrations.	This includes equipment such as pressure gauges that are used during the inspection, testing, and calibration of a pressure-relief valve. Test equipment shall have a valid certification of calibration and be appropriate for the intended calibration range.
3	Notify the control center or local operations (if applicable), and any affected personnel, prior to performing any test per the operator's procedures.	The control center or local operations (if applicable) shall be notified that work is to be performed on the relief valve.
4	Visually inspect the device and its associated equipment to determine: — appropriateness for intended service; — physical/mechanical condition; — presence of corrosion; — presence of erosion; — presence of leakage; — inlet and outlet (if applicable) flange connections; — integrity of the device and its associated piping support; — correct position and function of isolation valve.	Confirms the condition of the device. If maintenance, repair, or replacement is required, make appropriate notifications, or repairs, per the operator's and manufacturer's procedures.
5	Isolate the device from the process system and relieve trapped process pressure.	This allows the correct test pressure and medium to be applied during calibration and prevent a loss of containment. Stop task if an isolation valve does not function correctly and make appropriate notifications.
6	Connect test equipment and inspect all connections for leakage.	Loss of test pressure will result in inaccurate test results or calibration of the device.
7	Apply test medium pressure and determine the device set point or range "as found" and document the set point.	Using the "as found" value of a device set point prior to calibration helps determine the proper functionality and repeatability. This may need to be repeated multiple times per the operator's procedures. If the device is found to have an improper set point, it may have a problem maintaining its calibration within acceptable limits and tolerance, or a set point may have incorrectly been applied by a previous calibration. This step provides a historical record, verifies current device settings, and determines if a calibration is required.
8	If device calibration is required, reapply the test medium (Step 7) to the desired set point or range and adjust it according to the device manufacturer's specifications. Repeat the test procedure to achieve calibration.	Establish repeatability to the desired set point. If it fails to maintain calibration, the device may need to be replaced.

Step	Action	Explanation
9	Document the final set point value “as left” results per the operator’s procedure.	Documentation of the final calibration provides an opportunity for a review to ensure that the correct set point(s) was established, and it provides historical data for future testing of the device.
10	Remove test equipment, remove isolation, and return the device to normal operating condition per the operator’s procedures.	This step returns integrity to the system.
11	Apply a security seal to device, if required by the operator’s procedure.	Security seal can include inspection information and results. Utilize the operator’s procedures.
12	Notify the control center, local operations (if applicable), and any affected personnel per the operator’s procedures. Complete appropriate documentation, as required.	Provides notice that the device is operable and that the system is ready or has returned to normal operation. Documentation provides historical data for future testing of the device.

Task 24.1—Maintain/Repair Pressure-limiting Devices

1.0 Task Description

This task is performed to diagnose, clean, lubricate, and repair or replace worn or damaged components of pressure-limiting devices. Performance of this task can include the disassembly and reassembly of the device according to the applicable procedures and is conducted to maintain or repair the device's integrity and to verify that its performance meets all necessary functions.

This task begins with verification of the device number/identifier. This task ends with the notification and documentation to the appropriate personnel that the device is operable, and that the system has returned to normal operation.

The performance of this covered task may require the performance of other covered tasks such as:

— Inspect, Test, and Calibrate Pressure-limiting Devices (reference Task 24.2);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

This task is performed to ensure that the pressure-limiting device will function properly if the pressure in the pipeline reaches a specified control pressure.

Local operator procedures, including any alternate means of overpressure protection, should be considered prior to maintenance or repair activities. Performance of this task may require disabling certain output signals to related equipment during maintenance or repair.

An individual performing this task shall have knowledge of:

a) How to disassemble and/or reassemble a pressure-limiting device and related devices for internal inspection, cleaning, and to replace components for repair, maintenance, and adjustments.

b) Components of a valve.

c) Types of sliding-stem-style pressure-limiting devices and principles of operation, which may include but are not limited to the following:

   1) globe control valve and its associated components;

   2) cage control valve and its associated components.

d) Types of rotary-style pressure-limiting devices and principles of operation, which may include but are not limited to the following:

   1) butterfly-style control valve its and associated components;

   2) ball valves;

   3) V-notch valves.

e) Associated equipment of pressure-limiting devices and principles of operation, which may include but are not limited to the following:

1) controllers;
2) positioners;
3) solenoid valves;
4) limit switches;
5) regulators;
6) transducers.

f) Calibration equipment and tools, which may include but are not limited to the following:
1) analog pressure gauges;
2) digital pressure gauges;
3) calipers;
4) micrometers;
5) VOM multimeters;
6) manufacturer-specific multifunction calibrators;
7) torque wrench;
8) lifting equipment suitable for the weight of the valve and/or valve controller, if repair requires removal from the facility.

g) Operation and safe handling of test media, which may include but are not limited to the following:
1) pressure regulators;
2) nitrogen sources;
3) process connections.

h) Operation and safe handling of electrical systems, which may include but are not limited to the following:
1) voltages applied to the device;
2) electrical requirements;
3) connections of test equipment to the device.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operation conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product related to task performance.	Notify the appropriate personnel to take actions as required.
The unintentional activation of a safety/control device (e.g. abnormal shutdown, unintentional valve movement, high-pressure shutdown) that results in a loss of control or an overpressure condition of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition. Notify the control center or local operations.
The improper position of a device isolation valve.	Make the appropriate operator notifications and verify the proper valve position.
A component malfunctions or is inoperable (e.g. isolation valve fails to isolate).	Stop the task and notify appropriate company personnel of the condition.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the device number, location, and the type and manufacturer of associated components.	This step confirms that the correct component is identified and the appropriate inspection/repair procedures to be followed.
2	Notify the control center or local operations (if applicable), and any affected personnel prior to performing any test per the operator's procedures.	The control center or local operations (if applicable) shall be notified that work is to be performed on a pressure-limiting device.
3	Isolate the device from the process system and relieve trapped process pressure.	This step allows the device to be disassembled.
4	Disassemble the device following the applicable manufacturer's procedures.	This provides access to the internal components to be maintained.
5	Diagnose, clean, lubricate, and repair or replace the worn or damaged parts.	Follow the manufacturer's instructions and specifications for the applicable device in order to properly inspect, diagnose, and repair the device.
6	Assemble the device.	Follow the manufacturer's instructions for assembly.
7	Inspect, test, and calibrate the device and associated components.	This step verifies the device will operate as expected.
8	Return the device to normal operating condition and verify the integrity of the system per the manufacturer's specifications and the operator's procedures.	This step verifies that the device operates properly and is maintaining its integrity.
9	Document repairs as required by the operator's procedures.	Proper documentation is critical to future analysis and identification of problem areas.
10	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notice that the device is operable and that the system is ready or has returned to normal operation.

Task 24.2—Inspect, Test, and Calibrate Pressure-limiting Devices

1.0 Task Description

This task involves the inspection, testing, and calibration activities performed on a pressure-limiting device to verify that it is functioning properly, is in good operating condition, and is performing adequately for its intended purpose.

This task begins with verification of the device number/identifier. This task ends with notification and documentation that the pressure-limiting device is ready to be returned to a normal operating condition.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

This task does not include but may lead to the performance of other covered tasks such as:

— Maintain/Repair Pressure-limiting Devices (reference Task 24.1);

— Inspect, Test, and Calibrate Pressure Transmitters (reference Task 25.2).

2.0 Knowledge Component

Pressure-limiting devices installed on pipelines protect the pipeline from exceeding specified pressure limits by controlling the pressure in adjacent sections of the pipeline. This task is performed in order to ensure that the valve will function properly if the pressure in the pipeline reaches the specified control pressure.

An individual performing this task shall have knowledge of:

a) Methods of inspecting, testing, and calibrating pressure-limiting devices.

b) Types of sliding-stem-style pressure-limiting devices and the principles of operation, including the following:

   1) globe control valve and its associated components;

   2) cage control valve and its associated components.

c) Types of rotary-style pressure-limiting devices and the principles of operation, including the following:

   1) butterfly-style control valve its and associated components;

   2) ball valves;

   3) V-notch valves.

d) Associated equipment of pressure-limiting devices and their principles of operation, including the following:

   1) controllers;

   2) positioners;

   3) solenoid valves;

4) limit switches;

5) regulators;

6) transducers.

e) Calibration equipment and tools, including the following:

1) analog pressure gauges;

2) digital pressure gauges;

3) calipers;

4) micrometers;

5) VOM multimeters;

6) manufacturer-specific multifunction calibrators.

f) Operation and safe handling of test media, including the following:

1) pressure regulators;

2) nitrogen sources;

3) process connections.

g) Operation and safe handling of electrical systems, such as:

1) voltages applied to the device;

2) electrical requirements;

3) connections of test equipment to the device.

Terms applicable to this task:

actuator
A mechanism or device to control a valve automatically or remotely from outside the body.

calibration
The process of testing and adjusting, if needed, a device to ensure that it can be relied on to deliver predictable, accurate results that meet quality/tolerance standards.

set point
The inlet or outlet gauge pressure at which a pressure-limiting device is set to move open or move closed under service conditions. The value of increasing inlet static pressure whereby there is a measurable lift of the disc or at which discharge of the fluid or vapor becomes continuous, as determined by seeing, feeling, or hearing. It is also known as “opening pressure” or “set pressure.”

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product related to task performance.	Notify the appropriate personnel to take actions as required.
Leaking from the pressure-limiting device or leaking past the seating surfaces of the actuator.	Make appropriate operator notifications to repair or replace.
The unintentional activation of a safety/control device (e.g. abnormal shutdown, unintentional valve movement, high-pressure shutdown) that results in a loss of control or an overpressure condition of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition. Notify the control center or local operations.
The improper position of a device isolation valve.	Make the appropriate operator notifications and verify the proper valve position.
A component malfunctions or is inoperable.	Stop the task and notify/inform appropriate company personnel of the condition.
Component damage is observed (e.g. mechanical or corrosion damage).	Stop the task and notify/inform appropriate company personnel of the condition.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the device number, location, type, and manufacturer.	This step confirms that the correct component is identified and the appropriate inspection/repair procedures to be followed.
2	Verify that test equipment has been calibrated prior to performing any calibrations.	This includes equipment such as pressure gauges that are used during the inspection, testing, and calibration of a pressure-relief valve. Test equipment shall have a valid certification of calibration and be appropriate for the intended calibration range.
3	Notify control center, local operations (if applicable), or any affected personnel, prior to performing any test per the operator's procedures.	The control center or local operations (if applicable) shall be notified that work is to be performed on a device.
4	Visually inspect the device and its associated equipment to determine: — appropriateness for intended service; — physical/mechanical condition; — presence of corrosion; — presence of erosion; — presence of leakage; — inlet and outlet (if applicable) flange connections; — integrity of the device and its associated equipment.	This inspection confirms the condition of the device. If maintenance, repair, or replacement is required, make the appropriate notifications or repairs per the operator's and manufacturer's procedures.

5	For dynamic (in-service) testing and calibration, use the operator's procedures and notification protocols. For static (out-of-service) testing and calibration, isolate the pressure-limiting device from the process system and relieve trapped process pressure.	Dynamic testing yields the most accurate results and shall be performed in coordination with operations to establish operational testing limits and to avoid operational upsets. For static testing, isolation of the device and associated equipment from the process system allows for the correct test pressure and test medium to be applied during calibration. If an isolation valve is not in the correct position, make the appropriate operator notifications. Stop task if an isolation valve does not function correctly and make appropriate notifications.
6	Connect the test equipment.	The loss of test pressure results in inaccurate test results or calibration of the device.
7	Apply or simulate the test medium pressure and determine the device upper and lower operating limits and range.	If the device is improperly adjusted, it may have a problem maintaining its calibration within acceptable limits and tolerance. This step verifies the current settings for the device and its associated components and determines if a calibration and adjustment are required. Simulating test pressure applies only to static testing.
8	If calibration or adjustment of the device or its associated components is required, reapply the test medium (Step 7) to the required values and range. Adjust the device and its associated components per the manufacturer's and operator's specifications.	Repeat the test procedure to achieve calibration and establish repeatability to the desired upper and lower operating limits and range.
9	Remove the test equipment, remove isolation, and return the device and its associated equipment to normal operating condition.	This step returns integrity to the system.
10	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures. Complete appropriate documentation, as required.	This communication provides notice that the device is operable and that the system is ready or has returned to normal operation. Use point-to-point verification to confirm proper communication avenues. Documentation provides historical data for future testing of the device.

Task 25.1—Inspect, Test, and Calibrate Pressure Switches

1.0 Task Description

This task consists of the inspection, testing, and calibration activities performed on a pressure switch to verify that the equipment and associated output signals are functioning properly.

This task begins with identifying and verifying the pressure switch to be inspected, tested, and/or calibrated. This task ends with notification and documentation that the pressure switch is ready to be returned to a normal operating condition.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

The primary purpose of this task is to ensure that the pressure switch operates correctly to detect a possible overpressure of the pipeline system.

An individual performing this task shall have knowledge of:

a) Types of test equipment, including the following:

1) multimeters;

2) multifunction calibrators;

3) communicators;

4) analog or digital pressure gauges;

5) digital pressure modules;

6) equipment process connections;

7) pressure regulators;

8) hand pumps.

b) Types of test media and equipment, including the following:

1) air;

2) nitrogen;

3) glycol;

4) hydraulic fluid.

c) The principles of operation of pressure switches.

Terms applicable to this task:

alarm
A visible and/or audible means of indicating to the controller an equipment malfunction, an analog or accumulation process deviation, or other condition requiring a controller's response.

calibration
The process of testing and adjusting, if needed, a device to ensure that it can be relied on to deliver predictable, accurate results that meet quality or tolerance standards.

pressure switch dead band
The difference between the set point pressure (e.g. set to detect increasing pressure) and the pressure value (e.g. decreasing when system pressure subsides) required to reset a pressure switch after it has been actuated.

pressure switch range
Adjustable span of the pressure switch.

pressure switch set point
Trip threshold at which the switch activates.

shutdown device
A device that shall operate to provide protection for a pipeline. For example, a pressure switch activates and, through the control sequence, prevents the pipeline from exceeding pressure limits.

test equipment calibration
Able to determine that the test equipment is within its calibration period and accuracy.

test equipment operation
Operation and proper use of test equipment to be used to perform the functions required in this task [i.e. multimeters, multifunction calibrators, gauges (analog, digital, and digital pressure modules)].

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unintentional activation of a safety/control device (e.g. abnormal shutdown, unintentional valve movement, high-pressure shutdown, etc.) that results in a loss of control or overpressure condition of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition. Notify the control center or local operations.
The improper position of a device isolation valve.	Make the appropriate operator notifications and verify the proper valve position.
Unexpected release or discharge of product related to task performance.	Notify the appropriate personnel to take actions as required.
A component malfunctions or is inoperable.	Stop the task and notify/inform appropriate company personnel of the condition.
Component damage is observed (e.g. mechanical or corrosion damage).	Stop the task and notify/inform appropriate company personnel of the condition.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the device identifier, type, and manufacturer.	This step confirms that the correct component is identified and the appropriate inspection/repair procedures are followed.
2	Verify that test equipment has been calibrated prior to performing calibrations.	Test equipment that is used to calibrate pressure switches that are providing overpressure protection shall have valid certification of calibration and be appropriate for the intended calibration range.
3	Verify device set point for switch prior to performing calibration.	Set points of pressure switches that provide overpressure or other protection to a process system are established by design criteria through engineering. Consult company documentation to determine proper set point value. Designated set points shall be strictly adhered to.
4	Determine correct test medium to be used for testing.	The use of an incorrect test medium can result in inaccurate calibration of a device and cause possible damage to the device. Consult company documentation to determine proper test medium.
5	Notify the control center, local operations (if applicable), or any affected personnel, prior to performing any test per company procedures.	The control center or local operations (if applicable) shall be notified that the pressure switch will be tested and that an alarm tag may be activated. The control center may be required to validate: — receipt/initiation of the alarm; — proper pressure switch device number to alarm tag; — Supervisory Control and Data Acquisition (SCADA)/ human machine interface (HMI) display values; — transmitter device number corresponds to SCADA/HMI display ID. Notification is crucial to avoid a “false alarm” that could affect the operation of the pipeline.
6	Visually inspect pressure switch and its associated equipment to determine, per company procedure: — appropriateness for intended service; — physical/mechanical condition; — presence of corrosion; — presence of erosion; — presence of leakage; — electrical connections (if applicable).	This inspection confirms the condition of the device. If maintenance, repair, or replacement is required, make the appropriate notifications or repairs per the operator’s and manufacturer’s procedures.
7	Isolate the pressure switch from the process system and relieve trapped process pressure per the operator’s procedure.	This will allow correct test pressure and test medium to be applied during calibration and to also prevent loss of containment.
8	Connect test equipment and inspect all connections for leakage.	Loss of test pressure will result in inaccurate test results or calibration of the device.

9	Apply test medium pressure and determine device set point(s), dead band, or differential range “as found,” and document results.	The “as found” value of a device set point and other values prior to calibration helps determine the proper functionality and repeatability. This may need to be repeated multiple times per company procedure. If the device is found to have an improper set point, the device may have a problem maintaining its calibration within acceptable limits or a set point was incorrectly applied by a previous calibration. This step provides a historical record, verifies current device setting, and determines if a calibration is required.
10	If device calibration is required, reapply the test medium to desired set point or range and adjust according to the device manufacturer’s specifications. Repeat the test procedure to achieve calibration and establish repeatability to the desired set point.	Calibration according to device manufacturer’s instructions will ensure that proper calibration is achieved.
11	Document final set point(s), dead band, or differential range values “as left” results.	Document “as left” results per the operator’s procedure.
12	Remove test equipment, remove isolation, and return device to normal operating condition.	This step returns integrity to the system.
13	Notify control center, local operations (if applicable), and any affected personnel, per the operator’s procedures. Complete appropriate documentation, as required.	This communication provides notice that the device is operable and that the system is ready or has returned to normal operation. Use point-to-point verification to confirm proper communication avenues. Documentation provides historical data for future testing of the device.

Task 25.2—Inspect, Test, and Calibrate Pressure Transmitters

1.0 Task Description

This task involves the inspection, testing, and calibration activities performed on a pressure transmitter in order to verify that the equipment and associated output signals are functioning properly.

This task begins with identifying and verifying the pressure transmitter to be inspected, tested, and calibrated. This task ends with notification and documentation that the pressure transmitter is ready to be returned to a normal operating condition.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

The primary purpose of this task is to ensure that the pressure transmitter operates correctly to relay the detection of a possible overpressure of the pipeline system.

An individual performing this task shall have knowledge of:

a) Types of test equipment may include but are not limited to the following:

   1) multimeters;

   2) multifunction calibrators;

   3) communicators;

   4) analog or digital pressure gauges;

   5) digital pressure modules;

   6) equipment process connections;

   7) pressure regulators;

   8) hand pumps.

b) Types of test media and equipment may include but are not limited to the following:

   1) air;

   2) nitrogen;

   3) glycol;

   4) hydraulic fluid.

c) The principles of operation of pressure transmitters/transducers.

Terms applicable to this task:

alarm
A visible or audible means of indicating to the controller an equipment malfunction, an analog or accumulation process deviation, or other condition requiring a controller's response.

calibration
The process of testing and adjusting, if needed, a device to ensure that it can be relied on to deliver predictable, accurate results that meet quality or tolerance standards.

pressure transmitter range
Device output signal that can be adjusted by the operator to a different span of pressure.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unintentional activation of a safety/control device (e.g. abnormal shutdown, unintentional valve movement, high-pressure shutdown, etc.) that results in a loss of control or overpressure condition of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition. Notify controller or local operations monitoring the facility.
The improper position of a device isolation valve.	Make the appropriate operator notifications and verify the proper valve position.
Unexpected release or discharge of product related to task performance.	Notify the appropriate personnel to take actions as required.
A component malfunctions or is inoperable.	Stop the task and notify/inform appropriate company personnel of the condition.
Component damage is observed (e.g. mechanical or corrosion damage).	Stop the task and notify/inform appropriate company personnel of the condition.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the device identifier, type, and manufacturer.	This step confirms that the correct component is identified and the appropriate inspection/repair procedures to be followed.
2	Verify that test equipment has been calibrated prior to performing calibrations.	Test equipment that is used to calibrate pressure transmitters that are providing overpressure protection shall have valid certification of calibration and be appropriate for the intended calibration range.
3	Verify the required device input and output range values for the transmitter prior to performing testing or calibration.	The input and output range values of a pressure transmitter are established by design criteria through engineering analysis. Consult operator documentation to determine proper device range.
4	Determine correct test medium to be used for testing.	The use of an incorrect test medium can result in inaccurate calibration of a device and possibly cause damage to the device. Consult operator documentation to determine proper test medium.

Step	Action	Explanation
5	Notify control center, local operations (if applicable), and any affected personnel, per company procedures, prior to performing any test.	The control center or local operations (if applicable) shall be notified that the pressure transmitter will be tested. The control center may be required to validate: — receipt/initiation of an alarm; — Supervisory Control and Data Acquisition (SCADA)/ human machine interface (HMI) display values; — transmitter device number corresponds to SCADA/ HMI display ID. Notification is crucial to avoid a “false alarm” that could affect the operation of the pipeline.
6	Visually inspect pressure transmitter per company procedure and its associated equipment, to determine, per company procedure: — appropriateness for intended service; — physical/mechanical condition; — presence of corrosion; — presence of erosion; — presence of leakage; — electrical connections (if applicable).	This inspection confirms the condition of the device. If maintenance, repair, or replacement is required, make the appropriate notifications or repairs per the operator’s and manufacturer’s procedures.
7	Isolate the pressure transmitter from the process system and relieve trapped process pressure per company procedure.	This will allow correct test pressure and test medium to be applied during calibration and to also prevent loss of containment.
8	Connect test equipment and inspect all connections for leakage.	Leakage of test pressure will result in inaccurate test results or calibration of the device.
9	Apply test medium pressure through the desired test range. Determine the output values “as found” and document the results.	This test determines proper functionality and repeatability and shall be repeated multiple times per company procedure. This determines if a calibration is required. This documentation provides historical data that may indicate the device fails to maintain calibration and may need to be replaced.
10	If device calibration is required, reapply test medium pressure through the desired test range and adjust device settings using the manufacturer’s procedures. Repeat test procedure to verify proper calibration and establish repeatability.	The device range output values shall be set to the company required values.
11	Document “as left” results.	Document “as left” results per company procedure.
12	Remove test equipment, remove isolation, and return device to normal operating condition.	This step returns integrity to the system.
13	Notify the control center, local operations (if applicable), and any affected personnel, per the operator’s procedures. Complete appropriate documentation, as required.	This communication provides notice that the device is operable and that the system is ready or has returned to normal operation. Use point-to-point verification to confirm proper communication avenues. Documentation provides historical data for future testing of the device.

Task 27.1—Perform Routine Inspection of Breakout Tanks (API 653 Monthly or DOT Annual)

1.0 Task Description

This task involves performing routine tank inspections in accordance with the edition of API 653 incorporated by reference in 49 *CFR* § 195.3. Individuals performing routine inspections do not need to be an authorized inspector as defined in API 653 or API 510.

This task begins with the visual inspection of the tank. The task ends when the documentation is complete.

The performance of this covered task may require the performance of other covered tasks such as:

— Perform API 653 Inspection of In-service Breakout Tanks (reference Task 27.2);

— Perform API 510 Inspection of In-service Breakout Tanks (reference Task 27.3).

2.0 Knowledge Component

The purpose of this task is to evaluate the condition of a breakout tank by visually determining the condition of the tank and its components.

An individual performing this task shall have knowledge of:

a) The three primary types of atmospheric steel aboveground breakout tanks.

1) External/Open Top Floating Roof Tanks—An open-topped cylindrical aboveground steel shell equipped with a roof that floats on the surface of the stored liquid. The roof rises and falls with the liquid level in the tank. There is a rim seal system between the tank shell and roof to reduce rim evaporation.

   The roof has support legs hanging down into the liquid. At low liquid levels, the roof eventually lands, and a vapor space forms between the liquid surface and the roof, similar to a fixed roof tank. The support legs are usually retractable to increase the working volume of the tank.

2) Fixed/Cone Roof Tank—A closed-top cylindrical aboveground steel shell with a cone roof supported principally either by rafters on girders and columns or by rafters on trusses with or without columns, a self-supporting cone roof that is supported only at its periphery, or a self-supporting dome roof formed to approximately a spherical surface that is supported only at its periphery.

3) Internal Floating Roof Tanks—These tanks are cone roof tanks, or tanks with a geodesic roof, with a floating roof inside that travels up and down along with the liquid level.

b) The three primary types of secondary containment systems:

1) steel;

2) concrete;

3) earthen (e.g. soil, dirt, rocks).

Terms applicable to this task:

bottom projection plate
chime ring
The outside edge of the tank bottom that extends past the weld of the tank shell.

reinforcing plate/pad/repad
Steel reinforcement plates installed around appurtenances to provide added strength to the structure.

roof
The top external surface of the tank.

secondary containment
An impoundment, such as a dike, that could contain spilled product on site. The impoundment may be constructed of concrete, earth, steel, or solid masonry and is designed to be liquid tight.

shell
The vertical, cylindrical walls of a tank.

shell appurtenances
Manways, reinforcement plates, nozzles, sampling ports, temperature probes, mixers, and auto-gauge systems.

tank foundation
ring wall
Provides support for the tank. The foundation/ring wall may be made from concrete, earth, or other supportive materials.

telltale
weep hole
A threaded penetration of the reinforcing plate that is used to determine if the shell has developed a leak in the area where the reinforcing plate covers the shell.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Mechanical or corrosion damage is observed.	Make appropriate notifications according to the operator's procedures.
Secondary containment system damage.	Make appropriate notifications according to the operator's procedures.
Areas of immediate concern, such as excessive standing water on the roof, cracked chimes, staining around the tank or components, and signs of compromised foundation.	Notify the appropriate personnel to take actions as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Visually inspect for settlement around the perimeter of the tank and the condition of the foundation: — check that rainwater runoff from the shell drains away from tank; — inspect for broken concrete and cracks; — inspect for cavities under the foundation and vegetation against the bottom of the tank; — sheen on water or product on ground in containment area.	Visual inspection of the foundation is performed to identify conditions such as settlement or lack of support under the tank shell/floor. Surface water should be kept away from the tank to prevent corrosion or erosion of the foundation. If a sheen on water or product on ground is observed, make appropriate notifications according to the operator's procedures.
2	Visually inspect the following items for evidence of leaks, corrosion, pitting, and distortion, as applicable: — mixer seals; — flanges; — manways/nozzles; — bottom projection plate; — welds/rivets; — telltales/weep holes on reinforcing pads; — reinforcement plate/padding around appurtenances; — inspect for shell distortions—look for deflection or deformation of the shell; — insulation condition; — tank grounding system components.	Visual inspection of the shell is performed to identify coating condition, areas of pitting, or corrosion and distortions. Leaks indicate an integrity issue, and immediate response according to operator's policies is required. Response actions may include stopping operation and securing equipment, if safe to do so, immediately notifying the operator, and executing applicable emergency procedures.
3	Visually inspect the secondary containment system for impoundment integrity.	The tank dike wall shall be maintained so that the containment area capacity remains as designed. Dikes compromised by erosion, excavations, or excessive vegetation need to be addressed per the operator's procedures.
4	Visually inspect the tank roof for the following, if applicable: — coating condition, holes, pitting, and corrosion; — standing or pooling water or product; — floating roof out of level; — roof supports.	Large standing water areas on a floating roof indicate inadequate drainage design. Nonlevel roof indicates possible leaking pontoons. Floating roofs can sink and possibly impact the integrity of the tank floor if excessive weight from water/product on top of the roof is not removed. Significant sagging of a fixed roof deck indicates potential rafter failure.
5	Document the findings of the inspection.	Submit a completed inspection form according to the operator's procedures.

Task 27.2—Perform API 653 Inspection of In-service Breakout Tanks

1.0 Task Description

This task involves performing a detailed internal or external inspection of an in-service breakout tank in accordance with the DOT-approved edition of API 653. This inspection shall be performed by an authorized inspector only, as defined by API 653 incorporated by reference (IBR) in 195.3.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Pit Depth with Pit Gauge (reference Task 8.1);

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2);

— Measure Corroded Area (reference Task 8.3);

— Perform Routine Inspection of Breakout Tanks (API 653 Monthly or DOT Annual) (reference Task 27.1).

2.0 Knowledge Component

The purpose of this task is to complete a comprehensive inspection of an in-service breakout tank by an authorized inspector. An individual performing this task shall provide documentation of the API Authorized Inspector Certification for API 653 (atmospheric and low-pressure steel aboveground tanks).

An individual performing this task shall have knowledge of:

— The requirements detailed in the DOT-approved edition of API 653.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Mechanical or corrosion damage is observed.	Make appropriate notifications according to the operator's procedures.
Secondary containment system damage.	Make appropriate notifications according to the operator's procedures.
Areas of immediate concern, such as excessive standing water on the roof, cracked chimes, staining around the tank or components, and signs of compromised foundation.	Notify the appropriate personnel to take actions as required.

3.0 Skill Component

The certificate demonstrates task performance proficiency:

Step	Action	Explanation
1	Inspect the physical integrity of aboveground steel breakout tanks in accordance with the DOT-approved edition of API 653 IBR in 195.3.	Authorized Inspector Certification required in accordance with the DOT-approved edition of API 653 IBR in 195.3.

Task 27.3—Perform API 510 Inspection of In-service Breakout Tanks

1.0 Task Description

This task involves performing a detailed internal or external inspection of an in-service breakout tank in accordance with the DOT-approved edition of API 510. This inspection shall be performed by an authorized inspector only, as defined by API 510 IBR in 195.3.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Pit Depth with Pit Gauge (reference Task 8.1);

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2);

— Measure Corroded Area (reference Task 8.3);

— Perform Routine Inspection of Breakout Tanks (API 653 Monthly or DOT Annual) (reference Task 27.1).

2.0 Knowledge Component

The purpose of this task is to complete a comprehensive inspection of an in-service breakout tank by an authorized inspector. An individual performing this task shall provide documentation of the API Authorized Inspector Certification for API 510 (LPG installations built to API 2510).

An individual performing this task shall have knowledge of:

— the requirements detailed in the DOT-approved edition of API 510.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take actions as required.
Mechanical or corrosion damage is observed.	Make appropriate notifications according to the operator's procedures.
Areas of immediate concern, such as excessive standing water on the roof, cracked chimes, staining around the tank or components, and signs of compromised foundation.	Notify the appropriate personnel to take actions as required.

3.0 Skill Component

The certificate demonstrates task performance proficiency:

Step	Action	Explanation
1	Inspect the physical integrity of aboveground steel breakout tanks in accordance with the DOT-approved edition of API 510 IBR in 195.3.	Authorized Inspector Certification required in accordance with the DOT-approved edition of API 510 IBR in 195.3.

Task 30—Test Overfill Protective Devices

1.0 Task Description

This task consists of the testing activities performed on an overfill protective device (OPD) installed on a tank to ensure that the equipment and associated control center alarms are functioning properly and are adequate for the intended purpose.

This task begins with notification to the control center, local operations (if applicable), and affected personnel that OPD testing activities are to commence. This task ends with the completion of the appropriate documentation per the operator's procedures.

This task does not include but may lead to the performance of other covered tasks such as:

— Inspect and Calibrate Overfill Protective Devices (reference Task 31).

2.0 Knowledge Component

The primary purpose of this task is to verify that an OPD operates correctly in order to prevent or detect a possible overfill of a pipeline breakout tank. The OPD's purpose is to signal the controller or other individual monitoring the tank filling operation prior to the loss of containment of hazardous liquids due to the overfilling of a breakout storage tank or other containment vessel. The OPD typically initiates a high-priority level alarm to the control center. After receipt of the alarm, the control center takes appropriate and immediate actions to prevent an actual overfill beyond operational limits.

An individual performing this task shall have knowledge of:

a) The various types of overfill protection devices, systems, and associated equipment and their principles of operation.

b) Methods of testing OPDs.

c) Tank/vessel construction types:

  1) fixed roof;

  2) internal floating;

  3) external floating;

  4) underground.

d) Tank/vessel fill/drain operations:

  1) alarms;

  2) location;

  3) activation;

  4) shutdown sequence of activated alarms.

Terms applicable to this task:

alarm
A visible or audible means of indicating to the controller an equipment malfunction, an analog or accumulation process deviation, or other condition requiring a controller's response.

set point
Liquid level at which switch or signal activates an alarm, notification, and/or automated action.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Liquid level is found to be at an unexpected high or low level.	Notify the control center or appropriate personnel of level status.
Corrosion pitting or residue that interferes with the operation of the device or associated equipment.	Notify/inform appropriate personnel of the condition of the OPD.
Damage or deformation of housing, fitting, or support structure related to OPD.	Notify/inform appropriate personnel of the condition of the OPD.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Notify the control center or local operations (if applicable), and affected personnel, prior to performing this test per the operator's procedures.	The control center and local operations (if applicable) shall be notified that the OPD will be tested and that an alarm tag will be activated. The control center or local operations will be required to validate: — receipt/initiation of the alarm; — proper OPD device number to alarm tag; — Supervisory Control and Data Acquisition (SCADA)/ human machine interface (HMI) display values; — OPD device number corresponds to SCADA/HMI display ID. If the OPD is part of an automated shutdown or flow relief system, the control center, or local operations, may be required to set the alarm to a "Test Mode" status per the operator's procedure. An OPD alarm could initiate response activities. Notification is crucial to avoid a "false alarm" that could affect the operation of the pipeline.
2	Verify the device location, identifier, type, and manufacturer.	If the identifier is missing, replace per the operator's specifications.
3	Review the operation of the overfill protection control scheme (if applicable).	Identify any devices, such as valves, that may operate as part of a designed shutdown or relief flow system.
4	Manually activate the OPD.	This step confirms the operability of the OPD.
5	Verify that the alarm has been received by the control center and/or local operations.	This step confirms the correct alarm tag is received.

Step	Action	Explanation
6	Verify the operation of any devices, such as valves, that might operate as part of a shutdown or relief flow system per the operator's procedure (if applicable).	This step confirms the operation of the overfill protection control scheme. If the OPD is part of an automated shutdown or flow relief system, notify the control center and/or local operations of any unexpected changes in operation (i.e. valve movements, pump run status, etc.).
7	Reset and confirm that OPD has returned to a normal operating condition.	This step verifies that any alarms have cleared appropriately.
8	Verify all devices, such as valves, that might have operated as part of a shutdown or relief flow system have returned to normal operating condition (if applicable).	This step verifies that the system has returned to normal operation.
9	Notify control center, local operations, and any affected personnel the test has ended.	This communication provides notice that the device is operable and that the system is ready or has returned to normal operation.
10	Document test results as required by the operator's procedures.	Documentation provides historical data for future testing of the device.

Task 31—Inspect and Calibrate Overfill Protective Devices

1.0 Task Description

This task consists of the inspection and calibration activities performed on an overfill protective device (OPD) installed on a tank to ensure that the equipment is functioning properly and is adequate for the intended purpose.

This task begins with notification to the control center, local operations (if applicable), and/or affected personnel that OPD inspection and calibration activities are to commence. This task ends with the completion of the appropriate documentation per the operator's procedure.

This task may lead to the performance of other covered tasks such as:

— Test Overfill Protective Devices (reference Task 30).

2.0 Knowledge Component

The primary purpose of this task is to verify that an OPD is maintained and operates correctly and at the desired level in order to prevent the loss of containment of hazardous liquids due to the overfilling of a breakout storage tank or other containment vessel. The OPD initiates a high-priority level alarm to the control center. After receipt of the alarm, the control center takes appropriate and immediate actions to prevent an actual overfill beyond operational limits.

An individual performing this task shall have knowledge of:

a) The various types of overfill protection devices, systems, and associated equipment and their principles of operation.

b) Methods of inspection and calibration of OPDs.

c) Calibration equipment and tools:

   1) multimeter;

   2) measurement equipment;

   3) displacement test mediums.

d) Tank/vessel construction types:

   1) fixed roof;

   2) internal floating;

   3) external floating;

   4) underground.

e) Alarms:

   1) location;

   2) activation;

   3) shutdown sequence of activated alarms.

f) Device set point:

1) threshold at which switch activates.

Terms applicable to this task:

calibration
The process of testing and adjusting, if needed, a device to ensure that it can be relied on to deliver predictable, accurate results that meet quality/tolerance standards.

set point
Liquid level at which switch and/or signal activates an alarm, notification, and/or automated action.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Liquid level is found to be at an unexpected high or low level.	Notify the control center or appropriate personnel of level status.
Unintentional activation or shutdown of system devices.	Take appropriate action, such as disabling OPD output signals to mitigate the situation. Notify the control center or appropriate personnel who are monitoring the facility.
Observed structural damage to tank, tank roof, and/or other components.	Notify/inform appropriate operator personnel of the condition.
Debris or freestanding product on roof.	Notify/inform appropriate operator personnel of the condition.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Notify control center, local operations (if applicable), and any affected personnel, prior to performing any inspection or calibration activity, per the operator's procedures.	The control center and local operations (if applicable) shall be notified that inspection or calibration activities will be performed on the OPD and to communicate the device status.
2	Obtain OPD set point value.	Refer to operator's documentation to determine proper set point value.
3	Determine required calibration equipment.	Consult device manufacturer manual and operator procedures to determine type of calibration equipment needed.
4	Verify the device identifier.	Ensure that the proper device is located. If the identifier is missing, replace per the operator's specifications.
5	Inspect internal and external components of the OPD and associated equipment per the manufacturer's recommendations and the operator's procedures: — physical/mechanical condition; — corrosion; — electrical connections.	Confirms condition and functionality. If maintenance, repair, or replacement is required, make appropriate notifications per the operator's procedure.

Step	Action	Explanation
6	Verify device set point.	This step validates that the set point obtained in Step 2 matches the device. The set point is the point that an alarm will be activated based on the liquid level in the tank.
7	Adjust device, if required, according to the manufacturer's recommendations. Repeat procedure to achieve calibration and establish repeatability.	Refer to the operator's procedures to determine proper set point value and calibration.
8	Test OPD to verify the alarm is received by the control center and/or local operations.	Confirms operability of OPD and that the correct alarm tag is received. NOTE This is a separate operator qualification task. Refer to Task 30—Test Overfill Protective Devices.
9	Reset and confirm that OPD has returned to a normal operating condition.	This step verifies that the alarms have been cleared appropriately.
10	Verify that all devices, such as valves, that might have operated as part of a shutdown or relief flow system have returned to normal operating condition (If applicable).	This step verifies that the system has returned to normal operation.
11	Notify the control center, local operations, and any affected personnel that the inspection/calibration is complete and has ended.	This communication provides notice that the device is operable and that the system is ready or has returned to normal operation.
12	Document inspection and calibration results as required by the operator's procedures.	Documentation provides historical data for future testing of the device.

Task 32—Observe Excavation Activities

1.0 Task Description

This task is intended for the individual who is responsible for the observation of, and taking action to prevent, excavation activities from damaging buried pipeline facilities. This task does not apply to horizontal/directional drilling but does apply to all vertical drilling (e.g. soil sampling) when pipelines are known to be in the area of the excavation activity.

This task begins with verifying that the pipeline(s) has been properly located and marked. This task ends with the completion of the required documentation after all intended earth removal has been accomplished.

The performance of this covered task may require the performance of other covered tasks such as:

— Locate Line (reference Task 14.1).

— Install, Inspect, and Maintain Temporary Marker (reference Task 14.5).

2.0 Knowledge Component

This activity is performed to prevent damage to submerged or buried pipelines during excavation activities.

An individual performing this task shall have knowledge of:

a) Operator Damage Prevention Program, including the requirement for compliance with the One-Call system and the required on-site temporary markings of facilities within the area of excavation.

b) Allowable positioning of equipment, materials, or supplies at the excavation site as not to produce unacceptable stress loads on buried structures or excavations.

c) Operator procedures, specifications, or methodology for excavation criteria or process, which may include but are not limited to the following:

   1) tolerance zones;

   2) hand excavations requirements;

   3) pothole requirements for facility identification;

   4) soft excavation requirements (e.g. vacuum or water jet excavation).

d) Damage and injury prevention requirements for an unattended excavation site.

e) Types of equipment or tools that are appropriate for the excavation, which can include the following:

   1) heavy excavation equipment;

   2) jackhammer;

   3) vacuum excavator;

   4) shovels and hand tools.

Terms applicable to this task:

excavation
Any operation using nonmechanical or mechanized equipment, demolition, or explosives in the movement of earth, rock, or other material below existing grade.

tolerance zone
The space in which a line or facility is located and in which hand digging or other noninvasive excavation methods may be necessary.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Pipeline is hit during the excavation.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Unplanned or preexisting release of hazardous liquid or gas.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Discovery of damage to an underground pipeline facility, including but not limited to the following: — coating; — casing; — conduits; — any communication or protection device.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Discovery of an unexpected foreign structure in the area of excavation.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Insufficient support for the pipeline during excavation.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify that the pipeline has been located and marked.	Markings may be paint, flag, or other standard indicators of pipeline location.
2	Ensure that notification has been made to the control center or local operations at the beginning of work.	Operations personnel should closely monitor pipeline pressure and flow during excavation activities.
3	Identify an appropriate location for excavated material.	The spoil should not be placed in a location that could affect the integrity of the pipeline. Provide adequate distance from the excavation to ensure the integrity of the excavation, prevent excessive stress on the pipeline, and prevent pipeline damage because of collapse.
4	Identify the hazards surrounding the excavation site.	Observes for irregularities. Ensures that hazards are avoided and prevents damage to the line or any appurtenances. Hazards may be marked, unmarked, or underground.

Step	Action	Explanation
5	Determine and communicate to excavator the required tolerance zone and any site-specific operator requirements.	Adherence to tolerance zones reduces the probability that the pipeline will be hit. Site-specific operator requirements may include but are not limited to the use of a flat bar, spotter, or equipment preparation.
6	Ensure that the tolerance zone is maintained during excavation. Require hand digging or other noninvasive excavation methods of the remaining soil within the tolerance zone.	Use of hand tools, vacuum excavation, or other noninvasive methods minimizes the probability of damage when excavating near the pipe.
7	Confirm that the pipe is supported as necessary during and after excavation.	Proper pipe support helps prevent pipe sag or other conditions that could affect the integrity of the pipe.
8	Notify control center or local operations at the completion of work.	Ensure that the line is monitored during and after excavation activities.
9	Document the excavation per the operator's procedures.	Documentation about the excavation may include but is not limited to the following: — date; — location (line segment, mile post, etc.); — name of excavator; — purpose of excavation; — scope of excavation (size, extent, etc.); — One-Call information, if required; — depth of cover.

Task 33—Move In-service Pipe

1.0 Task Description

This task consists of the movement of in-service pipe.

This task begins with identification of the pipe segment to be moved. This task ends when all notifications and documentation have been completed.

The performance of this covered task may require the performance of other covered tasks such as:

— Examine for Mechanical Damage on Buried or Submerged Pipe (reference Task 5.1);

— Examine for External Corrosion on Buried or Submerged Pipe (reference Task 5.2);

— Inspect the Condition of External Coating on Buried or Submerged Pipe (reference Task 5.3);

— Visual Inspection of Atmospheric Coatings (reference Task 7.1);

— Observe Excavation Activities (reference Task 32);

— Perform Backfilling (reference Task 39).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) product in the line;

b) pressure restriction requirements;

c) soil conditions;

d) maps and drawings;

e) supports;

f) work plan.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Damage is observed (e.g. mechanical, corrosion, coating).	Stop task activities and make appropriate notifications.
Unexpected hazardous product encountered.	Stop task activities and make appropriate notifications.
Component malfunctions or fails.	Stop task activities and make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the in-service line to be moved.	Verifies that the correct line is being moved. Review the engineering design plan or work scope identifying the correct line, product type, location, and trench lengths. This step assumes that the excavation, if needed, has already been completed, the line is in the correct state, and communications have been made with the control center.
2	Verify that the pipe has been visually inspected and is fit to move.	Visual inspection is a separate covered task and shall be completed by a qualified individual.
3	Ensure that the pipe is supported in accordance with the operator's design plan.	The design will determine the trench length calculation and maximum allowable support spacing. Supports may include skids, rollers, cradles, sandbags, or other means.
4	Tie off equipment at appropriate locations of the pipe to prepare for movement.	Any belt, sling, boom, or chain contacting the pipe shall be padded to prevent damage to the pipe coating.
5	Ensure the lift plan is communicated with personnel on-site prior to beginning to move the pipe.	This ensures that the movement is synchronized and does not cause undue stress to the pipe.
6	Notify the control center that movement is about to begin.	The lift plan will include instructions for the control center to reduce pressure, isolate the line, or take actions prior to moving the pipe.
7	Begin moving the pipe until the desired location has been obtained.	—
8	Confirm that the pipe is supported when placing it into the final position.	If placing the pipe in an excavation, confirm it is free of debris and has the correct bedding.
9	Remove the temporary pipe supports.	—
10	After the move is complete, verify that the pipe is visually inspected for damage.	Visual inspection is a separate covered task and shall be completed by a qualified individual.
11	Make notifications, as required by the operator, to the control center and affected personnel.	—
12	Document all required information per the operator's procedure.	—

Task 35.0—Inspect Clearance of Existing Pipe to Underground Structures

1.0 Task Description

This task includes reviewing and applying operator procedures for required clearance specifications between the pipeline facility and foreign underground structures and determining the allowable minimum clearance by taking a measurement at the closest point between the underground foreign structure and the pipeline facility.

This task begins once the pipeline facilities are located and the path of the foreign underground encroachment has been determined. This task ends after the measurement has been recorded and documented.

This task does not include but may lead to the performance of other covered tasks such as:

— Examine for Mechanical Damage on Buried or Submerged Pipe (reference Task 5.1);

— Examine for External Corrosion on Buried or Submerged Pipe (reference Task 5.2);

— Inspect the Condition of External Coating on Buried or Submerged Pipe (reference Task 5.3);

— Perform Coating Inspection (reference Task 7.7).

2.0 Knowledge Component

This task is performed to confirm clearance between the pipeline facility and the underground foreign structure per the operator's specifications.

An individual performing this task shall have knowledge of:

a) operator specifications for allowable clearance;

b) operator requirements for excavation;

c) coating damage and anomalies;

d) evidence of mechanical damage.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of mechanical damage or corrosion.	Notify the appropriate personnel to take action as required.
Unexpected release of product.	Stop work, move to a safe location (if necessary), and notify the appropriate personnel and take action as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Review the operator procedures and clearance specifications.	This step informs the individual of the operator's established clearance specifications.
2	Determine the clearance between the pipeline facility and the underground foreign structure.	This step provides a baseline for measuring clearance and confirming allowable clearance.
3	Take measurements at closest point between the underground foreign structure (proposed or installed) and the pipeline facility.	This step identifies whether the underground foreign structure is within allowable clearance to the pipeline facility and describes the actions the individual should take if it is not. If measurement is not within acceptable clearance, stop activities and make notification to appropriate personnel for guidance on (1) practicality of maintaining specified minimum clearance and (2) what, if any, corrosion control measures would be required to protect the pipeline facility.
4	Document all required information per the operator's procedure.	Complete appropriate documentation according to the operator's procedures.

Task 38.1—Perform Visual Inspection of Pipe and Pipe Components Prior to Installation

1.0 Task Description

This task involves the visual inspection of pipe and components at the site of, and just prior to installation on, the pipeline system. The task does not include an assessment of damage and any determination of the measures that should be taken to mitigate the damage found during an inspection.

This task begins with visually inspecting pipe and components. This task ends with communicating the results.

2.0 Knowledge Component

The purpose of the inspection is to ensure that the pipe and components are not visibly damaged in a manner that could impair their strength or reduce their serviceability and to ensure that the pipe and components are rated for intended service.

An individual performing this task shall have knowledge of:

a) Coating defects that can be visually identified such as cuts, scratches, or other defects characterized by a visually determined loss of coating (also known as a “holiday”).

b) Each length of pipe with a nominal outside diameter of $4^1/_2$ in. (114.3 mm) or more shall be marked on the pipe or pipe coating with the specification to which it was made, the specified minimum yield strength or grade, and the pipe size. The marking shall be applied in a manner that does not damage the pipe or pipe coating and shall remain visible until the pipe is installed.

c) Each valve shall be marked on the body or the nameplate with at least the following:

   1) manufacturer’s name or trademark;

   2) class designation or the maximum working pressure to which the valve may be subjected;

   3) body material designation (the end connection material, if more than one type is used);

   4) nominal valve size;

   5) monogram license.

d) Butt-welding type fittings shall meet the marking and end preparation required by the operator’s specification.

Terms applicable to this task:

buckled or wrinkled bends
Bends shall have a smooth contour. Buckles and wrinkles are physical defects that are characterized by bulging or warping of the pipe.

component
Any part of a pipeline that may be subjected to pump pressure, including but not limited to pipe, valves, elbows, tees, flanges, and closures.

corrosion
Surface rust or pitting are examples of conditions that may be identified during a visual inspection.

crack
A surface flaw or defect characterized by a break without complete separation.

dent
A depression in the surface that has been created by external forces on the pipe or component with no visual evidence of metal loss.

gouge
A surface flaw characterized by the removal of steel from the pipe or component.

maximum operating pressure
MOP
The maximum pressure at which a pipeline or segment of a pipeline or a component may be normally operated.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Mechanical, corrosion, or coating damage is present on component.	Make appropriate notifications according to the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Visually inspect pipe and components for: — corrosion; — defects such as cracks, grooves, gouges, dents, or out-of-round pipe; — coating damage; — buckles or wrinkles in bends.	This inspection occurs at the installation location just prior to installation. NOTE This inspection does not include an assessment of damage and a determination of the measures necessary to mitigate the damage.
2	Ensure that component is rated for intended service.	Confirm that the markings on the pipe and components are compatible with the MOP for the system.
3	Communicate the inspection results.	A satisfactory outcome of the inspection shall be achieved. If not, the condition shall be noted and resolved. Complete all required documentation and notifications according to the operator's procedures.

Task 38.3—Perform Visual Inspection of Welds

1.0 Task Description

This task involves visually inspecting welds to ensure that they are performed in accordance with the applicable qualified welding procedure and identify any defects that may affect the integrity of a pipeline.

This task begins with a visual inspection and includes identifying any conditions that do not meet the qualified welding procedure. This task ends with communicating the results.

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Nondestructive Testing—Radiographic Testing (reference Task 38.4);

— Perform Nondestructive Testing—Liquid Penetrant Testing (reference Task 38.5);

— Perform Nondestructive Testing—Magnetic Particle Testing (reference Task 38.6);

— Perform Nondestructive Testing—Ultrasonic Testing (reference Task 38.7);

— Perform Nondestructive Testing—Magnetic Flux Leakage Testing (reference Task 38.8).

2.0 Knowledge Component

The purpose of the inspection is to ensure that the welds were produced in accordance with the applicable welding procedure and to identify any defects that may affect the integrity of a pipeline during or after tie-in or component replacement.

An individual performing this task shall have knowledge of:

— The inspection of welds and identification of conditions as defined by the latest DOT-approved edition of API 1104, ASME *BPVC* Section IX, ASME B31.3, API 510, API 650, or API 653 and the operator's applicable welding procedure(s). These are limited to conditions that can be identified visually.

Terms applicable to this task:

arc burns
These occur on the internal or external surface of the pipe as a result of inadvertent arc strikes or improper grounding. They generally appear as a pit or cavity visible to the eye. The cavity may be surrounded by a hard heat-affected zone that may be of lower toughness than the base material or the weld deposit.

crack
A surface flaw or defect characterized by a break without complete separation.

external undercut
EU
A groove melted into the parent material adjacent to the toe or root of the weld and left unfilled by weld metal.

individual or scattered porosity
Gas trapped by solidifying weld metal before the gas has a chance to rise to the surface of the molten puddle and escape. Porosity is generally spherical but may be elongated or irregular in shape, such as piping (wormhole) porosity.

qualified welding procedure
A tested and proven detailed method by which sound welds with suitable mechanical properties can be produced. The procedure shall be written, and records shall include the results of qualifying tests. An individual performing this task shall be knowledgeable of the operator's applicable written welding procedure.

slag inclusions
A nonmetallic solid entrapped in the weld metal or between the weld metal and the parent material. Elongated slag inclusions—e.g. continuous or broken slag lines or wagon tracks—are usually found at the fusion zone. Isolated slag inclusions are irregularly shaped and may be located anywhere in the weld.

weld (cap) height
The distance the completed weld extends beyond the height of the parent material. The weld dimensions, including the weld height, are determined by the written welding procedure.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Identify any indications or imperfections that may affect the integrity of the component.	Make appropriate notifications per the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Perform a visual inspection and identify any conditions that may affect the integrity of the weld. Conditions may include the following: — arc burn; — cracks; — external undercut; — pinhole/porosity; — slag; — weld (cap) height—inadequate or excessive.	Arc burns and cracks are not acceptable and shall be repaired. Surface pinholes are an indication of porosity. Slag and weld splatter can mask surface imperfections. Acceptable weld dimensions, including the minimum and maximum weld height, are determined by the applicable qualified welding procedure.
2	Communicate the inspection results.	A satisfactory outcome shall be achieved. If a satisfactory outcome is not achieved, make appropriate notifications per the operator's procedures.

Task 38.4—Perform Nondestructive Testing—Radiographic Testing

1.0 Task Description

This task involves the performance of radiographic nondestructive testing to identify any indications or imperfections that may affect the integrity of a pipeline system.

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Visual Inspection of Welds (reference Task 38.3).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) An individual performing this task shall provide documentation of certification through ASNT SNT-TC-1A, ACCP certification for radiography, or any other recognized national certification program that shall be acceptable to the operator for the test method used.

b) Testing requirements defined by the latest DOT-approved edition of API 1104, ASME *BPVC* Section IX, or ASME B31.3.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Identify any indications or imperfections that may affect the integrity of the component.	Make appropriate notifications per the operator's procedures.

3.0 Skill Component

The certificate demonstrates task performance proficiency:

Step	Action	Explanation
1	Evaluate pipeline component utilizing radiography to identify any indications or imperfections that may affect the integrity.	Certification required to Level II or III in accordance with the recommendations of ASNT SNT-TC-1A, ACCP for radiography, or any other recognized national certification program that shall be acceptable to the operator for the test method used.

Task 38.5—Perform Nondestructive Testing—Liquid Penetrant Testing

1.0 Task Description

This task involves the performance of liquid penetrant nondestructive testing to identify indications and imperfections that may affect the integrity of a pipeline system.

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Visual Inspection of Welds (reference Task 38.3).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) An individual performing this task shall provide documentation of certification through ASNT SNT-TC-1A, ACCP certification for liquid penetrant testing, or any other recognized national certification program that shall be acceptable to the operators for the test method used.

b) Testing requirements defined by the latest DOT-approved edition of API 1104, ASME *BPVC* Section IX, or ASME B31.3.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Identify any indications or imperfections that may affect the integrity of the component.	Make appropriate notifications per the operator's procedures.

3.0 Skill Component

The certificate demonstrates task performance proficiency:

Step	Action	Explanation
1	Evaluate the pipeline component utilizing liquid penetrant testing to identify any indications or imperfections that may affect the integrity.	Certification required to Level II or III in accordance with the recommendations of ASNT SNT-TC-1A, ACCP for liquid penetrant testing, or any other recognized national certification program that shall be acceptable to the operators for the test method used.

Task 38.6—Perform Nondestructive Testing—Magnetic Particle Testing

1.0 Task Description

This task involves the performance of magnetic particle nondestructive testing to identify any indications or perfections that may affect the integrity of a pipeline system.

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Visual Inspection of Welds (reference Task 38.3).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) An individual performing this task shall provide documentation of certification through ASNT SNT-TC-1A, ACCP certification for magnetic particle testing, or any other recognized national certification program that shall be acceptable to the operator for the test method used.

b) Testing requirements defined by the latest DOT-approved edition of API 1104, ASME *BPVC* Section IX, or ASME B31.3.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Identify any indications or imperfections that may affect the integrity of the component.	Make appropriate notifications per the operator's procedures.

3.0 Skill Component

The certificate demonstrates task performance proficiency:

Step	Action	Explanation
1	Evaluate pipeline component utilizing magnetic particle testing to identify any indications or imperfections that may affect the integrity.	Certification required to Level II or III in accordance with the recommendations of ASNT SNT-TC-1A, ACCP for magnetic particle testing, or any other recognized national certification program that shall be acceptable to the operator for the test method used.

Task 38.7—Perform Nondestructive Testing—Ultrasonic Testing

1.0 Task Description

This task involves the performance of ultrasonic nondestructive testing to identify any indications and imperfections that may affect the integrity of a pipeline system.

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Visual Inspection of Welds (reference Task 38.3).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) An individual performing this task shall provide documentation of certification through ASNT SNT-TC-1A, ACCP certification for ultrasonic testing, or any other recognized national certification program that shall be acceptable to the operator for the test method used.

b) Testing requirements defined by the latest DOT-approved edition of API 1104, ASME *BPVC* Section IX, or ASME B31.3.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Identify any indications or imperfections that may affect the integrity of the component.	Make appropriate notifications per the operator's procedures.

3.0 Skill Component

The certificate demonstrates task performance proficiency:

Step	Action	Explanation
1	Evaluate the pipeline component utilizing ultrasonic testing to identify any indications or imperfections that may affect the integrity.	Certification required to Level II or III in accordance with the recommendations of ASNT SNT-TC-1A, ACCP for ultrasonic testing, or any other recognized national certification program that shall be acceptable to the operator for the test method used.

Task 38.8—Perform Nondestructive Testing—Magnetic Flux Leakage Testing

1.0 Task Description

This task involves the performance of magnetic flux leakage nondestructive testing to identify indications and imperfections that may affect the integrity of a pipeline system.

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Visual Inspection of Welds (reference Task 38.3).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) An individual performing this task shall provide documentation of certification through ASNT SNT-TC-1A, ACCP certification for magnetic flux leakage testing, or any other recognized national certification program that shall be acceptable to the operators for the test method used.

b) Testing requirements defined by the latest DOT-approved edition of API 1104, ASME *BPVC* Section IX, or ASME B31.3.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Identify any indications or imperfections that may affect the integrity of the component.	Make appropriate notifications per the operator’s procedures.

3.0 Skill Component

The certificate demonstrates task performance proficiency:

Step	Action	Explanation
1	Evaluate the pipeline component utilizing magnetic flux leakage testing to identify any indications or imperfections that may affect the integrity.	Certification required to Level II or III in accordance with the recommendations of ASNT SNT-TC-1A, ACCP for magnetic flux leakage testing, or any other recognized national certification program that shall be acceptable to the operators for the test method used.

Task 39—Perform Backfilling

1.0 Task Description

This task applies to the process and material to backfill or cover a buried pipeline that has been excavated or otherwise exposed. Backfilling shall be done in a manner that provides firm support to the pipe while preventing damage to the pipe and/or coating from equipment or the material that is used for backfilling.

This task begins with the visual inspection of the excavation and backfilling material. This task ends with the documentation after the pipe is sufficiently covered such that further backfilling would not cause damage to the pipe and/or coating.

2.0 Knowledge Component

The purpose of this task is to prevent damage from occurring to the pipe or its coating when backfilling an exposed pipeline.

An individual performing this task shall have knowledge of:

a) pipe support procedures and methods;

b) unacceptable backfill material, which can include the following:

   1) items that could affect compaction, such as roots, stones, brush, broken skids, broken tools, and trash;

   2) items that could affect CP systems, such as cans, hand tools, welding rods, clamps, and scrap metal left in the ditch;

   3) items that could affect coating systems, such as large rocks, sharp objects, soil contaminated by hydrocarbons, or large chunks of hard-packed clay or dirt;

   4) items that could contain organic or corrosive materials that could cause localized pipe wall corrosion, such as battery acid, nitrate material, and caustic matter.

Terms applicable to this task:

crowning
The act of applying backfill material over an excavation site to an elevation that is greater than the adjacent ground level for the purpose of compensating for future settling (natural occurring compaction) of the material used to backfill the excavation.

rock shield
Operator-approved material that is applied around a pipe prior to backfilling for the purpose of preventing backfill material from becoming embedded into or otherwise damaging the coating of the pipe during the backfilling process.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Response
Coating damage from coarse materials.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Pipeline mechanical damage (e.g. dent, gouge, and scrape).	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.
Pipeline stress resulting from pipe movement (e.g. pipe sag).	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Inspect excavation and backfill material for presence of foreign objects or debris. Remove any objects that could cause damage to the pipe or coating. If excavated material is not suitable to refill the excavation, replace with suitable material or use a rock shield.	Visual inspection will identify if foreign objects or debris are in the excavation or backfill material that need to be removed. Noncoarse material shall be used near the coating; coarse backfill material may damage the pipe coating and potentially the pipe.
2	Starting from underneath the pipe, backfill the excavation with suitable material in appropriate increments while continuously monitoring the composition of the fill material.	Ensure that there are no voids located near the pipeline. Monitor the fill material for unacceptable material and remove material that may be too coarse for the location. Continuous monitoring shall be performed throughout the backfilling process.
3	Ensure soil compaction for proper pipe support during backfilling operations. Tamping is required to compact soil.	If soil used for support is not compacted, a pipe will move, adding stress to the pipe.
4	Continue to backfill equally along both sides of the pipe until adequate cover is achieved. When applicable, compact soil using appropriate equipment/methods.	Settlement could mean increased risk to pipeline by third-party damage.
5	Crown the backfill according to the operator's procedures.	Crowning is usually performed to compensate for settlement of backfill.
6	Complete the appropriate notification and documentation according to the operator's procedures.	Proper documentation is critical to future analysis and identification of problem areas.

Task 40.1—Fit Full Encirclement Welded Split Sleeve (Oversleeve, Tight-fitting Sleeve, etc.)

1.0 Task Description

The full encirclement welded split sleeve is a type of repair used for covering anomalies on a pipeline with two halves installed around the circumference of the pipeline in preparation for welding. Full encirclement split sleeves are designed to be installed on an in-service pipeline.

This task begins with confirming the preparation of the carrier pipe. This task ends with confirmation that the sleeves are correctly installed, and the proper welding gap has been established.

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Nondestructive Testing—Ultrasonic Testing (reference Task 38.7);

— Perform Welding (reference Task 42.7).

2.0 Knowledge Component

The full encirclement welded split sleeve is a permanent pressure-containing repair applied to a leaking or nonleaking defect.

An individual performing this task shall have knowledge of:

a) This type of sleeve may also be applied to reinforce the wall of the carrier pipeline where a defect exists. The length of the sleeve varies according to the extent of the defect to be repaired. Type A sleeve installation parameters are dictated by the welding procedure used.

b) The notification(s) that shall be completed prior to and/or after the task is completed, according to relevant operator procedures.

Terms applicable to this task:

full encirclement sleeve
Rolled steel formed in two halves to encase the pipeline. The pressure rating of the sleeve shall be equal to or greater than the carrier pipe.

type A sleeve
A steel split sleeve that only requires welding of the longitudinal seams of the sleeves. It is installed under compression.

type B sleeve
A steel split sleeve that requires welding the longitudinal seams of sleeves and welding the ends of the sleeves to the carrier pipe.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Anomaly or other defect on carrier pipe outside the area of application.	Notify the operator or appropriate individual.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Confirm that surface has been properly prepared according to the applicable covered task.	Coating removal and surface preparation is performed under Task 7.2, Task 7.3, or Task 7.4.
2	Confirm that pipe surface has been inspected for dents, gouges, or other irregularity according to applicable covered task.	Inspection of the pipe surface is performed under Task 5.1, Task 5.2, or Task 5.3.
3	Confirm the proper type of sleeve to be installed.	Ensures the proper type of sleeve will be installed. Type A sleeves are installed to reinforce the carrier pipe. Type B sleeves are installed for pressure-containing purposes.
4	Fill defects as needed, with operator-approved material. Filler material shall be applied following the manufacturer's recommendations.	Restricts flexion of the carrier pipe to maintain integrity.
5	If the installation is to be a type B sleeve, confirm that acceptable wall thickness has been measured in the seal welding zones according to the applicable covered task.	Ensures integrity of carrier pipe at location of split sleeve ends to be welded for a type B sleeve. Wall thickness measurement is performed under Task 8.2.
6	If the installation is to be a type A sleeve, follow the welding procedure to ensure the proper fit.	The welding procedure determines the techniques to apply compression to the sleeve and may include preheating and mechanical compression.
7	Verify proper sleeve length and material grade per the operator's procedures.	Ensures sleeve meets operator standards, manufacturer's specifications, and industry codes.
8	Prepare and fit the sleeve to the pipeline.	Ensures proper coverage of defect and fit of the sleeve.
9	Use lifting device and chains or clamps to achieve a proper fit and an equal welding gap for the longitudinal seam, as necessary.	Ensures proper coverage of defect and fit of sleeve. Improper use of the lifting device could result in damage to the carrier pipe.
10	Make notifications per the operator's procedures.	Follow the operator's policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 40.3—Apply Composite Sleeve

1.0 Task Description

Application of composite material repairs corrosion and mechanical damage defects for an in-service pipeline.

This task begins with confirming the preparations of the pipe as required by the manufacturer prior to applying the composite material. This task ends with a completed application as defined in the manufacturer's procedures.

2.0 Knowledge Component

The application of composite material in the form of multiple layers of woven fiber wrap or rigid fiber sleeves is an acceptable alternative to steel split sleeves for repairing corrosion and mechanical damage defects. Composite sleeves are designed to be applied to an in-service pipeline. The process also includes the application of filler material to eliminate voids and dents in the carrier pipe surface prior to applying the composite sleeve.

Composite sleeve manufacturers have structured curriculum, training, and certification processes to ensure installers have the knowledge and skills necessary to install their product in accordance with their specifications.

An individual performing this task shall have knowledge of:

a) A composite material shall be installed according to the manufacturer's procedures. The material consists of woven fiber cloth wrapped around the carrier pipe or rigid fiber sleeves shaped to fit the circumference of the carrier pipe. A chemical bonding system is used to adhere the material to the carrier pipe to establish the repair.

b) The notification(s) that shall be completed prior to and/or after the task is completed, according to relevant operator procedures.

Terms applicable to this task:

composite material
A high-strength glass or carbon fiber material or laminate that is wrapped around a pipe and adheres to the surface with an adhesive or resin bonding system.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Anomaly or other defect on carrier pipe outside the area of application.	Notify the operator of suspected defect.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Ensure that the carrier pipe surface is cleaned and prepared according to the manufacturer's procedures.	Ensures proper adhesion/bonding of material to pipe surface.
2	Fill defects, as needed, according to the composite material manufacturer's procedures.	Restricts flexion of carrier pipe to maintain integrity.
3	Apply composite material according to the manufacturer's instructions.	Follow the manufacturer's procedures for all steps, such as applying adhesive, wrapping, and sealing the material.
4	Make notifications per the operator's procedures.	Follow the operator's policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 40.4—Install Mechanical Bolt-on Split Repair Sleeve

1.0 Task Description

This task includes installing a mechanical bolt-on repair device on an in-service pipeline. The mechanical bolt-on repair device is designed to be installed on an in-service pipeline. This type of device is considered a pressure-containing repair and can be used on a leaking defect.

This task begins with preparation of the carrier pipe pursuant to the device manufacturer's procedures. This task ends when the bolts are tightened using the proper sequence and torque per the manufacturer's specifications.

This task does not include but may lead to the performance of other covered tasks such as:

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2).

2.0 Knowledge Component

The mechanical bolt-on device is a type of pipeline repair used for covering anomalies with a full encirclement component secured onto the pipeline.

An individual performing this task shall have knowledge of:

a) Mechanical bolt-on repair devices (type B) are designed for application on a pipeline and its flanged assemblies. The mechanical bolt-on repair device may be used as a temporary or permanent repair applied to a leaking defect. A permanent repair will require seal welding.

b) The bolts used to secure the repair device shall be tightened in the proper torque sequence and value to properly establish a satisfactory seal. The bolting sequence and torque shall be completed according to the manufacturer's specifications.

c) Bolt-on repair devices should be delivered with specifications identifying the pressure rating, material grade, and other details that shall be verified to ensure compatibility with the pipeline operating pressure and service.

d) The notification(s) that shall be completed prior to and/or after the task is completed, according to relevant operator procedures.

Terms applicable to this task:

bolt-on repair device
A device, including sleeves or clamps that is equipped with seals that are bolted together around the pipeline circumference to repair defects, including leaks. This type of device is available in various designs, lengths, and diameters and may be welded to the pipeline for permanent installation.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Anomaly or other defect on carrier pipe outside the area of installation.	Notify the operator of the suspected defect.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Prepare the carrier pipe for a proper fit of the sealing elements according to the manufacturer's instructions.	Ensures the sealing integrity of the repair device.
2	Prior to installing the device on the carrier pipe, confirm that an acceptable wall thickness has been measured in the seal welding zones if the installation is to be permanent.	Ensures that a qualified person has measured the wall thickness of carrier pipe. Ensures the integrity of the carrier pipe in anticipation of welding, if necessary.
3	Install the repair device and tighten the bolts using the proper sequence and torque per the manufacturer's specifications.	Ensures the proper location and sealing integrity of the repair device.
4	Make notifications per the operator's procedures.	Follow the operator's policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 40.5—Install Weldable Compression Coupling

1.0 Task Description

This task involves the installation of a weldable compression coupling. A weldable compression coupling is a bolt-on repair device used to mechanically connect pipeline segments, and it is installed by being clamped to the surface of a pipeline. Once attached, longitudinal bolts apply pressure to a steel ring and neoprene seal. The neoprene seal expands and provides a compressive seal between the coupling and exterior surface of the pipe.

This task begins with preparation of the carrier pipe pursuant to the device manufacturer's procedures. This task ends when the bolts are tightened using the proper sequence and torque per the manufacturer's specifications.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2).

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Nondestructive Testing—Ultrasonic Testing (reference Task 38.7);

— Perform Welding (reference Task 42.7).

2.0 Knowledge Component

A weldable compression coupling is a bolt-on repair device mechanically connected to the pipeline to provide a compressive seal between the coupling and exterior surface of the pipe as a temporary or permanent repair.

An individual performing this task shall have knowledge of:

a) appropriate application of a weldable compression coupling device; a weldable compression coupling device is designed for application on a pipeline or flanged assembly; a device may be used as a temporary or permanent repair;

b) torque procedures;

c) compatibility of weldable compression coupling device with existing pipeline;

d) the notification(s) that shall be completed prior to and/or after the task is completed, according to relevant operator procedures.

Terms applicable to this task:

weldable compression coupling
A device that uses radial bolts to attach a compression coupling to the surface of a pipeline. Once attached, longitudinal bolts apply pressure to a steel ring and neoprene seal that expand, providing a compressive seal between the weldable compression coupling and exterior surface of the pipe. This type of device is available in various designs, lengths, and diameters, and it may be welded to the pipeline for permanent installation.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Anomaly or other defect on a carrier pipe inside the area of installation.	Notify the operator of the suspected defect.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the compatibility of the weldable compression coupling device with pipeline and the shelf life of the seal.	This ensures that the coupling device and seal are properly rated for the pipe being repaired.
2	Prepare the carrier pipe for proper fit of the sealing elements according to the manufacturer's instructions.	This step ensures the sealing integrity of the device.
3	Prior to installing the device on the carrier pipe, confirm that the acceptable wall thickness has been measured in the seal welding zones if the installation will be permanent.	Confirmation of the wall thickness ensures the integrity of the carrier pipe in anticipation of welding, if necessary.
4	Install the repair device and tighten the bolts using the proper sequence and torque per the manufacturer's specifications.	The bolts used to secure a coupling shall be tightened in the proper torque sequence and value in order to establish a satisfactory seal. This step ensures the proper location and sealing integrity of the repair device.
5	Make notifications per the operator's procedures.	Follow the operator's policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 40.6—Install and Remove Plugging Machine

1.0 Task Description

This task involves installation and operation of a plugging machine to allow for isolation of a section of a pipeline and for removal of the plugging machine. The fitting referenced in this task has been installed by a person qualified to perform the respective task prior to installing the plugging machine.

This task begins with the installation of the plugging machine on the valve. This task ends with the removal of the plugging machine from the valve.

2.0 Knowledge Component

The installation or removal of the plugging machine allows for isolation of a pipeline segment or the diversion the flow on an active pipeline.

An individual performing this task shall have knowledge of:

a) the plugging machine that is installed on an operating pipeline to temporarily isolate a section of the pipeline;

b) the plugging machine serves as a temporary block valve;

c) the notification(s) that shall be completed prior to and/or after the task is completed, according to relevant operator procedures.

Terms applicable to this task:

completion plug
A plug designed to seal the opening created by a hot tap. The plug allows the installation and removal of the tapping machine or plugging machine and valve.

fitting
A component welded or clamped to the pipeline upon which a valve is installed to allow tapping and plugging.

plugging machine
A machine installed onto a valve for the purpose of inserting a plug to isolate a pipeline segment or divert the flow.

tapping valve
The component installed on the fitting to control product flow while inserting the boring bar and operating the cutter on the pipeline or breakout tank and during removal of the tapping machine.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Malfunction of or damage to tapping machine, tapping valve, or other related equipment that has the potential for loss of product.	Stop operation and secure the equipment if safe to do so. Inspect the equipment and readjust or reset as necessary.
Pipeline pressure exceeds the rated capacity of the plug.	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator or appropriate individual. Inspect the equipment and readjust or reset, as necessary.
Inadequate supports for the plugging machine cause stress and pipeline damage.	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator or appropriate individual. Inspect the equipment and readjust or reset, as necessary.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Install the plugging machine and other fittings and appurtenances as required by the manufacturer's specifications.	This step allows for the insertion of the plug into the pipeline and for pressure equalization. This will ensure valve and fitting will maintain integrity and prevent leakage. Verify that fittings and appurtenances have the required pressure rating.
2	Install the appropriate support for the plugging machine as necessary.	This step ensures that the weight of the plugging machine does not overstress the pipe.
3	Prior to opening the valve, equalize the pressure on each side of the valve if possible.	Equalized pressure facilitates operation of the tapping machine.
4	Slowly open the valve fully on the fitting.	This step allows the plugging machine access to the pipe.
5	Operate the plugging machine to lower the plug into place.	Plug insertion will stop the product flow.
6	Monitor the pipeline pressure upstream and downstream of the plug.	This step ensures that pressure does not exceed manufacturer's specifications.
7	Confirm that maintenance repairs are complete.	—
8	Equalize the pressure on either side of the plug.	Equalized pressure will allow retraction of the plug.
9	Retrieve the plug from the pipe.	The plug is retracted into the plugging machine.
10	Close the tapping valve and relieve the pressure from the plugging machine.	The plugging machine is isolated from the product flow. Ensures that the tapping valve is fully closed.
11	Drain the plugging machine before removal.	Depressurize and drain the product trapped between the valve and plugging machine to ensure that residual product is not inappropriately released.
12	Remove the plugging machine from the tapping valve.	Install the cap, blind flange, piping, instrumentation, or other component onto the fitting or valve per the operator's procedures.
13	Make notifications per the operator's procedures.	Follow the operator's policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 40.7—Install and Remove a Tap 2 in. and Under on a Pipeline System

1.0 Task Description

This task provides the means for safely hot tapping into an operating pipeline or breakout tank. This task may or may not require the removal of a coupon.

This task starts with the installation of the tapping machine onto the tapping valve. This task ends with the removal of the tapping machine from the tapping valve and retrieval of the coupon, if applicable.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2);

— Insert and Remove Coupons (reference Task 10.1);

— Welding (reference Task 42.7).

This task does not include but may lead to the performance of other covered tasks such as:

— Install and Remove Completion Plug on Pipelines Larger Than 2 in. on a Pipeline System (reference Task 40.9).

2.0 Knowledge Component

Hot tapping is performed on an in-service pipeline or breakout tank to make connections without having to shut down.

An individual performing this task shall have knowledge of:

a) the details of line segment, such as pressure, flow, wall thickness, and product, to ensure that all materials [machine, fitting(s), appurtenances] are appropriately rated;

b) the notification(s) that shall be completed prior to and/or after the task is completed, according to relevant operator procedures.

Terms applicable to this task:

bleeder valve
A valve that allows the controlled relief of pressure.

boring bar
The main shaft of a tapping machine that turns the cutter.

coupon
The piece of wall cut from a pipeline or breakout tank with a cutter.

cutter
The cutter is the tool used to drill or cut a hole through the wall of a pipeline or breakout tank. The cutter may or may not produce a coupon.

fitting
A component welded or clamped to the pipeline upon which a tapping valve is installed to allow tapping and plugging.

hot tap
The process of safely cutting or boring a hole into an in-service pipeline or breakout tank.

tapping machine
drilling machine
A machine installed onto the appropriate tapping valve for the purpose of boring a hole into a pipeline or breakout tank.

tapping valve
The component installed on the fitting to control product flow while inserting the boring bar and operating the cutter on the pipeline or breakout tank and during removal of the tapping machine.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Malfunction of or damage to tapping machine, tapping valve, or other related equipment that has the potential for loss of product.	Stop operation and secure equipment, if safe to do so. Inspect equipment and readjust or reset, as necessary.
Unexpected release of hazardous liquid.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.
Lost coupon may damage downstream equipment.	Immediately notify the operator.
Pressure trapped between the tapping valve and the hot tap machine.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.
Loss of product by boring hole through opposite wall of pipeline.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.
Improper alignment may result in damage to tapping valve or tapping machine.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.
Damage to pipeline from the tapping machine that could affect integrity.	Stop operation and secure equipment, if safe to do so. Determine the extent of the damage and make appropriate notifications and documentation as required by the operator.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the proper tapping valve and fitting were installed according to the applicable procedure.	This will ensure tapping valve and fitting will maintain integrity and prevent leakage during the hot tapping task.
2	Confirm proper operation of the tapping valve and that it is in the open position.	This allows insertion of the boring bar and cutter through the tapping valve bore.
3	Confirm the tapping machine rating and cutter size.	Verifies the proper machine rating on specific size pipelines.
4	Assemble the tapping machine per the manufacturer’s procedures.	Assembles the tapping machine to bore the proper sized hole.

Step	Action	Explanation
5	Prior to connecting the tapping machine to the tapping valve, make necessary measurements to determine the depth of the cut.	Accurate measurement is important to ensure the tap is performed correctly.
6	Verify the operating conditions meet operator procedures and requirements.	Ensure that pressures, level, product, or other operational parameters are as specified by the operator.
7	Install the tapping machine on the tapping valve and ensure the cutter can pass through the open tapping valve and the tapping valve can be fully closed when the cutter is retracted.	Performing this step ensures tapping valve operation and that isolation can occur before and after the tap is made.
8	Conduct leak test.	Verify no leaks occur, per operating procedure.
9	Lower the boring bar to verify proper alignment and initial depth measurements.	Accurate measurement is important to ensure the tap is performed correctly.
10	Operate tapping machine and perform hot tap according to the manufacturer's instructions.	Verity depth measurements of cutter assembly to prevent drilling through the opposite pipe wall.
11	Raise the boring bar, cutter, and pilot bit and verify depth measurements to ensure valve clearance and allow closure.	Valve closure is necessary to prevent product release.
12	Close the tapping valve.	Prevent release of product when the tapping machine is removed by ensuring the tapping valve is fully closed.
13	Depressurize and drain the product trapped between the tapping valve and the hot tap machine.	Prepare for removal of the tapping machine. Follow operator procedures if unable to relieve pressure.
14	Remove the tapping machine.	—
15	Confirm retrieval of coupon, if applicable.	Provide to appropriate personnel for evaluation. If the coupon is unable to be retrieved, follow the operator policies and procedure(s).
16	Make notifications per the operator's procedures.	Follow the operator's policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 40.8—Install and Remove a Tap Larger Than 2 in. on a Pipeline System

1.0 Task Description

This task provides the means for safely cutting a hole 2 in. and larger in an operating pipeline or breakout tank. This task requires the removal of a coupon.

This task begins with the installation of the valve on the fitting. This task ends with the removal of the tapping machine from the valve and retrieval of the coupon.

The performance of this covered task may require the performance of other covered tasks such as:

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2);

— Insert and Remove Coupons (reference Task 10.1);

— Welding (reference Task 42.7).

This task does not include but may lead to the performance of other covered tasks such as:

— Install and Remove Completion Plug on Pipelines Larger Than 2 in. on a Pipeline System (reference Task 40.9).

2.0 Knowledge Component

Hot tapping is performed on an in-service pipeline or breakout tank to make connections without having to shut down.

An individual performing this task shall have knowledge of:

a) the notification(s) that shall be completed prior to and/or after the task is completed, according to relevant operator procedures;

b) the details of line segment, such as pressure, flow, wall thickness, and product, to ensure that all materials [machine, fitting(s), appurtenances] are appropriately rated.

Terms applicable to this task:

bleeder valve
A valve that allows the controlled relief of pressure.

boring bar
The main shaft of a tapping machine that turns the cutter.

coupon
The piece of wall cut from a pipeline or breakout tank with a cutter.

cutter
The bit that cuts a coupon from the wall of a pipeline or breakout tank. The cutter is equipped with a pilot bit to bore a hole that will center the cutter.

fitting
A component welded or clamped to the pipeline upon which a tapping valve is installed to allow tapping and plugging.

hot tap
The process of safely cutting or boring a hole into an in-service pipeline or breakout tank.

tapping machine
drilling machine
A machine installed onto the appropriate tapping valve for the purpose of boring a hole into a pipeline or breakout tank.

tapping valve
The component installed on the fitting to control product flow while inserting the boring bar and operating the cutter on the pipeline or breakout tank and during removal of the tapping machine.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Malfunction of or damage to tapping machine, tapping valve, or other related equipment that has the potential for loss of product.	Stop operation and secure equipment, if safe to do so. Inspect equipment and readjust or reset, as necessary.
Unexpected release of hazardous liquid.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.
Lost coupon may damage downstream equipment.	Immediately notify the operator.
Pressure trapped between the tapping valve and the hot tap machine.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.
Loss of product by boring hole through opposite wall of pipeline.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.
Improper alignment may result in damage to tapping valve or tapping machine.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.
Damage to pipeline from the tapping machine that could affect integrity.	Stop operation and secure equipment, if safe to do so. Determine the extent of the damage and make appropriate notifications and documentation as required by the operator.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the proper tapping valve and fitting were installed according to applicable procedure.	This will ensure tapping valve and fitting will maintain integrity and prevent leakage during the hot tapping task.
2	Confirm proper operation of the tapping valve and that it is in the open position.	This allows insertion of the boring bar and cutter through the tapping valve bore.
3	Confirm the tapping machine rating and cutter size.	Verifies the proper machine rating on specific size pipelines.
4	Assemble the tapping machine per the manufacturer's procedures.	Assembles the tapping machine to bore the proper sized hole.

Step	Action	Explanation
5	Prior to connecting the tapping machine to the tapping valve, make necessary measurements to determine the depth of cut.	Accurate measurement is important to ensure the tap is performed correctly.
6	Verify the operating conditions meet operator procedures and requirements.	Ensure that pressures, level, product, or other operational parameters are as specified by the operator.
7	Install the tapping machine on the tapping valve and ensure the cutter can pass through the open tapping valve and the tapping valve can be fully closed when the cutter is retracted.	Performing this step ensures tapping valve operation, and that isolation can occur before and after the tap is made.
8	Conduct leak test.	Verify that no leaks occur per operating procedure.
9	Lower the boring bar to verify proper alignment and initial depth measurements.	Accurate measurement is important to ensure that the tap is performed correctly.
10	Operate tapping machine to complete hot tap according to manufacturer's instructions.	Verity depth measurements of cutter assembly to prevent drilling through the opposite pipe wall.
11	Raise the boring bar, cutter, and pilot bit and verify depth measurements to ensure valve clearance and allow closure.	Valve closure is necessary to prevent product release.
12	Close the tapping valve.	Prevent release of product when tapping machine is removed by ensuring that the tapping valve is fully closed.
13	Depressurize and drain the product trapped between the tapping valve and the hot tap machine.	Prepare for removal of the tapping machine.
14	Remove the tapping machine.	—
15	Confirm retrieval of coupon.	Provide to appropriate personnel for evaluation.
16	Make notifications per the operator's procedures.	Follow the operator's policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 40.9—Install and Remove Completion Plug Larger Than 2 in. on a Pipeline System

1.0 Task Description

This task addresses the installation of a completion plug to tightly seal the fitting and allow installation and removal of the valve used in conjunction with a tapping machine or plugging machine. The fitting referenced in this task has been installed by a person qualified to perform the respective task, prior to installing the completion plug.

This task begins with the installation of the tapping machine on the tapping valve. This task ends with the installation of a cap, blind flange, piping, instrumentation, or other component onto the fitting.

2.0 Knowledge Component

A completion plug is used to seal the fitting to allow removal of the valve after completion of a hot tap.

An individual performing this task shall have knowledge of:

a) the completion plug prevents the release of product while a blind flange, piping, valve, or other component is being attached to the fitting; the completion plug can be subsequently removed from the fitting to install a plugging machine;

b) the notification(s) that shall be completed prior to and/or after the task is completed, according to relevant operator procedures.

Terms applicable to this task:

completion plug
A plug designed to seal the opening created by a hot tap. The plug will allow installation and removal of the tapping machine or plugging machine and valve.

fitting
A component welded or clamped to the pipeline upon which a valve is installed to allow tapping and plugging.

plugging machine
A machine installed onto a valve for the purpose of inserting a plug to isolate a pipeline segment or divert the flow.

tapping machine
A machine installed onto the appropriate valve for the purpose of cutting a hole into a pipeline or breakout tank and installing and removing completion plugs.

tapping valve
The component installed on the fitting to control product flow while inserting the boring bar and operating the cutter on the pipeline or breakout tank and during removal of the tapping machine.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Malfunction of completion plug or tapping machine affects integrity of fitting or pipeline.	Stop operation and secure equipment, if safe to do so. Inspect equipment and readjust or reset, as necessary.
Unexpected release of pressure or product from pipeline or completion plug.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator or responsible person and initiate applicable emergency procedures. Remove completion plug or leaking component, inspect or replace components, and reinstall the plug in the fitting.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps for installation of completion plug:

Step	Action	Explanation
1	Assemble plug and plug holder to the boring bar.	Confirms proper assembly of compatible components and the plug correctly fits the void and remains in place once installed, as well as correct retrieval and removal of the plug.
2	Inspect and assemble tapping machine and plug holder components.	Verifies components are in good condition.
3	Take necessary measurements prior to installing the tapping machine on the valve.	Confirms proper seating location.
4	Install tapping machine onto the valve with the plug holder fully retracted.	Prevents damage to tapping machine.
5	Prior to opening the valve, equalize the pressure on each side of the valve if possible.	Equalized pressure facilitates operation of tapping machine and/or valve.
6	Slowly open the valve fully on the fitting.	The valve shall be fully opened to allow insertion of the completion plug.
7	Lower the completion plug into the fitting with the boring bar. Verify proper alignment and initial depth measurements.	Verifies that the plug is mechanically positioned correctly.
8	Confirm plug is properly set.	Confirms proper containment of product in the pipeline.
9	Safely relieve pressure.	Confirms proper depressurization and containment of product within tapping machine assembly.
10	Confirm that plug is properly sealed.	Allows proper removal of the tapping machine, valve and installation of the cap, blind flange, etc.
11	Remove the tapping machine from the valve.	Install the cap, blind flange, piping, instrumentation, or other component onto the fitting or valve.

To demonstrate proficiency of this task, an individual shall perform the following steps for removal of completion plug:

Step	Action	Explanation
1	Visually inspect that the completion plug is seated in the fitting.	Confirms proper alignment for correct retrieval and removal of the completion plug.
2	Verify that the proper tapping valve is installed according to applicable procedure.	This confirms that the tapping valve will maintain integrity and prevent leakage during completion plug removal.
3	Slowly open the tapping valve fully on the fitting.	Verifies that the tapping valve is fully opened to allow removal of the completion plug.
4	Verify clear accessibility to the completion plug.	Verify correct retrieval and removal of the completion plug.
5	Inspect and assemble tapping machine and plug holder components.	Verifies components are in good condition.
6	Take necessary measurements prior to installing the tapping machine on the tapping valve.	Confirms proper fit.
7	Install tapping machine onto the valve with the boring bar fully retracted.	Prevents damage to tapping machine.
8	Lower the boring bar to the plug.	—
9	Verify proper alignment and initial depth measurements.	—
10	Connect to the completion plug.	—
11	Equalize the pressure on each side of the plug prior to removing the plug (if required).	—
12	Remove plug from fitting.	—
13	Retract the boring bar, plug holder, and plug from the fitting and tapping valve.	—
14	After fully retracting the boring bar, plug holder, and completion plug, close the valve and relieve pressure above the tapping valve and from the tapping machine.	Relieve pressure and drain.
15	Remove the tapping machine from the tapping valve.	Once machine is removed, assembly is now ready for further operational tasks.
16	Make notifications per the operator’s procedures.	Follow the operator’s policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 40.11—Install and Remove Completion Plug 2 in. and Under on a Pipeline System

1.0 Task Description

This task addresses the installation of a completion plug to tightly seal the fitting and allow installation and removal of the valve used in conjunction with a tapping machine or plugging machine. The fitting referenced in this task has been installed by a person qualified to perform the respective task, prior to installing the completion plug.

This task begins with the installation of the tapping machine on the tapping valve. This task ends with the installation of a cap, blind flange, piping, instrumentation, or other component onto the fitting.

2.0 Knowledge Component

A completion plug is used to seal the fitting to allow removal of the valve after completion of a hot tap. The completion plug prevents the release of product while a blind flange, piping, valve, or other component is being attached to the fitting. The completion plug can be subsequently removed from the fitting to install a plugging machine.

An individual performing this task shall have knowledge of:

— the notification(s) that shall be completed prior to and/or after the task is completed, according to relevant operator procedures.

Terms applicable to this task:

completion plug
A plug designed to seal the opening created by a hot tap and allow installation and removal of the valve.

fitting
A component welded or clamped to the pipeline upon which a valve is installed to allow tapping and plugging.

plugging machine
A machine installed onto a valve for the purpose of inserting a plug to isolate a pipeline segment or divert the flow.

tapping machine
A machine installed onto the appropriate valve for the purpose of cutting a hole into a pipeline or breakout tank and installing and removing completion plugs.

tapping valve
The component installed on the fitting to control product flow while inserting the boring bar and operating the cutter on the pipeline or breakout tank and during removal of the tapping machine.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Malfunction of completion plug or tapping machine affects integrity of fitting or pipeline.	Stop operation and secure equipment, if safe to do so. Inspect equipment and readjust or reset, as necessary.
Unexpected release of pressure or product from pipeline or completion plug.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator or responsible person and initiate applicable emergency procedures. Remove completion plug or leaking component, inspect or replace components, and reinstall the plug in the fitting.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps for installation:

Step	Action	Explanation
1	Assemble plug and plug holder to the boring bar.	Confirms proper assembly of compatible components and the plug correctly fits the void and remains in place once installed, as well as correct retrieval and removal of the plug.
2	Inspect and assemble tapping machine and plug holder components.	Verifies that components are in good condition.
3	Take necessary measurements prior to installing the tapping machine on the valve.	Confirms proper seating location.
4	Install tapping machine onto the valve with the plug holder fully retracted.	Prevents damage to tapping machine.
5	Prior to opening the valve, equalize the pressure on each side of the valve if possible.	Equalized pressure facilitates operation of the tapping machine and/or valve.
6	Slowly open the valve fully on the fitting.	The valve shall be fully opened to allow insertion of the completion plug.
7	Lower the completion plug into the fitting with the boring bar. Verify proper alignment and depth measurements.	Verifies that the plug is mechanically positioned correctly.
8	Confirm plug is properly set.	Confirms proper containment of product in the pipeline.
9	Safely relieve pressure.	Confirms proper depressurization and containment of product within tapping machine assembly.
10	Confirm plug is properly sealed.	Allows proper removal of the tapping machine, valve and installation of the cap, blind flange, etc.
11	Remove the tapping machine from the valve.	Install the cap, blind flange, piping, instrumentation, or other component onto the fitting or valve.

To demonstrate proficiency of this task, an individual shall perform the following steps for removal:

Step	Action	Explanation
1	Visually inspect that the completion plug is seated in the fitting.	Confirms proper alignment for correct retrieval and removal of the completion plug.
2	Verify that the proper tapping valve is installed according to applicable procedure.	This confirms that the tapping valve will maintain integrity and prevent leakage during completion plug removal.
3	Slowly open the tapping valve fully on the fitting.	Verifies that the tapping valve is fully opened to allow removal of the completion plug.
4	Verify clear accessibility to the completion plug.	Verify correct retrieval and removal of the completion plug.
5	Inspect and assemble tapping machine and plug holder components.	Verifies that components are in good condition.
6	Take necessary measurements prior to installing the tapping machine on the tapping valve.	Confirms proper fit.
7	Install tapping machine onto the valve with the boring bar fully retracted.	Prevents damage to tapping machine.
8	Lower the boring bar to the plug.	—
9	Verify proper alignment and initial depth measurements.	—
10	Connect to the completion plug.	—
11	Equalize pressure on each side of the plug prior to removing the plug (if required).	—
12	Remove plug from fitting.	—
13	Retract the boring bar, plug holder, and plug from the fitting and tapping valve.	—
14	After fully retracting the boring bar, plug holder, and completion plug, close the valve and relieve pressure above the tapping valve and from the tapping machine.	Relieve pressure and drain.
15	Remove the tapping machine from the tapping valve.	Once machine is removed, assembly is now ready for further operational tasks.
16	Make notifications per the operator’s procedures.	Follow the operator’s policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 40.12—Cutting on Steel Pipeline

1.0 Task Description

This task involves the use of cutting equipment (e.g. cold cutter, torch, saw, chisel, and plasma cutter) during the repair of steel pipelines.

This task begins with the identification of the pipe to be cut. This task ends with the completion of the appropriate documentation for the task.

2.0 Knowledge Component

The purpose of this task is to cut steel pipelines in preparation of maintenance repairs.

An individual performing this task shall have knowledge of:

a) operator-approved equipment for cutting, including the following:

   1) torches;

   2) saws;

   3) chisels;

   4) cutters, such as plasma cutters, travel cutters, clamshell cutters, and split-frame cutters;

b) hazardous atmosphere testing with combustible gas monitors;

c) operator procedures for the required timing and locations when testing for hazardous atmospheres;

d) ignition sources.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Hazardous atmosphere.	Stop task activities, leave the area, remove ignition sources if safe to do so, assess the situation for public safety, and notify local operations personnel.
Unexpected release or discharge of product.	Notify the appropriate personnel to take action as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the correct segment of pipe for cutting.	This step ensures that the correct segment of pipeline has been exposed for cutting.
2	Prepare the pipeline surface for cutting.	Cleaning the surface prevents bladed tools from gumming up. When choosing an exact location for the cut, avoid areas with welds or significant pitting to ensure a clean cut. NOTE Design plans may require nondestructive testing to ensure suitable location prior to cutting.

Step	Action	Explanation
3	Support the pipeline.	Secure the pipeline with skids or vises, as needed, to prevent unintended movement and ensure a square cut.
4	Install bonding cables.	This eliminates the risk of static spark.
5	Install the cutter and supports, if applicable.	Ensure that the cutter is aligned properly for the cut.
6	Cut the pipeline.	Cut the pipeline in accordance with the tool manufacturer's instructions.
7	Remove the cutter.	—
8	Inspect the cut.	Inspect the cut to ensure that it is square and even. Uneven edges may need to be recut, chamfered, or ground out in accordance with the work plan.
9	Document completion of the task and notify all affected parties.	Follow the operator's procedures for appropriate documentation and notification.

Task 40.13—Perform Flange Bolting

1.0 Task Description

This task includes connection of flanges applying the appropriate bolting sequence and torquing specifications. This task includes gasket and lubrication selection to obtain a leak-free connection and inspection of the connection.

This task begins with the identification of the installation location. This task ends with the completion of appropriate documentation.

The performance of this covered task may require the performance of other covered tasks such as:

— Install Bonds (reference Task 9.1).

2.0 Knowledge Component

The purpose of this task is to properly align two pipe segments with flanges.

An individual performing this task shall have knowledge of:

a) operator-approved equipment, including gasket types and lubricants;

b) lockout/tagout procedures;

c) bonding;

d) torquing equipment and operator procedures;

e) flange class ratings.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Pitting on the flange faces.	Notify appropriate personnel.
Flange misalignment due to design flaw.	Replace the flawed component.
Unexpected release or discharge of product.	Notify the appropriate personnel to take action as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the location for flange installation.	This step ensures that work is being completed in the correct location and in accordance with the operator's design plan.
2	Inspect flange bolting equipment and materials.	This step ensures that the proper tools, material, and equipment are serviceable and calibrated. This ensures that materials are inspected for proper sizing, damage or corrosion, gasket type, bolt and nut length and diameter, and flange assembly (rating and size).

Step	Action	Explanation
3	Clean the flange faces, nuts, gaskets, studs, and bolts, as necessary.	Rust, debris, or other contaminants shall be removed from the flange, gasket, and threads on nuts and bolts with a wire brush or other approved cleaning method. Confirm that studs are lubricated per the operator's procedure.
4	Align the flange faces.	Insert lineup pins to align the flanges, if needed.
5	Place two bolts in the bottom part of the flange and install an approved gasket.	If installing an insulating kit, make sure that all stud bolt insulating sleeves and flange insulator washers are in place. Follow the manufacturer's specifications that are provided with the insulating kit.
6	Install remaining bolts and hand tighten the nuts.	—
7	Bolt up the flange and tighten accordingly to attain specified torque.	Verify the proper flange tightening sequence and procedure according to the operator's procedure. Pay close attention to angularity and offset to ensure that the flange faces are parallel (same gap around entire flange). Bolts or stud bolts shall extend completely through the nuts.
8	Visually inspect the completed flange and test isolation, if insulated.	Inspect the alignment gasket, and insulators (if installed) ensuring there are no gaps. The isolation testing may be completed by an individual qualified by another task (reference Task 1.5).
9	Make notifications per the operator's procedures.	—
10	Complete required documentation.	Complete appropriate documentation according to the operator's procedures.

Task 40.14—Install Threaded Connections

1.0 Task Description

This task involves installation of threaded connections using approved fittings adequate for intended service.

This task begins with identifying the proper location for the fitting installation. This task ends when the threaded connection is assembled and appropriate documentation has been completed.

The performance of this covered task may require the performance of other covered tasks such as:

— Conduct Pressure Test (reference Task 41).

2.0 Knowledge Component

The purpose of this task is to install pipe threaded connections and components.

An individual performing this task shall have knowledge of:

a) thread sealant application;

b) ability to distinguish various thread types, such as SAE, Metric, NPT, AN, compression, etc.;

c) proper support to obtain a leak-free connection with proper thread engagement;

d) inspection of the connection; some examples are as follows: applicable drain down equipment, including plugs, pipe, instrumentation, and atmospheric vents.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Stop task activities, move to a safe location (if necessary), and notify the appropriate personnel to take action as required.
Discovery of damage (e.g. mechanical damage and corrosion) or anomaly to a pipeline facility.	Stop task activities and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the location for the fitting installation.	This step ensures that the correct location is identified according to the design plan.
2	Inspect fitting materials and equipment.	This step verifies that all materials, including threaded pipes, fittings, and gaskets, meet the required specifications and standards. Inspect the threading equipment and ensure that it is in proper working condition.
3	Prepare the pipe for fitting installation.	This step ensures that pipe ends are clean, free from defects, and have the correct dimensions. This step may also include beveling the pipe ends, if required.

Step	Action	Explanation
4	Visually inspect the threads.	Inspect the threads visually and, if necessary, use thread gauges to ensure that they meet the required specifications. Ensure that the fitting is not cross threaded.
5	Apply thread sealant or tape in accordance with the operator's procedures.	This ensures a tight seal.
6	Assemble the threaded connections.	Assemble the threaded connections by hand and torque to the appropriate torque values ensuring to not overtighten the fitting.
7	Monitor for leaks in accordance with the operator's procedures.	—
8	Make the appropriate notifications that the fitting is ready for pressure testing, if applicable.	This ensures that notifications are completed in accordance with the operator's procedures.
9	Complete required documentation.	Complete appropriate documentation according to the operator's procedures.

Task 40.15—Install and Monitor Vapor Barriers

1.0 Task Description

This task involves sealing and monitoring a portion of pipeline with a vapor barrier (e.g. mud plug, freeze plug, dry ice, inflatable, mechanical) for the purpose of isolating hazardous vapors during pipeline repairs.

This task begins with the selection of the vapor barrier. This task ends when the vapor barrier is removed and all documentation has been completed.

The performance of this covered task may require the performance of other covered tasks such as:

— Install and Remove Completion Plug Larger Than 2 in. on a Pipeline System (reference Task 40.9);

— Install and Remove Plugging Machine (reference Task 40.6);

— Perform Welding (reference Task 42.7).

2.0 Knowledge Component

The purpose of this task is to isolate hazardous vapors during pipeline repairs.

An individual performing this task shall have knowledge of:

a) atmospheric testing used to ensure a safe working environment; the type of vapor barrier being used in the task, including freeze plugs, mud plugs, MRD tools, PLP tools, airbags, etc.;

b) system design and venting measures;

c) which plugs are or are not classified as vapor barriers.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Corrosion: external or internal.	Notify proper operator personnel and document findings. Follow company policy and procedures regarding documentation and notification of appropriate company personnel.
Unexpected release or discharge of product (e.g. incorrect sealing of vapor device).	Notify the appropriate operator personnel to take action as required.
Hazardous atmosphere.	Stop task activities, leave the area, remove ignition sources if safe to do so, assess the situation for public safety, and notify local operations personnel.
Mechanical damage.	Notify proper operator personnel and document findings. Follow company policy and procedures regarding documentation and notification of appropriate company personnel.
Unplanned pressure deviation.	Notify proper company personnel and document findings. Follow company policy and procedures regarding documentation and notification of appropriate company personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Select the equipment in accordance with the operator's procedures.	—
2	Confirm isolation and ventilation of the pipeline segment.	This ensures that the vapor barrier is installed on an isolated line that is vented away from the direction of the worksite.
3	Prepare the pipe surface for installation.	Preparation may vary depending on the type of vapor barrier. This step ensures that the pipeline is in good condition for vapor barrier installation. For freeze plugs, ensure that the area does not include girth welds.
4	Inspect the vapor barrier tool.	Ensures that the seals and other components are in good condition.
5	Install the vapor barrier.	Follow the manufacturer instructions and operator procedures for installation.
6	Test the integrity of the seal.	This step includes using a gas detector to ensure that vapors are not present and the seal is adequate.
7	Mark off the line of fire, hazardous area, in front of the open pipe end in accordance with operator's procedures.	This includes temporarily marking the area with flags, cones, or stakes in accordance with the operator's procedures to ensure the safety of personnel.
8	Monitor the vapor barrier.	This step includes maintaining the vapor barrier to ensure adequate seal and monitoring to verify that there is no pressure buildup or product accumulation. Some tools have built-in venting. Different types of vapor barriers require additional monitoring in accordance with the manufacturer's recommendations. For instance, temperatures shall be monitored for freeze plugs and pressures shall be monitored for air bags. Not all vapor barriers are pressure-holding devices. If pressure builds up behind the vapor barrier, a dangerous situation may be created.
9	Uninstall the vapor barrier.	Follow the manufacturer instructions and operator procedures for uninstalling or deflating the vapor barrier while equalizing pressure. Continue monitoring the atmosphere.
10	Complete required documentation.	Complete appropriate documentation according to the operator's procedures.

Task 40.16—Remove Casings

1.0 Task Description

This task involves using cutting and other equipment to remove casing from carrier pipe.

This task begins with identifying the segment of casing to be removed. This task ends with documentation of the completed task in accordance with the operator's policies and procedures.

This task does not include but may lead to the performance of other covered tasks such as:

— Apply Coating Using Hand Application Methods (reference Task 7.5);

— Apply Coating Using Spray Applications (reference Task 7.6);

— Perform Coating Inspection (reference Task 7.7);

— Perform Backfilling (reference Task 39).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) operator-approved equipment, including torches, shims, and other hand tools;

b) hazardous atmosphere testing with combustible gas indicators;

c) operator procedures for the required timing and locations when testing for hazardous atmospheres while removing casings;

d) types of end seals, including rubber, wrap-around, and zipper-end;

e) ignition sources;

f) the operator's procedures for safely removing test leads.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected release or discharge of product.	Notify the appropriate personnel to take action as required.
Damage is observed on the carrier pipe (e.g. mechanical damage and corrosion).	Make appropriate notifications according to the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the segment of casing to be removed.	This step ensures that the correct segment of pipeline has been exposed for casing removal.

Step	Action	Explanation
2	Remove the end seals, if applicable.	End seals may need to be removed if included in the identified segment. Perform hazardous atmosphere testing throughout the task per the operator's procedures.
3	Install shims, if applicable.	It is ideal to have as much space as possible between the casing and the pipeline when cutting.
4	Prepare the casing surface for cutting.	Cleaning the casing surface prevents bladed tools from gumming up and torches from burning off potentially harmful contaminants.
5	Cut casing.	Cutting techniques may be hot or cold, depending on the operator's procedures. Always refer to the operator's procedures when determining the distance between cuts and the frequency of girth cuts.
6	Remove casing, spacers, shims, and debris from the excavation.	This cleans the area and ensures that the carrier pipe is accessible for visual inspection.
7	Complete required documentation.	Complete appropriate documentation according to the operator's procedures.

Task 40.17—Install Tubing

1.0 Task Description

This task includes the installation of tubing that includes bending, tubing support, and connection of tube and fittings that are adequate for intended service.

The task begins with the identification of the tubing and materials used to complete the task. The task ends with the documentation that the task has been completed.

The performance of this covered task may require the performance of other covered tasks such as:

— Conduct Pressure Test (reference Task 41);

— Install Threaded Connections (reference Task 40.14).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) the type of tubing and its use; uses of tubing include instrumentation control lines and sampling line tubing;

b) manufacturer recommendations and required training for bending and gauging equipment;

c) lockout/tagout procedures;

d) the type of fittings and adapter types needed to make the proper connections according to job specifications and intended use.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Defect on the tubing or threaded connection.	Replace equipment and components as needed.
Unexpected release or discharge of product.	Notify the appropriate personnel to take action as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the tubing and materials to be installed per design specifications.	This ensures the tubing material and installation conform to the operator's specifications and system requirements, including proper support.
2	Visually inspect the tubing and installation equipment.	Ensure that the tubing and all equipment required for the task is in serviceable condition and approved by the operator.
3	Cut and bend the tubing to the required lengths and configuration.	Remove any sharp edges or burrs that could compromise the tubing integrity or interfere with the connection. If applicable, bend the tubing to conform to the pipe's layout with operator-approved bending tools.

Step	Action	Explanation
4	Ensure that the system is isolated.	This includes following the operator's lockout/tagout procedures.
5	Connect the tubing using the appropriate connection method.	Ensure that the tubing is supported, if necessary. NOTE Making connections by threaded fittings is a separate covered task (reference Task 40.14).
6	Inspect the connection per the operator's procedure and the manufacturer's instructions.	This includes a leak test and ensures that there is no damage or cross threading and the bend is smooth. Confirm that the ferrule is not cracked.
7	Complete required documentation.	Complete appropriate documentation according to the operator's procedures.

Task 41—Conduct Pressure Test

1.0 Task Description

This task consists of the activities required for pressure testing steel pipelines and components of a pipeline prior to it being placed in service.

This task begins with isolation of the pipeline segment to be tested. This task ends with the release of test pressure according to the specified procedures.

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) The pressure test provides verification that the pipeline does not leak after withstanding the required pressure for the specified time period. Pressure testing is conducted for purposes such as the following:

   1) maximum operating pressure (MOP) certification or integrity management;

   2) testing for certification;

   3) testing of replacement pipe for sections being relocated, replaced, or otherwise changed;

   4) conversion of service.

b) Pressure testing is normally conducted with water as the test medium (hydrostatic testing). Except for offshore pipelines, liquid petroleum that does not vaporize rapidly may be used as the test medium under the following conditions:

   1) the pipeline test section is outside of cities and populated areas;

   2) buildings within 300 ft feet of test section are unoccupied when test pressure is greater than a pressure that produces a hoop stress of 50 % specified minimum yield strength;

   3) surveillance and continuous communication are maintained along the test section.

c) Test pressure shall be maintained for four continuous hours at a pressure equal to at least 125 % of the MOP. Pipelines that cannot be visually inspected for leakage shall maintain an additional four continuous hours of test pressure equal to 110 % of the MOP.

d) A pressure test plan shall be prepared that identifies the name of the operator and the person conducting the test (including name of test company, if applicable). The following documentation shall be included with the plan:

   1) date and time of the test;

   2) pressure-recording charts;

   3) test instrumentation calibration data;

   4) minimum and maximum test pressures;

   5) minimum time duration of the test;

   6) description of the facility tested and the test apparatus;

   7) temperature of the test medium or pipe during the test period.

e) If elevation differences in the test segment exceed 100 ft, a profile of the pipeline identifying the elevations and test sites shall also be included with the plan documentation.

f) The testing instrumentation calibration shall be current and certified prior to the test. All pipe, components, and test equipment shall be capable of withstanding the required maximum test pressure as required by the test plan. Pressure discontinuities, including test failures that appear on the pressure-recording charts, shall be explained in the pressure test plan.

Terms applicable to this task:

hydrostatic testing
The application of pressure to a pipeline utilizing water as the test medium.

maximum operating pressure
MOP
The maximum pressure at which a pipeline or segment of the pipeline may be normally operated under 49 *CFR* Part 195.

pressure testing
The application of pressure to a pipeline segment or pipe utilizing water or non-HVL product as the test medium. Air or an inert gas may be used as the test medium on a low-stress pipeline.

test instruments
Calibrated equipment, such as deadweight testers, temperature recorders, temperature probes, or pressure recorders that are used to conduct a pressure test.

test medium
The liquid or gas used to transmit a predetermined force throughout an isolated pipeline segment for the purpose of determining the ability of the pipeline to withstand a specified pressure.

test normalization
To factor the thermal effects of temperature increase or decrease on the test medium and the pipe.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Component failure, such as valve failure, pipe failure, gasket failure, threaded fitting failure, or weld failure.	Assess damage and notify appropriate operator personnel make appropriate notifications per the operator’s procedures.
Pipe or component failure during a test or the presence of air in the test medium.	Determine the cause of deviation and take appropriate steps to correct. Make any necessary operator notification appropriate notifications per the operator’s procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Confirm that the pipeline segment has been isolated for the test according to the specified procedures.	Verifies affected pipeline segment is prepared to accept test pressure.
2	Confirm that calibration and certification of testing instrumentation is current.	Verifies proper measurement of test parameters.
3	Connect a pump or compressor to the pipeline segment.	Confirm that connections are secured for tightness.
4	Install temperature probes and connect the temperature- and pressure-recording devices.	Allows for accurate measurement of test parameters.
5	Fill and vent the pipeline segment with the test medium and allow the temperature to stabilize.	Confirms removal of air from pipeline segment. Allows test normalization to minimize fluctuations.
6	Increase pipeline pressure according to specified procedures.	Performs at specified intervals.
7	Observe and record pressure and temperature according to specified procedures.	Documents pressure discontinuities.
8	Document test results.	Confirms that test records are maintained.
9	After confirming the test was successful, release pressure according to specified procedures.	Allows pipeline system to be returned to normal operation.

Task 42.7—Perform Welding

1.0 Task Description

This task validates that welders can perform welds on pipelines and breakout storage tanks according to the operator's applicable welding procedures.

This task pertains to numerous welding types, including but not limited to installing components such as flanges, reinforcing saddles, and nozzles; joining steel pipe; or welding a door sheet on a breakout tank. Each individual welding type shall have a qualified welding procedure, and the individual shall satisfactorily complete the weld according to that procedure.

This task begins with the first step identified in the operator's applicable welding procedure. This task ends once the weld has been completed.

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Visual Inspection of Welds (reference Task 38.3);

— Perform Nondestructive Testing—Radiographic Testing (reference Task 38.4);

— Perform Nondestructive Testing—Liquid Penetrant Testing (reference Task 38.5);

— Perform Nondestructive Testing—Magnetic Particle Testing (reference Task 38.6);

— Perform Nondestructive Testing—Ultrasonic Testing (reference Task 38.7);

— Perform Nondestructive Testing—Magnetic Flux Leakage Testing (reference Task 38.8).

2.0 Knowledge Component

This task validates that qualified welders can effectively follow operator-approved welding procedures.

An individual performing this task shall have knowledge of:

a) operator-approved welding procedures applicable to the welds to be performed;

b) the notification(s) that shall be completed prior to and/or after the task is completed, according to relevant operator procedures.

Welders shall be qualified in accordance with the latest DOT-approved edition of API 1104 or ASME *BPVC* Section IX before they can be qualified to perform this covered task.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Burn-through during the performance of a butt weld.	Stop task activities and notify local operations personnel.
Arc burns outside the weld area.	Stop task activities and notify local operations personnel.
Misalignment of components.	Stop task activities and notify local operations personnel.
Hazardous atmosphere.	Stop task activities, leave the area, remove ignition sources if safe to do so, assess the situation for public safety, and notify local operations personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Complete the qualifying weld(s) according to the operator's welding procedures.	Welding procedures are developed to meet standards applicable to the type of weld being performed. Successful completion of the qualifying weld(s) is determined either through destructive or nondestructive testing, and results shall be interpreted by a qualified person.
2	Make notifications per the operator's procedures.	Follow the operator's policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 43.1—Perform Start-up of a Liquid Pipeline (Control Center)

1.0 Task Description

This task involves the start-up of a liquid pipeline from the control center.

This task begins with identifying and verifying that the intended flow path is configured in accordance with applicable operating procedures and includes start-up of pumping unit(s) and monitoring operational data. This task ends when the line segment reaches steady state and pressure and flow alarms have been set.

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Shutdown of a Liquid Pipeline (Control Center) (reference Task 43.2);

— Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Control Center) (reference Task 43.3);

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Perform Shutdown of a Liquid Pipeline (Field) (reference Task 63.2).

2.0 Knowledge Component

The purpose of this task is to start up any pipeline system in a manner designed to ensure safe operation.

An individual performing this task shall have knowledge of:

a) pipeline hydraulics;

b) elevation profile of the given pipeline and components;

c) the product characteristics, including drag-reducing agents;

d) operational changes, including start-ups and shutdowns.

Terms applicable to this task:

alarm
Supervisory Control and Data Acquisition (SCADA)-generated visual and/or audible alert that indicates an operating parameter has been exceeded. An alarm receipt requires the controller to take action.

leak detection system—computational pipeline monitoring (CPM) and non-CPM:

— **CPM leak detection**
An algorithmic approach to detect hydraulic anomalies in pipeline operating parameters. The CPM leak detection system generates an alarm when a leak event is probable and/or notifies a controller when a condition approaching a leak event is detected.

— **non-CPM leak detection**
SCADA tools that utilize analog and other data to detect deviations from normal operations that may indicate a leak. Leak detection, as performed by a pipeline controller, may involve comparisons of pressures, expected flow rates, over/shorts, and rate of change alarms.

line fill
A line fill is the actual volume of product in a pipeline segment that may vary depending on product density, pressure, and temperature.

line pack
Line pack is a condition where product vaporization and product mixing are reduced or eliminated. Line pack is a function of the elevation profile, volume of product, pressure, and volatility of the product. Line pack is reached when minimum pressures are held throughout the line section.

maximum operating pressure
MOP
MOP means the maximum pressure at which a pipeline or segment of a pipeline may be normally operated.

pipeline hydraulics
Characteristics of fluid flow in a pipeline.

steady state
The point when pressures and flows are relatively constant over time and comparable to historical operational data for that particular segment.

Supervisory Control and Data Acquisition
SCADA
A computer-based system or systems used by a controller in a control room that collects and displays information about a pipeline facility and may have the ability to send commands back to the pipeline facility.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Activation of a safety device—Pressure-relief, emergency/abnormal shutdown, high-pressure shutdown, case pressure/temperature shutdown, etc. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	If a safety device activates, the controller should investigate the cause of the safety device activation and take appropriate action to mitigate the situation. Make appropriate notifications.
Communications, control system, or power interruption or failure—Loss of SCADA or electrical services on all or part of the pipeline. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Ensure that backup systems are activated. Follow troubleshooting procedures and take appropriate action to mitigate the situation. Make appropriate notifications.
Flow rate deviation (unexplained)—High flow, low flow, or no flow. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the flow rate deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Pressure deviation (unexplained)—Pressure increase, decrease, or lack of a pressure reading. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the pressure deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Status change (unintended)—Changes in unit status or valve position. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the status change and take appropriate action to mitigate the situation. Make appropriate notifications.
Tank level outside safe limits.	Shut down operation. Investigate the cause of the tank exceeding safe limits and take appropriate action to mitigate the situation. Make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Notify all origin and delivery facilities of an impending start-up and verify sufficient capacity at the receipt/delivery point.	Allows field personnel and shippers to perform necessary functions.
2	Verify that the intended flow path is configured in accordance with applicable operating procedures.	Verification may be by SCADA or by other communications.
3	Determine the operating pressures, flows, line packs, and line fill for the pipeline under similar conditions.	Refer to the operator’s procedures, documentation, and historical trends.
4	Determine which pumping units will be started to provide a scheduled flow rate.	Follows the operator’s procedures. Refer to pumping schedule, documentation, and historical trends.
5	Verify that pumps and other equipment are in a ready state.	Verification may be by HMI/SCADA or by other communications.
6	Start pump(s).	Complete according to the operator’s procedures.
7	Monitor pressures and flow rates after start-up and make adjustments, as applicable.	This step is performed to achieve a steady state.
8	Complete appropriate documentation for start-up.	Complete according to the operator’s procedures.
9	After steady state has been achieved, set pressure and flow alarms, as applicable.	This step is completed to maintain pipeline integrity.

Task 43.2—Perform Shutdown of a Liquid Pipeline (Control Center)

1.0 Task Description

This task involves shutting down any part of a pipeline system in a manner designed to ensure safe operation.

This task begins with identifying the part of the pipeline system to be shut down. The task includes verifying all necessary valve alignments, making the required communications, and monitoring pressure and flow rates to ensure operation within safe design limits. This task ends when the identified part of a pipeline system reaches static state.

The performance of this covered task may require the performance of other covered tasks such as:

— Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Control Center) (reference Task 43.3);

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

The purpose of this task is to start up any pipeline system in a manner designed to ensure safe operation.

An individual performing this task shall have knowledge of:

a) pipeline hydraulics;

b) elevation profile of the given pipeline and components;

c) the product characteristics, including drag-reducing agents;

d) operational changes, including start-ups and shutdowns.

Terms applicable to this task:

alarm
SCADA-generated visual and/or audible alert that indicates an operating parameter has been exceeded. An alarm receipt requires the controller to take action.

leak detection system—computational pipeline monitoring (CPM) and non-CPM:

— **CPM leak detection**
An algorithmic approach to detect hydraulic anomalies in pipeline operating parameters. The CPM leak detection system generates an alarm when a leak event is probable and/or notifies a controller when a condition approaching a leak event is detected.

— **non-CPM leak detection**
SCADA tools that utilize analog and other data to detect deviations from normal operations that may indicate a leak. Leak detection, as performed by a pipeline controller, may involve comparisons of pressures, expected flow rates, over/shorts, and rate of change alarms.

line fill
The actual volume of product in a pipeline segment that may vary depending on product density, pressure, and temperature.

line pack
A condition where product vaporization and product mixing are reduced or eliminated. It is a function of the elevation profile, volume of product, pressure, and volatility of the product and is reached when minimum pressures are held throughout the line section.

maximum operating pressure
MOP
MOP means the maximum pressure at which a pipeline or segment of a pipeline may be normally operated.

pipeline hydraulics
Characteristics of fluid flow in a pipeline.

steady state
The point when pressures and flows are relatively constant over time and comparable to historical operational data for that particular segment.

Supervisory Control and Data Acquisition
SCADA
A computer-based system or systems used by a controller in a control room that collects and displays information about a pipeline facility and may have the ability to send commands back to the pipeline facility.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Activation of a safety device—Pressure-relief, emergency/abnormal shutdown, high-pressure shutdown, case pressure/temperature shutdown, etc. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	If a safety device activates, the controller should investigate the cause of the safety device activation and take appropriate action to mitigate the situation. Make appropriate notifications.
Communications, control system, or power interruption or failure—Loss of SCADA or electrical services on all or part of the pipeline, as indicated by SCADA displays or as a result of field communication. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Ensure that backup systems are activated. Follow troubleshooting procedures and take appropriate action to mitigate the situation. Make appropriate notifications.
Flow rate deviation (unexplained)—High flow, low flow, or no flow, as indicated by SCADA displays or as a result of field communication. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the flow rate deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Pressure deviation (unexplained)—Pressure increase, decrease, or lack of a pressure reading, as indicated by SCADA displays or as a result of field communication. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the pressure deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Status change (unintended)—Changes in unit status or valve position, as indicated by SCADA displays or as a result of field communication. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the status change and take appropriate action to mitigate the situation. Make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Notify all origin and delivery facilities of an impending shutdown, if applicable.	Allows field personnel to perform necessary local and/or nonautomated functions.
2	Identify the pumping units that will be shut down.	Verification may be by HMI/SCADA or by other communications.
3	Shut down the identified part of the pipeline system.	Complete according to the operator’s procedures. Procedures may include steps to maintain appropriate pressure on shutdown to minimize contamination of products.
4	Monitor pressures and flow rates during shutdown and make adjustments, as applicable.	This step is performed to achieve a static state.
5	Complete appropriate documentation for shutdown.	Complete according to the operator’s procedures.
6	When pump shutdown is completed, verify valve status and static state have been achieved.	This step is completed to maintain pipeline integrity.

Task 43.3—Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Control Center)

1.0 Task Description

This task includes the activities for monitoring and maintaining pipeline conditions (such as pressures, flow rates, and tank levels) within allowable limits according to regulation and operator's procedures.

This task begins when a pipeline reaches steady state. This task ends when the start-up or shutdown of the pipeline begins.

The performance of this covered task may require the performance of other covered tasks such as:

— Perform Start-up of a Liquid Pipeline (Control Center) (reference Task 43.1);

— Perform Shutdown of a Liquid Pipeline (Control Center) (reference Task 43.2);

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Perform Shutdown of a Liquid Pipeline (Field) (reference Task 63.2).

2.0 Knowledge Component

The purpose of this task is to ensure steady state operations are maintained within specified operating limits.

An individual performing this task shall have knowledge of:

— pipeline hydraulics;

— elevation profile of the given pipeline and components;

— the product characteristics, including drag-reducing agents;

— operational changes.

Terms applicable to this task:

alarm
SCADA-generated visual and/or audible alert that indicates an operating parameter has been exceeded. An alarm receipt requires the controller to take action.

leak detection system—computational pipeline monitoring (CPM) and non-CPM:

— **CPM leak detection**
An algorithmic approach to detect hydraulic anomalies in pipeline operating parameters. The CPM leak detection system generates an alarm when a leak event is probable and/or notifies a controller when a condition approaching a leak event is detected.

— **non-CPM leak detection**
SCADA tools that utilize analog and other data to detect deviations from normal operations that may indicate a leak. Leak detection, as performed by a pipeline controller, may involve comparisons of pressures, expected flow rates, over/shorts, and rate of change alarms.

line fill
The actual volume of product in a pipeline segment that may vary depending on product density, pressure, and temperature.

line pack
A condition where product vaporization and product mixing are reduced or eliminated. Line pack is a function of the elevation profile, volume of product, pressure, and volatility of the product. Line pack is reached when minimum pressures are held throughout the line section.

maximum operating pressure
MOP
The maximum pressure at which a pipeline or segment of a pipeline may be normally operated.

pipeline hydraulics
Characteristics of fluid flow in a pipeline.

static state
An inactive or shutdown pipeline where product is not flowing.

steady state
The point when pressures and flows are relatively constant over time and comparable to historical operational data for that particular segment. Steady state refers to a condition on an active or flowing pipeline.

Supervisory Control and Data Acquisition
SCADA
A computer-based system or systems used by a controller in a control room that collects and displays information about a pipeline facility and may have the ability to send commands back to the pipeline facility.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Activation of a safety device—Pressure-relief, emergency/abnormal shutdown, high-pressure shutdown, case pressure/temperature shutdown, etc. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	If a safety device activates, the controller should investigate the cause of the safety device activation and do what is necessary to mitigate the situation. Make appropriate notifications.
Communications, control system, or power interruption or failure—Loss of SCADA or electrical services on all or part of the pipeline. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Ensure that backup systems are activated. Follow troubleshooting procedures and do what is necessary to mitigate the situation. Make appropriate notifications. Follow appropriate operator procedures for repetitive alarms.
Flow rate deviation (unexplained)—High flow, low flow, or no flow. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the flow rate deviation and do what is necessary to mitigate the situation. Make appropriate notifications.
Pressure deviation (unexplained)—Pressure increase, decrease, or lack of a pressure reading. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the pressure deviation and do what is necessary to mitigate the situation. Make appropriate notifications.
Status change (unintended)—Changes in unit status or valve position. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the status change and do what is necessary to mitigate the situation. Make appropriate notifications.
Tank level outside safe limits.	Shut down operation. Investigate the cause of the tank exceeding safe limits and do what is necessary to mitigate the situation. Make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps. These actions are not performed in sequence and can happen simultaneously.

Step	Action	Explanation
1	Verify that the pressure and flow rates are stable (static/steady state).	When this task is completed during system start-up, allow time for line packing to achieve steady state. If the line is shut down, ensure that it is in a static state.
2	Set appropriate operating limits, such as pressure and flow rate.	Each pipeline has its own normal operating parameters. If operating limits are not set appropriately, safe operating parameters may be exceeded.
3	Continuously monitor SCADA information, such as alarms, trending, pressure, flow rates, rate of change, line fill, tank levels, and communication status.	Each pipeline has its own normal operating parameters. By analyzing data, a controller can take actions to avoid alarm conditions.
4	Adjust set points on control points to achieve and maintain desired flow rates or pressures, as applicable.	This step is performed to achieve a static/steady state.
5	Communicate, as necessary, with field personnel and shippers regarding pipeline operations.	Communication with field personnel and shippers may be necessary to effect changes or to notify of changes.
6	Utilize the leak detection system to continuously monitor for leak indications.	Leak detection indications require a controller to take some sort of remedial action, which may include system shutdown and internal notifications. If an alarm is received, take the appropriate action according to the operator's procedures.
7	Document and/or report information, as appropriate.	Documenting provides data for compliance, historical review, and trending.

Task 43.4—Operate Valves Remotely on a Liquid Pipeline System

1.0 Task Description

This task involves the remote operation of a valve.

This task begins with identification of the valve to be operated and includes the remote operation of that valve. This task ends when the proper valve position has been indicated. Remote operation of the valve is defined as manipulation of the valve's position from a location that is not in direct proximity to the valve.

This task does not include but may lead to the performance of other covered tasks such as:

— Operate Valves Locally on a Liquid Pipeline System (Field) (reference Task 63.4).

2.0 Knowledge Component

The purpose of this task is to remotely operate a valve on a pipeline system.

An individual performing this task shall have knowledge of:

a) How valve indication is identified by some type of human machine interface (HMI)/Supervisory Control and Data Acquisition (SCADA) or other indicator that changes appearance when the valve position changes.

b) Items to be considered prior to operation of valves include the following:

   1) impacts to the pipeline operation such as pressure, flow, and tank levels;

   2) operation of incorrect valves could cause an unsafe condition;

   3) how communication with either local operations or control center may be required prior to or after valve operation.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Pressure deviation (unexplained)—Pressure display(s), alarms, or other pressure indicators show the unexplained pressure deviation. The operator/controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the pressure deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Flow deviation (unexplained)—Flow gauges, flow recorders, alarms, tank levels, or other flow indicators show the unexplained flow deviation. The operator/controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the flow rate deviation and take appropriate action to mitigate the situation. Make appropriate notifications.

AOC Recognition	AOC Reaction
Communications, control system, or power interruption or failure—Loss of SCADA or electrical services on all or part of the pipeline. The controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Ensure that backup systems are activated. Follow troubleshooting procedures and do what is necessary to mitigate the situation. Make appropriate notifications.
Valve position indication (unexpected)—HMI/SCADA or other valve position/status indicators show unexpected valve position indication. The operator/controller should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Troubleshoot communications and valve control functions as appropriate. Make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the valve to be operated.	Use appropriate references to help ensure correct identity of valve.
2	Communicate with field operations or the control center prior to valve operation, as applicable.	Complete according to the operator's procedures.
3	Remotely operate valve.	Complete according to the operator's procedures.
4	Ensure proper valve position and communicate with field operations or the control center after valve operation, as applicable.	Valve position is indicated by some type of HMI/SCADA or other indicators that will change appearance when valve position changes. Complete according to the operator's procedures.

Task 44.3—Inspect, Test, and Maintain a Flow Computer for Hazardous Liquid Leak Detection

1.0 Task Description

This task consists of the inspection, testing, and maintenance activities performed on a flow computer that is associated with a hazardous liquid leak detection system. This task ensures that the computer and its associated input/output (I/O) signals are functioning properly and are adequate for their intended purpose.

This task begins with identifying and verifying the flow computer to inspect, test, and/or maintain. This task ends with notification to appropriate personnel that the flow computer is ready for normal operation.

This task does not include but may lead to the performance of other covered tasks such as:

— Inspect, Test, and Calibrate Pressure Transmitters (reference Task 25.2);

— Prove Flow Meters for Hazardous Liquid Leak Detection (reference Task 44.5);

— Maintain Flow Meters for Hazardous Liquid Leak Detection (reference Task 44.6);

— Inspect, Test, and Maintain Gravitometers/Densitometers for Hazardous Liquid Leak Detection (reference Task 44.7);

— Inspect, Test, and Maintain Temperature Transmitters for Hazardous Liquid Leak Detection (reference Task 44.8);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

The purpose of this task is to confirm that a flow computer is in good working order to measure hazardous product movement.

An individual performing this task shall have knowledge of:

a) flow computer configuration programming;

b) analog/digital I/O;

c) communications;

d) operation and safe handling of electrical systems (i.e. voltage applied to the device, electrical requirements, and connection of test equipment to the device to be tested);

e) knowledge of the control instrumentation for the process system (i.e. knowing the alarm, control, indication, and recording functions of the device in the process system);

   1) differential pressure;

   2) ethernet;

   3) serial;

   4) analog;

   5) digital;

   6) end device that receives and processes data from field equipment. Some examples of end devices include programmable logic controller (PLC), computational pipeline monitoring leak detection, human machine interface (HMI), Supervisory Control and Data Acquisition (SCADA), and flow computers.

Terms applicable to this task:

flow computer
A flow computer is a microprocessor-based computational device that implements the required algorithms using the analog and digital signals received from flow meters, temperature, pressure, and density devices to calculate volumetric or mass flow.

A flow computer also audits changes that have been made to any of the parameters required to turn the raw flow meter data into standard volumes. It records events and alarms related to the flow measurement system.

A flow computer keeps a running tally of the volume for each flow meter it monitors and creates a record of this volume on an hourly, daily, batch, monthly, or continuous basis.

Flow data are made available externally through an electronic interface (i.e. PLC, HMI, SCADA, or leak detection systems and processes).

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
A flow computer is found in an inoperable condition.	Notify the control center or appropriate personnel to take actions as specified by the operator's procedures.
Loss of communication.	Make notifications per the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the flow computer number/nameplate data.	This step uses the appropriate operator's documentation to verify the correct flow computer to be maintained.
2	Identify all associated devices that interface with the flow computer.	Associated equipment inputs may include the following: — flow meters; — temperature/pressure transmitters; — gravitometers/densitometers; — valve status devices; — prover detector switches; — strainer differential pressure devices; — HMI/SCADA; — fluid interface detection; — sampling systems. Associated equipment outputs can include the following: — sampling systems; — prover controls; — HMI/SCADA communication; — PLC/analog/digital.

Step	Action	Explanation
3	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any inspection, testing, and/or maintenance activities.	The control center and local operations (if applicable) shall be notified that testing or maintenance is to be performed on the flow computer. The control center may be required to validate the following: — receipt/initiation of an alarm; — HMI/SCADA display values; — flow computer data corresponds to HMI/SCADA display ID. This step includes consulting the operator's procedures.
4	Inspect the flow computer hardware.	A visual inspection of the device and its associated equipment includes the following: — physical/mechanical condition; — corrosion; — electrical connections; — electronic components. If components need to be repaired or replaced, follow appropriate manufacturer's specifications and operator's procedures.
5	Verify that the I/O parameters for each identified device are correct, and the displayed values are accurate.	Parameter values of a flow computer are established by the operating conditions and calibration results of associated equipment. This step includes consulting the appropriate operator's documentation of associated equipment, such as the following: — proving reports; — pycnometer reports; — transmitter calibration reports. If unwanted override parameters exist, make appropriate notifications according to the operator's procedures.
6	Verify that the configuration for the flow computer is correct.	Engineering design of system criteria establishes configuration parameters. The correct flow computer configuration is determined by referencing the operator's documentation and/or consulting with a measurement specialist.
7	Confirm that the communication link to HMI/SCADA is functional.	This step confirms that the relayed information is accurate. Common communication links can include the following: — ethernet; — serial; — analog/digital. The step includes consulting the operator's procedures. If a flow computer does not communicate to the HMI/SCADA, notify the control center or appropriate personnel to take actions as specified by the operator's procedures.
8	Correct any errors and/or implement required changes noted in Steps 5 to 7.	This step follows the manufacturer's specifications and the operator's procedures.
9	Validate the changes made in the flow computer.	A review of Steps 5 to 7 confirms the changes.

Step	Action	Explanation
10	Document any corrections or changes to the flow computer I/O parameters and configuration.	This step creates a backup of the flow computer configuration. Notification and data retention should follow the operator's procedures.
11	Notify the control center, local operations (if applicable), and any affected personnel that work is complete.	This communication notifies the appropriate personnel that the flow computer is ready for normal operation and that the task is complete.

Task 44.4—Inspect, Test, and Perform Corrective and Preventative Maintenance of Tank Gauging for Hazardous Liquid Leak Detection

1.0 Task Description

This task involves the inspection, testing, and maintenance activities performed on tank gauging equipment that is associated with a hazardous liquid leak detection system, including calibration. This task ensures that the equipment and its associated output signals are functioning properly and are adequate for their intended purpose.

This task begins with identifying and verifying the tank gauging equipment to inspect, test, and/or maintain. This task ends with appropriate notifications that the tank gauging equipment is returned.

The performance of this covered task may require the performance of other covered tasks such as:

— Test Overfill Protective Devices (reference Task 30);

— Inspect and Calibrate Overfill Protective Devices (reference Task 31);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

The purpose of this task is to confirm tank gauging devices are in good working order to accurately measure hazardous product levels in containment vessels.

An individual performing this task shall have knowledge of:

— Tank gauge systems. The primary purpose of a tank gauge system is to accurately determine the liquid volume within a breakout storage tank or other containment vessel. The tank gauge device output values are utilized to display and manage the flow into and out of a tank and can be an input into an Operator's hazardous liquid leak detection system or process.

In some instances, when designed to do so by an operator, the tank gauge device can be part of an automated overfill protection control scheme.

a) Gauging equipment to maintain, which may include the following:

   1) sonar;

   2) radar;

   3) laser;

   4) mechanical (tape with displacer);

   5) magnetostrictive.

b) Operation and safe handling of electrical systems (i.e. voltage applied to the device, electrical requirements, and connection of test equipment to the device to be tested).

c) Control instrumentation for the process system (i.e. knowing the alarm, control, indication, and recording functions of the device in the process system).

d) Tank/vessel construction types.

e) Tank/vessel fill/drain operations.

f) Control center communication methods.

g) Operator's testing and operating procedures related to the testing of tank gauges.

h) Alarms indicating that an operating parameter has been exceeded.

i) Test measurement equipment required.

j) Test equipment certification and calibration.

k) Test equipment operation.

l) Documentation/recordkeeping.

m) End device that receives and processes data from field equipment; some examples of end devices include programmable logic controller, computational pipeline monitoring leak detection, human machine interface (HMI), and Supervisory Control and Data Acquisition (SCADA).

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
The liquid level is at an unexpected high or low level.	Notify the control center or the appropriate personnel of the level status.
The tank gauge equipment and/or system is in an inoperable condition.	Notify/inform the appropriate operator personnel of the condition.
Roof components contain structural damage.	Notify/inform the appropriate operator personnel of the condition.
A floating roof contains debris, water, or freestanding product.	Notify/inform the appropriate operator personnel of the condition.
A tank in static condition experiences an unexplained level movement.	Notify/inform the appropriate operator personnel of the condition.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the device number/nameplate data.	This step uses the appropriate operator's drawings to verify the correct device.
2	Verify the calibration point values for the gauging device.	Engineering analysis of design criteria establishes the calibration point values of a tank gauge device. This step includes consulting the operator's documentation to determine the proper device range.

Step	Action	Explanation
3	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any inspection, testing, and/or maintenance activities.	The control center and local operations (if applicable) shall be notified that work is to be performed on the tank gauging device. The control center may be required to validate the following: — receipt/initiation of an alarm; — HMI/SCADA display values; — gauge device number corresponds to HMI/SCADA display ID. If the tank gauging device is part of an automated shutdown or flow relief system, the control center or local operations may be required to override automation to prevent unintended operations.
4	Inspect the tank gauging device and system.	Inspection of the tank gauging device and the associated equipment includes the following: — physical/mechanical condition; — corrosion; — leakage; — electrical connections (if applicable); — high/low level triggers. All moving parts should move smoothly and freely. The cable and/or tape should move smoothly over the rollers (if applicable). If components need to be repaired or replaced, follow appropriate manufacturer's specifications and operator's procedures.
5	Confirm that the tank is in a static condition per the operator's procedures.	The tank level shall be in a static condition with no movements in or out and with all mixers turned off. After flow into or out of the tank is stopped, personnel shall wait an appropriate amount of time for the level to stabilize before beginning testing.
6	Verify that the test equipment has been certified prior to performing verification.	The test equipment shall have a valid certification of calibration including the date and appropriateness for the intended range per the operator's policy/API standard.
7	Perform a test to determine the proper gauge equipment functionality and to determine if calibration is required per the manufacturer's specifications and the operator's procedures.	Local procedures specify how to obtain an accurate value for the tank level (test value). Typically, this step is accomplished by use of a certified gauge tape (hand line). This step compares the test value with local and remote gauge displays (includes control center HMI/SCADA values). The manufacturer's procedures should be followed when using alternate electronic test equipment in order to obtain a test value (i.e. radar, sonar, or laser).
8	Document the "as found" results of the performance of this task.	The step documents the results per the operator's procedures.

Step	Action	Explanation
9	If calibration of the gauging device is required, adjust the device settings using the manufacturer's specifications and the operator's procedures.	The device output value should be set to the correct test value. The field device shall be calibrated and verified to the "end" device. This step incorporates validating the accurate local and remote display values, including control center HMI/SCADA values, (i.e. the values at the end device and in the control center shall match).
10	Document the "as left" results of the performance of this task.	This step documents the results per the operator's procedures.
11	Return the device to normal operating condition and verify the integrity of the system as per the operator's procedures.	This step confirms that the system is ready to resume normal operations.
12	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication notifies appropriate personnel that the device is ready for normal operation and that the task is complete.

Task 44.5—Prove Flow Meters for Hazardous Liquid Leak Detection

1.0 Task Description

This task involves proving a flow meter to obtain an accurate meter factor and proving report.

This task begins with identifying and verifying the meter to prove. This task ends with a control center notification that the meter has returned to a normal operating condition.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (Field) (reference Task 63.4).

This task does not include but may lead to the performance of other covered tasks such as:

— Inspect, Test, and Calibrate Pressure Transmitters (reference Task 25.2);

— Inspect, Test, and Maintain a Flow Computer for Hazardous Liquid Leak Detection (reference Task 44.3);

— Inspect, Test, and Maintain Gravitometers/Densitometers for Hazardous Liquid Leak Detection (reference Task 44.7);

— Inspect, Test, and Maintain Temperature Transmitters for Hazardous Liquid Leak Detection (reference Task 44.8);

— Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field) (reference Task 63.3).

2.0 Knowledge Component

The purpose of this task is to calibrate flow meters using a prover to establish accurate flow measurements for leak detection.

An individual performing this task shall have knowledge of:

a) Prover types, including the following:

   1) master meter;

   2) bidirectional;

   3) unidirectional;

   4) compact/small volume.

b) Input information used to calculate a meter factor, including the following:

   1) product tables;

   2) material selection;

   3) temperature coefficients;

   4) pressure coefficients;

   5) base prover volume;

   6) meter orientation (prover upstream or downstream of the meter);

7) meter ID;

8) K factor;

9) meter counts;

10) acceptable deviation between prover runs (repeatability);

11) previous meter factor.

Terms applicable to this task:

end device
A device that receives and processes data from field equipment. Some examples of end devices include programmable logic controller (PLC), computational pipeline monitoring leak detection, human machine interface (HMI), Supervisory Control and Data Acquisition (SCADA), and flow computers.

flow computer
A microprocessor-based computational device that implements the required algorithms using the analog and digital signals received from flow meters and temperature, pressure, and density devices to calculate volumetric or mass flow.

A flow computer also audits changes that have been made to any of the parameters required to turn the raw flow meter data into standard volumes. It records events and alarms related to the flow measurement system. It will keep a running tally of the volume for each flow meter it monitors and will create a record of this volume on an hourly, daily, batch, monthly, or continuous basis.

The flow data are made available externally through an electronic interface (i.e. PLC, HMI, SCADA, or leak detection systems and processes).

K factor
The nominal number of pulses per unit volume generated by a meter.

meter factor
A ratio of the corrected prover volume to the corrected meter volume. For subsequent metering operations, the actual throughput is determined by multiplying the indicated volume registered at the meter by the meter factor.

meter proving
The procedure required to determine the relationship between the actual measured volume of liquid through a meter and the indicated meter volume.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
A meter is found in an inoperable condition or does not communicate to the end device.	Notify the control center or the appropriate personnel to take appropriate action.
Unexpected change in pressure, flow, or other test variables does not meet prover specifications.	Discontinue the task and make notifications per the operator's procedures.
Abnormal or erratic readings.	Make appropriate notifications and follow appropriate operator procedures.
Introduction of air to the pipeline system.	Make appropriate notifications and follow appropriate operator procedures.
Unexpected hazardous product encountered when proving the meter.	Stop task activities, move to a safe location (if required), and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the meter number/nameplate data.	This step uses the appropriate operator's documentation to verify the correct meter to prove.
2	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any meter proving.	This step makes all of the required notifications prior to the performance of this procedure per the operator's procedures.
3	Verify the flow rate range values for the meter from the manufacturer's specifications.	To obtain an accurate meter factor, the meter shall be proven at the actual operating flow rate and within a determined flow rate range established by a meter manufacturer's design criteria and specifications.
4	Line up the appropriate valves to fill and pressurize the portable prover equipment.	Verify that the pipeline pressure is within the portable prover equipment design specifications, make the connections to appropriate meter equipment. The portable prover equipment should meet or exceed the pipeline pressure specifications. Connections include the following: — grounding lead; — prover piping; — meter pulse wiring; — AC power—if applicable. This step follows the manufacturer's and operator's procedures to fill the prover and purge all air out of the prover equipment.
5	Perform an equipment integrity assessment.	This step ensures connections and prover equipment are operating as intended.
6	For stationary and portable prover equipment, line up valves for meter proving. Check the double block and bleed valves.	The prover loop equipment diverts all meter flow. Checking the double block and bleed valves confirm integrity of the seals. This step follows the valve manufacturer's and operator's procedures.
7	Verify that the prover temperature, pressure, and flow rate is stable with the meter.	This step allows sufficient time for the temperature, pressure, and flow rate of the meter and prover equipment to stabilize. This step follows the operator's procedures.
8	Determine the product gravity/density and stability.	Stable gravity/density is required to obtain an accurate meter factor.
9	Initiate the prover run and complete the required number of proving runs.	Initiation of a prover run can be performed manually or automatically based on equipment design and the operator's requirements. This step verifies the integrity (positive seal) of a four-way valve (as applicable). The operator, contract, and/or industry standards determine the number of proving run parameters.

Step	Action	Explanation
10	Verify all proving input information.	This information is utilized for manual calculations or data points in a flow computer. Input information includes the following: — product tables; — material selection; — temperature coefficients; — pressure coefficients; — base prover volume; — meter orientation (prover upstream or downstream of the meter); — meter ID; — K factor; — meter counts; — acceptable deviation between prover runs (repeatability); — previous meter factor.
11	Calculate the meter factor and produce a proving report.	The calculation can be performed manually or as a function of a flow computer. Completed meter proving will calculate the new meter factor.
12	Verify that the new meter factor is acceptable and implement the new meter factor as applicable.	This step implements the new meter factor by the following methods: — input into the flow computer; — apply to a manual meter ticket.
13	Reset the system to normal operating position.	This step follows the operator's procedure. For a portable prover, line up appropriate valves to drain and depressurize portable prover equipment and disconnect all connections to appropriate meter equipment. The connections to disconnect include the following: — prover piping; — meter pulse wiring; — AC power—if applicable; — grounding lead. This step follows the manufacturer's and the operator's procedures.
14	Complete appropriate documentation as required by the operator's procedures.	This step helps keep a historical record of data on the pipeline system.
15	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication notifies appropriate personnel that proving activities have concluded and to return to normal operation.

Task 44.6—Maintain Flow Meters for Hazardous Liquid Leak Detection

1.0 Task Description

This task involves activities associated with maintaining a liquid flow meter that is part of a hazardous liquid leak detection system. This task ensures that the equipment and associated output signals are functioning properly and are adequate for their intended purpose.

This task begins with identifying and verifying the meter to maintain. This task ends with the completion of repair documentation per the operator's procedures.

The performance of this covered task may require the performance of other covered tasks such as:

— Prove Flow Meters for Hazardous Liquid Leak Detection (reference Task 44.5).

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Start-up of a Liquid Pipeline (Control Center) (reference Task 43.1);

— Perform Start-up of a Liquid Pipeline (Field) (reference Task 63.1);

— Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field) (reference Task 63.3);

— Operate Valves Locally on a Liquid Pipeline System (Field) (reference Task 63.4).

2.0 Knowledge Component

The purpose of this task is to confirm that a flow meter is in good working order to measure hazardous product movement.

An individual performing this task shall have knowledge of:

a) Primary purpose of a meter. The primary purpose of a meter is to accurately determine the liquid flow volume within an operating pipeline. The meter device output values are utilized to determine the flow rate and are commonly an input into an operator's hazardous liquid leak detection system or process.

b) Types of meters to maintain, including the following:

   1) turbine meter;

   2) positive displacement meter;

   3) ultrasonic meter;

   4) Coriolis meter;

   5) magmeter;

   6) differential pressure meter;

   7) vortex meter.

c) Operation and safe handling of electrical systems (i.e. voltage applied to the device, electrical requirements, and connection of test equipment).

d) Control instrumentation for the process system (i.e. knowing the alarm, control, indication, and recording functions of the device in the process system).

e) Ancillary equipment, including the following:

   1) flow conditioners;

   2) strainers.

f) Control center communication methods.

g) Alarms indicating that an operating parameter has been exceeded.

h) Test/diagnostic equipment required.

i) Test equipment certification and calibration.

j) End device that receives and processes data from field equipment; some examples of end devices include programmable logic controller, computational pipeline monitoring leak detection, human machine interface, Supervisory Control and Data Acquisition, or a flow computer.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
The meter is found in an inoperable condition.	Notify the control center or the appropriate personnel to take appropriate action.
Unexpected hazardous product encountered when visually observing pipe for integrity issues.	Eliminate ignition source(s) and notify appropriate personnel.
Discovery of damage (e.g. mechanical damage and corrosion) to a meter.	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the meter number/nameplate data.	This step uses the appropriate operator's documentation to verify the correct meter to maintain.
2	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any maintenance per the operator's procedures.	The control center and local operations (if applicable) shall receive notification of work to be performed.

Step	Action	Explanation
3	Conduct a visual inspection.	A visual inspection of the meter and its associated equipment includes the following: — physical/mechanical condition; — corrosion; — leakage; — electrical connections; — electronic components; — ancillary equipment.
4	Perform routine preventive maintenance.	Preventive maintenance activities are meter-type specific. This step consults the manufacturer's specifications and the operator's procedures.
5	Perform diagnostics to determine if repairs are required per the applicable manufacturer's and operator's procedures.	Diagnostic activities include the following: — meter factor trend analysis; — pulse output diagnostics; — manufacturer software; — vibration; — noise; — electrical power and connections; — electronic components. If a meter does not communicate to the end device, make appropriate notifications per the operator's procedures for repair or replacement.
6	Determine if removal of the meter is required.	The step determines if meter removal is required. If meter removal is required, isolate, depressurize, drain, and purge the piping, then remove the meter from the pipeline following the operator's procedures.
7	Perform the repair as required.	This step performs repairs per the manufacturer's and operator's procedures. If the meter was removed, reinstall the meter in the pipeline and ensure that the orientation is correct for product flow, as applicable, according to the operator's procedures. Notify the control center, local operations (if applicable), and any affected personnel that meter commissions activities will begin. Remove isolation measures, purge, and fill the piping with product according to manufacturer's start-up procedures to ensure that damage does not occur to the meter.
8	Perform a meter loop integrity check.	This step inspects for leaks and verifies that the meter is ready for service.
9	Notify operations that the meter run is ready for start-up.	This step includes consulting and following the manufacturer's procedure for start-up to ensure that damage does not occur to the meter. A qualified individual shall perform meter proving, which is a separate covered task (Task 44.5).
10	Document the repair results.	This step documents the results per the operator's procedures.

Task 44.7—Inspect, Test, and Maintain Gravitometers/Densitometers for Hazardous Liquid Leak Detection

1.0 Task Description

This task involves the inspection, testing, and calibration activities performed on gravitometers/ densitometers to ensure that the equipment and associated output signals are functioning properly and are adequate for their intended purpose.

This task begins with identifying and verifying that the gravitometer/densitometer device has been inspected, tested, and/or calibrated. This task ends with documenting repair and/or calibration results.

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Start-up of a Liquid Pipeline (Field) (reference Task 63.1);

— Perform Shutdown of a Liquid Pipeline (Field) (reference Task 63.2);

— Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field) (reference Task 63.3);

— Operate Valves Locally on a Liquid Pipeline System (Field) (reference Task 63.4).

2.0 Knowledge Component

The purpose of this task is to confirm that gravitometers and densitometers are in good working order to measure hazardous product characteristics.

An individual performing this task shall have knowledge of:

a) operation and proper use of test equipment used to perform the functions required in this task (i.e. pycnometer, multimeter, certified thermometer, certified hydrometer, or certified electronic scale);

b) operation and safe handling of electrical systems (i.e. voltage applied to the device, electrical requirements, and connection of test equipment to the device to be tested);

c) control instrumentation for the process system (i.e. knowing the alarm, control, indication, and recording functions of the device in the process system);

d) density;

e) density correction factor (DCF);

f) test equipment certification and calibration.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
The device is found in an inoperable condition or does not communicate to the end device.	Notify the control center or the appropriate personnel to take appropriate action.
Unexpected hazardous product encountered when visually observing pipe for integrity issues.	Eliminate ignition source(s) and notify appropriate personnel.
Discovery of damage (e.g. mechanical damage and corrosion) to a gravitometer or densitometer.	Stop task activities, move to a safe distance (if necessary), and notify appropriate pipeline personnel.
Abnormal or erratic readings on test equipment.	Follow appropriate operator procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the densitometer number/ nameplate data.	This step uses the appropriate operator's documentation to verify the correct densitometer to maintain.
2	Confirm the test equipment has been certified, calibrated, and verified prior to performing device calibration.	Test equipment (i.e. multimeters, multifunction calibrators, thermometers) shall have a valid certification of calibration that is appropriate for the intended calibration range.
3	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any maintenance per the operator's procedures.	The control center and local operations (if applicable) shall receive notification of work to be performed.
4	Conduct a visual inspection.	A visual inspection of the gravitometer or densitometer and its associated equipment includes the following: — physical/mechanical condition; — corrosion; — leakage; — electrical connections; — electronic components.
5	Perform a routine pycnometer calibration or hydrometer verification check.	Pycnometer calibration and hydrometer verification checks are dependent on the product type and the operator's procedures. Pycnometer calibration is typically used for pressurized gas products in a liquid state and for refined products. Hydrometer verification checks can be used for refined products and crude oil.
6	Calculate the DCF and produce the appropriate report.	The report is used for the densitometer calibration correction factor. Performance of this step is per the operator's procedures, contract requirements, and/or industry standards.
7	Verify that the new DCF is acceptable and implement the new DCF as applicable.	This step implements the new DCF by the following methods: — input into the flow computer; — apply to a manual meter ticket. Performance of this step is per the operator's procedures, contract requirements, and/or industry standards.

Step	Action	Explanation
8	If the DCF is not acceptable or is out of tolerance, perform test diagnostics to determine if a repair or maintenance is required.	Depending on the manufacturer's design and/or product service, test diagnostic activities can include the following: — densitometer factor trend analysis; — signal output diagnostics; — electrical power and connections; — electronic components; — vibration; — coefficient checks. If a meter does not communicate to the end device, make appropriate notifications per operator's procedures for repair or replacement.
9	Determine if removal of the gravitometer or densitometer is required.	Inspection of the device for buildup of debris or contaminates may require removal.
10	Override the density value at the end device per the operator's procedure.	This step provides a temporary density value input to the hazardous liquid leak detection system in order to maintain accurate measurement during the maintenance activities. The override value should be the current live process density value unless the operator's procedures dictate otherwise.
11	Isolate, depressurize, and drain the device piping.	This step follows the operator's procedures.
12	Remove the gravitometer or densitometer from the pipeline if necessary.	This step follows the operator's procedures.
13	Perform all inspection, cleaning, maintenance, and repairs as required.	Repairs are performed per the manufacturer's and operator's procedures.
14	Reinstall gravitometer or densitometers in the pipeline and ensure that the orientation is correct for product flow, as applicable.	This step follows the operator's procedures.
15	Remove isolation measures, purge the piping, and fill the piping with product.	Following the manufacturer's procedure for start-up ensures that damage does not occur to the densitometers.
16	Perform a loop integrity check.	This step inspects for leaks and verifies that the device is ready for service.
17	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notification to personnel that the densitometer commissioning and start-up activities begin.
18	Remove the override density value at the end device per the operator's procedure.	A live density value shall be observed to perform a device calibration.
19	Perform a pycnometer or hydrometer calibration (see Steps 5 to 7).	After performing maintenance, this step repeats the calibration to generate a new DCF.
20	Document repair results per the operator's procedures.	This step documents the results per the operator's procedures.

Task 44.8—Inspect, Test, and Maintain Temperature Transmitters for Hazardous Liquid Leak Detection

1.0 Task Description

This task involves the inspection, testing, and maintenance activities (including calibration) performed on a temperature transmitter associated with a hazardous liquid leak detection system. This purpose of this task is to ensure that the equipment and associated output signals are functioning properly and are adequate for their intended purpose.

This task begins with identifying and verifying the temperature transmitter to be inspected, tested, and/or maintained. This task ends with appropriate notifications that the temperature transmitter returned to a normal operating condition.

Elements of this task may include the following:

— verify that all calibration equipment certifications are valid and have not expired;

— inspect the physical and mechanical condition and function;

— conduct tests to determine if the output values are within agreed tolerances;

— calibrate a transmitter to the proper input and output range values;

— document all results—input and output range values “as found” and “as left.”

This task does not include but may lead to the performance of other covered tasks such as:

— Inspect, Test, and Maintain a Flow Computer for Hazardous Liquid Leak Detection (reference Task 44.3);

— Operate Valves Locally on a Liquid Pipeline System (Field) (reference Task 63.4).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) Operation and proper use of test equipment used to perform the functions required in this task. Common test equipment can include the following:

   1) smart communicators;

   2) volt/ohm/amp multimeters;

   3) decade box;

   4) resistance thermal device simulator;

   5) certified thermometers (digital and analog);

   6) multifunction calibrators.

b) Operation and safe handling of electrical systems (i.e. voltage applied to the device, electrical requirements, and connection of test equipment to the device to test).

c) Control instrumentation for the process system (i.e. knowing the alarm, control, indication, and recording functions of the device in the process system).

Terms applicable to this task:

alarm
Supervisory Control and Data Acquisition (SCADA)- or human machine interface (HMI)-generated visual and/or audible indication that an operating parameter has been exceeded.

end device
A device that receives and processes data from field equipment. Some examples of end devices include programmable logic controller, computational pipeline monitoring leak detection, HMI, SCADA, and flow computers.

temperature sensor
An ancillary component of a transmitter that outputs a signal. The temperature transmitter receives and processes this signal to determine an accurate temperature value. Some examples of temperature sensors include the following:

— resistance thermal device;

— thermocouple (voltage).

temperature transmitter range and span functions
A device output signal that can be adjusted by the operator to a different span and range of temperature.

test equipment calibration
Process used to determine that test equipment is within its calibration period and accuracy.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
The transmitter is found in an inoperable condition or does not communicate to the end device.	Notify the control center or the appropriate personnel to take appropriate action.
Unexpected hazardous product encountered.	Stop work, move to a safe location (if required), and notify appropriate personnel.
Discovery of damage (e.g. mechanical damage and corrosion) to the device.	Stop task activities and notify appropriate pipeline personnel.
Abnormal or erratic readings on test equipment.	Follow appropriate operator procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify the device number/nameplate data.	This step uses the appropriate operator's documentation to verify the correct device. This step is crucial in verifying that the temperature transmitter output display and/or the correct alarm tag will be activated.

Step	Action	Explanation
2	Confirm that test equipment has been certified, calibrated, and verified prior to performing device calibration.	Test equipment (i.e. multimeters, multifunction calibrators, thermometers) shall have a valid certification of calibration and be appropriate for the intended calibration range.
3	Verify the required device input and output range values for the transmitter and the end device prior to performing testing or calibration.	Engineering analysis of design criteria establishes the input and output range values of a temperature transmitter. This step includes consulting the operator's documentation to determine the proper device range.
4	Notify the control center, local operations (if applicable), and any affected personnel prior to performing any test per the operator's procedures.	The control center and local operations (if applicable) shall be notified that the temperature transmitter is tested or calibrated. The control center may be required to validate the following: — receipt/initiation of an alarm; — HMI/SCADA display value; — transmitter device number corresponds to HMI/SCADA display ID. If the temperature transmitter is part of an automated shutdown or flow relief system, the control center or local operations may be required to override automation to prevent unintended operations.
5	Visually inspect the temperature transmitter per the operator's procedure.	Visual inspection of the transmitter and associated equipment includes the following: — physical/mechanical condition; — corrosion; — leakage; — electrical connections (if applicable).
6	To perform a verification test, install a certified thermometer in the test well with product flowing.	This step obtains an accurate reference temperature. Product flow is necessary to ensure that a consistent temperature is obtained between the test well and the transmitter sensor well. When verification is complete, remove certified thermometer from test well.
7	Compare the reference temperature to the transmitter output and end device temperature values.	This comparison determines if the output values are within the agreed upon tolerances per the operator's documentation. This comparison also determines if a calibration of the transmitter and/or the end device is required. If a transmitter does not communicate to the end device, make appropriate notifications per the operator's procedures for repair or replacement.
8	Document "as found" results.	This step documents the results per the operator's procedures.
9	To perform calibration, override the temperature value at the end device per the operator's procedure.	This step provides a temporary temperature value input to the hazardous liquid leak detection system to maintain accurate measurement during the test and calibration activities. The override value should be the current live process temperature value unless the operator's procedures dictate otherwise.
10	Disconnect the sensor input connections and connect the test equipment using the manufacturer's and operator's procedures.	The test equipment is used to simulate sensor input.

Step	Action	Explanation
11	Confirm the transmitter configuration and range values obtained in Step 3.	This step confirms that the transmitter is ready for calibration.
12	Apply the simulated sensor input values through the desired test range and adjust the device settings using the manufacturer's and the operator's procedures.	This step repeats the calibration procedure, as necessary, to verify the proper calibration and to establish repeatability.
13	Remove the test equipment and reconnect the sensor input connections.	This step removes the connections used to simulate sensor input.
14	Remove the override temperature value at the end device (Step 9) per the operator's procedure.	This step is to prepare the end device for a verification test.
15	Perform a verification test (Step 7) and determine if a sensor trim adjustment is required.	The sensor trim adjustment compensates for any slight discrepancies between the sensor actual and sensor nominal values. Perform sensor trim adjustment using the manufacturer's and the operator's procedures.
16	Document "as left" results.	This step documents "as left" results per the operator's procedure.
17	Return the device to normal operating condition.	Follow the manufacturer's and operator's procedures.
18	Notify the control center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication notifies the appropriate personnel that the device is ready for normal operation.

Task 45—Operate Pressure Relieving Devices for Launching and Receiving Facilities

1.0 Task Description

This task consists of the activities required to relieve pressure and verify the absence of pressure prior to opening the launching/receiving device.

This task begins with the pre-loading inspection. This task ends when the proper documentation is complete.

The performance of this covered task may require the performance of other covered tasks such as:

— Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Control Center) (reference Task 43.3);

— Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field) (reference Task 63.3);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) the types of pipeline inspection gauges (PIGs) and their intended uses;

b) the types of launchers and receivers;

c) the specific valve arrangement for the station or junction and related site-specific procedures;

d) system suitability for pigging.

Terms applicable to this task:

pipeline inspection gauge
PIG
This can generally refer to cleaning PIGs, in-line inspection tools, internal devices, pipeline tools, or smart PIGs and can refer to any tool that travels through the system.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Signs of a leak around the launcher door.	Inspect sealing surface and remediate as needed.
Unexpected product leak-by.	Stop activities, isolate the launcher or receiver, and make appropriate notifications.
Damaged threads on launcher/receiver door.	Notify the appropriate personnel or repair if qualified.
Isolation valve fails.	Investigate the cause and resolve.
Blocked, clogged, or inoperable drain or vent.	Stop task activities, take steps to remediate drain or vent operation, and make appropriate notifications.

AOC Recognition	AOC Reaction
Abnormal pressure readings.	Confirm line pressure at other locations and make appropriate notifications. NOTE Do not open the launcher or receiver door while under pressure.
Overpressure due to thermal conditions.	Isolate as needed and relieve pressure.
PIG does not launch.	Stop activities, isolate the launcher or receiver, depressurize the barrel, and make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Complete a pre-loading inspection to ensure that the launcher is serviceable.	This step assumes that the launcher is permanent or has already been installed in accordance with manufacturer specifications if it is a temporary installation. During the pre-loading inspection, check for any signs of damage, corrosion, or wear that could affect the integrity of the launcher.
2	Inspect the PIG.	This step ensures that the PIG size and design are appropriate for the task. This also verifies that the appropriate tracking devices are installed and operable on the PIG.
3	Verify the launcher is isolated.	Follow the operator’s lockout/tagout procedures.
4	Complete a valve integrity check.	This ensures valves are holding. This step is critical for ensuring safety before opening the launcher door to load the PIG.
5	Depressurize and drain the launcher per the operator’s procedures.	This could be completed with a connected drain system or truck. This also includes verifying the system is drained per the operator’s procedure.
6	Prepare the launcher for loading.	This step includes opening the launcher door, removing any obstructions, checking the door seal for serviceability, and ensuring the launcher is clean of debris.
7	Load and secure the PIG.	Secure the PIG in the nominal portion of the launcher to prevent movement during pressurization and launch using the appropriate push tool. Ensure that all securing mechanisms, such as clamps or brackets, are properly engaged.
8	Close the launcher door.	Close the launcher door in accordance with manufacturer specifications, ensuring that the seals are tight. If applicable, lubricate the threads on the door per the operator’s procedures and manufacturer’s recommendations.
9	Pressurize the launcher.	Gradually pressurize the launcher to the desired operating pressure. Monitor pressure gauges and control systems to ensure a controlled and gradual pressurization process. NOTE Monitoring pressure is a separate covered task and shall be completed by a qualified individual.

Step	Action	Explanation
10	Check the pressurized launcher for signs of leaks.	Check for leaks in accordance with the operator policy. This could include visual inspection and soap or bubble tests.
11	Complete pre-launch communications in accordance with procedures.	Notify all affected personnel and downstream monitors prior to launching the PIG. This also verifies proper valve alignment to receive the PIG.
12	Launch the PIG.	Once the launcher is pressurized and all systems are verified, initiate the launch sequence to release the PIG into the pipeline. Follow manufacturer guidelines and project specifications for the specific launching mechanism. Confirm that the PIG propels smoothly out of the launcher and into the system. NOTE Monitoring the PIG's progress may be completed using PIG signals, timing calculations, and multiple personnel.
13	Verify that the PIG enters the receiver.	This can be verified through the tracking devices or PIG signals.
14	Isolate the receiver from the system.	Follow the operator's lockout/tagout procedures.
15	Complete a valve integrity check.	This ensures valves are holding. This step is critical for ensuring safety before opening the receiver door to unload the PIG.
16	Depressurize the receiver in accordance with the manufacturer's specifications.	This could be completed with a connected drain system or truck. This also includes verifying the system is drained per the operator's procedure.
17	Prepare the receiver for unloading.	This step includes opening the receiver door, removing any obstructions, checking the door seal for serviceability, and ensuring the launcher is clean of debris. NOTE Do not stand in the line of fire of the receiver door.
18	Remove the PIG.	—
19	Close the receiver door.	Close the receiver door in accordance with manufacturer specifications, ensuring that the seals are tight and greased. If applicable, lubricate the threads on the door per the operator's procedures.
20	Repressurize the system.	Gradually pressurize the receiver to the desired operating pressure. Monitor pressure gauges and control systems to ensure a controlled and gradual pressurization process. NOTE Monitoring pressure is a separate covered task and shall be completed by a qualified individual.
21	Check the pressurized receiver for signs of leaks.	Check for leaks in accordance with operator policy. This could include visual inspection and soap or bubble tests.
22	Document all required information per the operator's procedures.	—

Task 63.1—Perform Start-up of a Liquid Pipeline (Field)

1.0 Task Description

The purpose of this task is to safely start up a pipeline and achieve steady state operation.

This task begins with identifying and verifying that the intended flow path is configured in accordance with applicable operating procedures and includes start-up of pumping unit(s) and monitoring operational data. This task ends when the line segment reaches steady state.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field) (reference Task 63.3);

— Operate Valves Locally on a Liquid Pipeline System (Field) (reference Task 63.4).

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Shutdown of a Liquid Pipeline (Field) (reference Task 63.2).

2.0 Knowledge Component

This task involves the start-up of any pipeline system in a manner designed to ensure safe operation.

An individual performing this task shall have knowledge of:

a) pipeline hydraulics;

b) elevation profile of the given pipeline and components;

c) operational changes, including start-ups and shutdowns.

Terms applicable to this task:

alarm
Supervisory Control and Data Acquisition (SCADA)- or human machine interface (HMI)-generated visual or audible alert that indicates an operating parameter has been exceeded. An alarm receipt requires a controller or operator to take action.

human machine interface
HMI
A software application that presents information to an operator about the state of a process and accepts and implements control instructions. Typically, information is displayed in a graphic format.

line fill
A line fill is the actual volume of product in a pipeline segment that may vary depending on product density, pressure, and temperature.

line pack
Line pack is a condition where product vaporization and product mixing are reduced or eliminated. Line pack is a function of the elevation profile, volume of product, pressure, and volatility of the product. Line pack is reached when minimum pressures are held throughout the line section.

maximum operating pressure
MOP
MOP means the maximum pressure at which a pipeline or segment of a pipeline may be normally operated.

pipeline hydraulics
Characteristics of fluid flow in a pipeline.

steady state
The point when pressures and flows are relatively constant over time and comparable to historical operational data for that particular segment.

Supervisory Control and Data Acquisition
SCADA
A computer-based system or systems used by a controller in a control room that collects and displays information about a pipeline facility and may have the ability to send commands back to the pipeline facility.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Activation of a safety device—Pressure-relief, emergency/ abnormal shutdown, high-pressure shutdown, case pressure/temperature shutdown, etc. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	If a safety device activates, the operator should investigate the cause of the safety device activation and take appropriate action to mitigate the situation. Make appropriate notifications.
Communications, control system, or power interruption or failure—Loss of SCADA communication to control room or electrical services. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Ensure that backup systems are activated. Follow troubleshooting procedures and take appropriate action to mitigate the situation. Make appropriate notifications.
Flow rate deviation (unexplained)—High flow, low flow, or no flow. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the flow rate deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Pressure deviation (unexplained)—Pressure increase, decrease, or lack of pressure reading. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the pressure deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Status change (unintended)—Changes in unit status or valve position. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the status change and take appropriate action to mitigate the situation. Make appropriate notifications.
Unexpected hazardous product is encountered.	Stop task activities, move to a safe location (if required), and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Communicate with the control room or appropriate operating personnel to verify that sufficient capacity at the receipt/delivery points exists.	Confirms action with control room or appropriate operations personnel prior to start-up.

Step	Action	Explanation
2	Verify with the control room or appropriate operating personnel that the intended flow path is configured in accordance with applicable operating procedures.	Verification may include local piping alignment and/or confirmation of remote flow path configuration from control room.
3	Verify that pumps and other equipment are in a ready state.	Verification may be by HMI/SCADA or by other communications.
4	Start pump(s).	Complete according to the operator’s procedures.
5	Monitor pressures and flow rates after start-up and make adjustments, as applicable.	This step is performed to achieve a steady state.
6	Complete appropriate documentation for start-up.	Complete according to the operator’s procedures.
7	Communicate with the control room or appropriate operations personnel to verify that it has assumed control of the operation or continue monitoring system.	Complete according to the operator’s procedures.

Task 63.2—Perform Shutdown of a Liquid Pipeline (Field)

1.0 Task Description

This task involves shutting down any part of a pipeline system in a manner designed to ensure safe operation.

This task begins with identifying the part of the pipeline system to be shut down. This task ends when the shutdown is complete, the target static state has been achieved, and the control room or appropriate operating personnel have been notified.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field) (reference Task 63.3);

— Operate Valves Locally on a Liquid Pipeline System (reference Task 63.4).

This task does not include but may lead to the performance of other covered tasks such as:

— Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field) (reference Task 63.3);

2.0 Knowledge Component

The purpose of this task is to safely shut down a pipeline.

An individual performing this task shall have knowledge of:

a) pipeline hydraulics;

b) elevation profile of the given pipeline and components;

c) the product characteristics, including drag-reducing agents;

d) operational changes.

Terms applicable to this task:

alarm
Supervisory Control and Data Acquisition (SCADA)- or human machine interface (HMI)-generated visual or audible alert that indicates an operating parameter has been exceeded. An alarm receipt requires a controller or operator to take action.

human machine interface
HMI
A software application that presents information to an operator about the state of a process and accepts and implements control instructions. Typically, information is displayed in a graphic format.

maximum operating pressure
MOP
MOP means the maximum pressure at which a pipeline or segment of a pipeline may be normally operated.

pipeline hydraulics
Characteristics of fluid flow in a pipeline may impact shutdown operations.

pressure surge
Pressure surge is a wave resulting when a fluid in motion is forced to stop or change direction suddenly. This commonly occurs in a pipeline when a valve is suddenly closed at the end of a pipeline system and a pressure wave propagates in the pipe.

static state
Static state refers to an inactive or shutdown pipeline where product is not flowing.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Activation of a safety device—Pressure-relief, emergency/ abnormal shutdown, high-pressure shutdown, case pressure/ temperature shutdown, etc. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	If a safety device activates, the operator should investigate the cause of the safety device activation and take appropriate action to mitigate the situation. Make appropriate notifications.
Communications, control system, or power interruption or failure—Loss of HMI communication to control room or electrical services. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Ensure that backup systems are activated. Follow troubleshooting procedures and take appropriate action to mitigate the situation. Make appropriate notifications.
Flow rate deviation (unexplained)—High flow, low flow, or no flow. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the flow rate deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Pressure deviation (unexplained)—Pressure increase, decrease, or lack of pressure reading. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the pressure deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Status change (unintended)—Changes in unit status or valve position. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the status change and take appropriate action to mitigate the situation. Make appropriate notifications.
Unexpected hazardous product is encountered.	Stop task activities, move to a safe location (if required), and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Communicate with the control room or the appropriate operating personnel of the impending shutdown.	Allows the control room or appropriate operations personnel to confirm shutdown.
2	Identify which pumping units will be shut down, if any.	Verification may be by HMI/SCADA or by other communications.
3	Shut down the identified part of the pipeline system.	Complete according to the operator's procedures. Procedures may include steps to maintain appropriate pressure on shutdown to minimize contamination of products.

Step	Action	Explanation
4	Monitor pressures and flow rates during shutdown and make adjustments, as applicable.	This step is performed to achieve a static state.
5	Complete appropriate documentation for shutdown.	Complete according to the operator's procedures.
6	When shutdown is complete, verify that valve status and static state have been achieved.	This step is completed to maintain pipeline integrity.
7	Communicate with the control room or the appropriate operations personnel to confirm that the pipeline shutdown has been completed.	Complete according to the operator's procedures.

Task 63.3—Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field)

1.0 Task Description

This task includes activities for monitoring and maintaining pipeline conditions (such as pressures, flow rates, and tank levels) within allowable limits according to regulations and operator's procedures.

The task begins when a part of the pipeline system reaches steady state. This task ends when the start-up or shutdown of the pipeline begins.

The performance of this covered task may require the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4);

— Operate Valves Locally on a Liquid Pipeline System (Field) (reference Task 63.4).

This task does not include but may lead to the performance of other covered tasks such as:

— Perform Start-up of a Liquid Pipeline (Field) (reference Task 63.1);

— Perform Shutdown of a Liquid Pipeline (Field) (reference Task 63.2).

2.0 Knowledge Component

The purpose of this task is to ensure steady state operations are maintained within specified operating limits. An individual performing this task shall have knowledge of:

a) pipeline hydraulics;

b) elevation profile of the given pipeline and components;

c) the product characteristics, including drag-reducing agents;

d) operational changes.

Terms applicable to this task:

alarm
Supervisory Control and Data Acquisition (SCADA)- or human machine interface (HMI)-generated visual or audible alert that indicates an operating parameter has been exceeded. An alarm receipt requires a controller or operator to take action.

human machine interface
HMI
A software application that presents information to an operator about the state of a process and accepts and implements control instructions. Typically, information is displayed in a graphic format.

line fill
A line fill is the actual volume of product in a pipeline segment that may vary depending on product density, pressure, and temperature.

line pack
Line pack is a condition where product vaporization and product mixing are reduced or eliminated. Line pack is a function of the elevation profile, volume of product, pressure, and volatility of the product. Line pack is reached when minimum pressures are held throughout the line section.

maximum operating pressure
MOP
MOP means the maximum pressure at which a pipeline or segment of a pipeline may be normally operated.

pipeline hydraulics
Characteristics of fluid flow in a pipeline.

static state
Static state refers to an inactive or shutdown pipeline where product is not flowing.

steady state
The point when pressures and flows are relatively constant over time and comparable to historical operational data for that particular segment.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Activation of a safety device—Pressure-relief, emergency/abnormal shutdown, high-pressure shutdown, case pressure/temperature shutdown, etc. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	If a safety device activates, the operator should investigate the cause of the safety device activation and take appropriate action to mitigate the situation. Make appropriate notifications.
Communications, control system, or power interruption or failure—Loss of SCADA communication to control room or electrical services. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Ensure that backup systems are activated. Follow troubleshooting procedures and take appropriate action to mitigate the situation. Make appropriate notifications. Follow appropriate operator procedures for repetitive alarms, if applicable.
Flow rate deviation (unexplained)—High flow, low flow, or no flow. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the flow rate deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Pressure deviation (unexplained)—Pressure increase, decrease, or lack of pressure reading. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the pressure deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Status change (unintended)—Changes in unit status or valve position. The operator should receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the status change and take appropriate action to mitigate the situation. Make appropriate notifications.
Unexpected hazardous product is encountered.	Stop task activities, move to a safe location (if required), and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Verify that the pressure and flow rates are stable (static/steady state).	When this task is completed during system start-up, allow time for line packing to achieve steady state. If the line is shut down, ensure that it is in a static state.
2	Set appropriate operating limits, such as pressure and flow rate.	Each pipeline has its own normal operating parameters. If operating limits are not set appropriately, safe operating parameters may be exceeded.
3	Monitor operating information, such as alarms, trending, pressure, flow rates, rate of change, line fill, tank levels, and communication status.	Each pipeline has its own normal operating parameters. By analyzing data, a qualified individual can take actions to avoid or respond to alarm conditions.
4	Adjust set points on control points to achieve and maintain desired flow rates or pressures, as applicable.	This step is performed to achieve a static/steady state.
5	Communicate, as necessary, with field personnel, control room personnel, and shippers regarding pipeline operations.	Communication may be necessary to effect changes or to notify of changes.
6	Document and/or report information, as appropriate.	Documenting provides data for compliance, historical review, and trending.

Task 63.4—Operate Valves Locally on a Liquid Pipeline System (Field)

1.0 Task Description

This task involves the manual operation of a valve in the field.

This task begins with identification of the valve to be operated and includes the local operation of the valve. The task ends when proper valve position has been indicated. Local operation of the valve is defined as manipulation of the valve's position from a location that is in close proximity to the valve. Direct observation shall be used to confirm the valve's position.

This task does not include but may lead to the performance of other covered tasks such as:

— Operate Valves Remotely on a Liquid Pipeline System (reference Task 43.4).

2.0 Knowledge Component

The purpose of this task is to locally operate a valve on a pipeline system.

An individual performing this task shall have knowledge of:

a) Valve Position Indication—Each valve, other than a check valve, shall have some method to indicate the valve's position. Examples include the following:

   1) rising stem;

   2) arrow;

   3) handle position;

   4) open/close flag or display.

b) Inoperable valve indications, such as:

   1) valve indicator does not show the intended position;

   2) unexpected pressure and flow outcomes;

   3) inoperable operator/actuator or hand wheel;

   4) excessive differential pressure across valve prohibits its operation.

c) Items to be considered prior to operation of valves include the following:

   1) impacts to the pipeline operation, such as pressures, flows, and tank levels; pressure surges and hydraulic shock/hammer are examples of conditions that can result from valve operation;

   2) operation of incorrect valves could cause an unsafe condition;

   3) creation of thermal traps by shutting in segments of pipeline systems where it could be overpressured because of an increase of product temperature;

   4) how communication with either local operations or control center may be required prior to or after valve operation.

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Pressure deviation (unexplained)—Pressure display(s), sound, vibration, alarms, or other pressure indicators show the unexplained pressure deviation. The operator may receive or observe an audible or visual indication from the human machine interface (HMI)/ Supervisory Control and Data Acquisition (SCADA) or other systems.	Investigate the cause of the pressure deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Flow rate deviation (unexplained)—Flow gauges, alarms, tank levels, or other flow indicators show the unexplained flow deviation. The operator may receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Investigate the cause of the flow rate deviation and take appropriate action to mitigate the situation. Make appropriate notifications.
Valve position indication (unexpected)—Valve position indicators show unexpected valve position indication. The operator may receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Confirm valve position. Investigate and resolve source of discrepancy between valve position and indicator. Proper valve indication is required. Ensure that appropriate notifications are made before resuming safe pipeline operation.
Valve inoperable—Valve will not operate as intended or will not fully close/open. The operator may receive or observe an audible or visual indication from the HMI/SCADA or other systems.	Make the condition safe to the extent possible and according to operator’s procedures. Assess condition for safety, environmental, or physical damage. Reactions could include the following: — retry operation; — relieve excessive differential pressure; — shut down system (if qualified). Make appropriate notifications.
Unexpected hazardous product is encountered.	Stop task activities, move to a safe location (if required), and notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Identify the valve to be operated.	Uses appropriate references to help ensure correct identity of valve.
2	Communicate with field operations or the control center prior to valve operation, as applicable.	Complete according to the operator’s procedures.
3	Locally operate valve.	Valves may be operated manually and/or by a motor-operated actuator.
4	Ensure proper valve position and communicate with field operations or the control center after valve operation, as applicable.	Complete according to the operator’s procedures.

Task 101—Underwater—Measure Structure-to-electrolyte Potentials

1.0 Task Description

This task consists of using measurement equipment to take a reading of the potential between the underwater structure or pipeline and electrolyte (fresh or salt water) and record data. This task is similar to Task 1.1 (Measure Structure-to-soil Potentials) but contains steps or equipment that are unique to an underwater environment.

This task begins with equipment selection. This task ends with documentation and post calibration of the reference electrode per the manufacturer's recommendation.

This task does not include but may lead to the performance of other covered tasks such as:

— Repair or Replace Damaged Test Lead (reference Task 2.2).

2.0 Knowledge Component

The purpose of this task is to verify electrical continuity between the underwater structure or pipeline and the reference electrode using voltage potential readings.

An individual performing this task shall have knowledge of:

a) cathodic protection systems;

b) types of reference electrodes and environment:

  1) copper-copper sulfate (Cu/CuSO4) used in soil and freshwater;

  2) silver-silver chloride (Ag/AgCl) used in saltwater;

  3) zinc used in soil and saltwater;

c) voltage values for each reference electrode to achieve adequate protection;

d) external influences that can affect the accuracy of the reference electrode:

  1) temperature;

  2) light;

  3) electrolyte concentration;

  4) electrolyte contamination or electrode polarization.

Terms applicable to this task:

electrolyte
A term used to describe a medium that allows for ion flow, and includes soil and water.

IR drop
The voltage or potential difference as a result of current flow. From Ohm's Law, V = IR. When evaluating structure-to-soil measurements, IR drop is the voltage drop other than the drop across the structure-to-soil boundary.

pneumofathometer
A depth-measuring device consisting of an open-end hose fixed to the diver, with the surface end connected to a gas supply and pressure gauge (usually marked in feet of seawater or FSW). The gauge measures the pressure required to discharge water to the diver's depth.

reference electrode
Another term for a half cell or reference cell.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Damaged coating, scratches, dents, and gouges.	Implement mitigation measures per the operator's procedures.
Missing or broken test points and leads.	Repair the test leads or equipment as needed.
Abnormal or erratic readings.	Make appropriate notifications and follow appropriate operator procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Select the instrumentation (test leads, voltmeter, and reference electrode) to be used.	Incorrect or faulty equipment will not provide accurate results.
2	Identify the correct test point locations for proximity and/or contact measurements. Verify using drawings, maps, survey data, pneumofathometer readings, diver video, or dive supervisor/diver communications.	The reference electrode shall be correctly located to obtain accurate results. A structure may have several locations for taking measurements.
3	Prepare the reference electrode and calibrate the test equipment per the manufacturer's recommendation.	Damaged equipment or improper connection of equipment will lead to inaccurate potential readings.
4	Install the ground lead.	Improper or damaged ground lead will lead to inaccurate potential measurements. Proximity and dual element probes require a ground lead when taking readings. Contact probes have a built-in grounding tip. The ground lead, or continuity clamp, is a mechanical connection that provides electrical continuity by connecting the voltmeter and the structure.
5	Take proximity and/or contact readings and record readings.	Place the probe a few inches to a few feet away from the structure or pipeline for proximity readings. Place the tip of the contact probe on the surface of the structure or pipeline for contact readings. Readings should be reviewed as they are taken to ensure that measurements fall within the desired range with the correct polarity. If readings are outside desired range or are erratic or floating, implement mitigation measures per operator's procedures.
6	Confirm calibration of the reference electrode after the dive to ensure accurate readings.	Follow the manufacturer's instructions.
7	Document the readings as required by the operator's procedures.	Documentation is critical to future analysis and identification of problem areas.

Task 102—Underwater—Examine for Mechanical Damage

1.0 Task Description

This task is to verify whether mechanical damage like dents, gouges, etc. exist on the pipeline. This task is similar to Task 5.1 (Examine for Mechanical Damage on Buried or Submerged Pipe) but contains steps or equipment that are unique to an underwater environment.

This task begins with an inspection of the pipeline surface. This task ends after inspection results are documented and reported.

This task does not include but may lead to the performance of other covered tasks such as:

— Coating tasks (reference Task 7.2, Task 7.3, Task 7.4, Task 7.5, Task 7.6, and Task 7.7);

— Measure Pit Depth with Pit Gauge (reference Task 8.1);

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2);

— Measure Corroded Area (reference Task 8.3);

— Underwater—Examine for External Corrosion (reference Task 103);

— Underwater—Inspect the Condition of External Coating (reference Task 104).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) identify characteristics of mechanical damage and corrosion;

b) types of coating and the ways that it can mask mechanical or corrosion damage.

Terms applicable to this task:

buckle
A bend, bulge, or kink that can cause flattening or changes in the curvature of the pipe.

dent
A depression in the surface that has been created by external forces on the pipeline with no visual evidence of metal loss.

gouge
A groove in which metal has been removed or displaced from the surface.

marine growth
The covering of marine plants, animals, and other organisms found on parts of man-made structures that are fully submerged in the sea or intermittently immersed during the tidal cycle. Marine growth can be described as either hard or soft and can be categorized into different levels based on the thickness of the accumulated organisms:

— **light fouling**
Marine growth thickness is less than 300 microns (0.3 mm).

— **moderate fouling**
Marine growth thickness is between 300 microns (0.3 mm) and 1 mm.

— **heavy fouling**
Marine growth thickness is greater than 1 mm.

mechanical damage
Visible physical damage to the metallic surface of the pipeline that, at a minimum, may include one or more of the defects listed below.

scratch
A thin, shallow cut or mark on the surface.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected hazardous liquid or carbon dioxide encountered. Evidence of release: Stream of bubbles, globules of oil, oil slick, or rainbow sheen.	Eliminate ignition source(s) and notify appropriate personnel.
Discovery of damage (e.g. mechanical damage and corrosion).	Implement mitigation measures per the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Inspect area for evidence of a release. If the inspection identifies integrity issues that are not safe, discontinue the task and make immediate notifications.	Helps ensure that the pipeline is safe for operation and continued task performance. Look for a stream of bubbles, globules of oil, oil slick, or rainbow sheen.
2	Perform visual or tactile inspection to verify that the pipeline surface has been prepared for the mechanical damage inspection.	Proper surface preparation is critical to identifying and locating all types of mechanical damage present on the pipe.
3	Measure and classify marine growth.	Identify hard or soft growth and the percentage of coverage using visual or tactile inspection. Measure the thickness of marine growth using a probe, soft tape measure, or other appropriate equipment.
4	Examine the pipeline to determine if mechanical damage exists.	Visual or tactile inspection for mechanical damage is critical to identifying potential risks that need further assessment to avoid future leaks or failures.
5	Examine the condition of support structures.	Examine sandbags, cement bags, grout bags, anchors, concrete mats, and clamps for signs of damage.
6	Identify the type(s) and location(s) of mechanical damage.	There are a variety of methods to describe the location of the damage. One of the more common methods is to locate the damage circumferentially with respect to a clock face. The location of the seam weld and the longitudinal distance to the nearest girth weld are also typically reported. The type(s) and location(s) of the damage are used to determine later actions such as whether repairs are needed and, if so, what kind of repair is needed.
7	Document the findings and make notifications.	Follows the operator's policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 103—Underwater—Examine for External Corrosion

1.0 Task Description

This task is to verify whether external corrosion exists on the pipeline. This task is similar to Task 5.2 (Examine for External Corrosion on Buried or Submerged Pipe) but contains steps or equipment that are unique to an underwater environment.

This task begins with an inspection of the pipeline surface. This task ends after inspection results are documented and reported.

This task does not include but may lead to the performance of other covered tasks such as:

— Coating tasks (reference Task 7.2, Task 7.3, Task 7.4, Task 7.5, Task 7.6, and Task 7.7);

— Measure Pit Depth with Pit Gauge (reference Task 8.1);

— Measure Wall Thickness with Ultrasonic Meter (reference Task 8.2);

— Measure Corroded Area (reference Task 8.3);

— Underwater—Examine for Mechanical Damage (reference Task 102);

— Underwater—Inspect the Condition of External Coating (reference Task 104).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) identify characteristics of mechanical damage and corrosion;

b) types of coating and the ways that it can mask mechanical or corrosion damage.

Terms applicable to this task:

general corrosion
An electrochemical reaction that takes place uniformly over the surface of steel, thereby causing general thinning of the component that could lead to eventual failure of the material.

localized corrosion
Individual areas of pitting or general corrosion areas at discrete sites that may also contain pitting. Areas of localized corrosion in the area of girth or longitudinal welds should be identified and documented.

marine growth
The covering of marine plants, animals, and other organisms found on parts of man-made structures that are fully submerged in the sea or intermittently immersed during the tidal cycle. Marine growth can be described as either hard or soft and can be categorized into different levels based on the thickness of the accumulated organisms:

— **light fouling**
Marine growth thickness is less than 300 microns (0.3 mm).

— **moderate fouling**
Marine growth thickness is between 300 microns (0.3 mm) and 1 mm.

— **heavy fouling**
Marine growth thickness is greater than 1 mm.

pitting
An electrochemical reaction that creates metal loss of the outer surface in small, crater-like depressions that have the potential to cause rapid wall loss.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected hazardous liquid or carbon dioxide encountered. Evidence of release: Stream of bubbles, globules of oil, oil slick, or rainbow sheen.	Eliminate ignition source(s) and notify appropriate personnel.
Discovery of damage (e.g. mechanical damage and corrosion).	Implement mitigation measures per the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Inspect area for evidence of a release. If the inspection identifies integrity issues that are not safe, discontinue the task and make immediate notifications.	Helps ensure that the pipeline is safe for operation and continued task performance. Look for a stream of bubbles, globules of oil, oil slick, or rainbow sheen.
2	Perform visual or tactile inspection to verify that the pipeline surface has been prepared for the external corrosion inspection.	Proper surface preparation is critical to identifying and locating all types of external corrosion present on the pipe.
3	Measure and classify marine growth.	Identify hard or soft growth and the percentage of coverage using visual or tactile inspection. Measure the thickness of marine growth using a probe, soft tape measure, or other appropriate equipment.
4	Examine the pipeline for any areas of external corrosion.	Visual or tactile inspection for external corrosion is critical to identifying potential risks that need further assessment to avoid future leaks or failures.
5	Inspect the condition of support structures and the interface between the supports and pipeline.	Examine anchors and clamps for signs of corrosion.
6	Identify the type(s) and location(s) of external corrosion.	There are a variety of methods to describe the location of the damage. One of the more common methods is to locate the damage circumferentially with respect to a clock face. The location of the seam weld and the longitudinal distance to the nearest girth weld are also typically reported. The type(s) and location(s) of corrosion are used to determine later actions, such as whether repairs are needed and, if so, what kind of repair is needed.
7	Document the findings and make notifications.	Follows the operator's policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 104—Underwater—Inspect the Condition of External Coating

1.0 Task Description

This task is to verify that the coating is intact (free from damage and/or degradation) and is adequately bonded to the pipe surface. This task is similar to Task 5.3 (Inspect the Condition of External Coating on Buried or Submerged Pipe) but contains steps or equipment that are unique to an underwater environment.

This task begins with an inspection of the pipeline surface. This task ends after inspection results are documented and reported.

This task does not include but may lead to the performance of other covered tasks such as:

— Coating tasks (reference Task 7.2, Task 7.3, Task 7.4, Task 7.5, Task 7.6, and Task 7.7);

— Underwater—Examine for Mechanical Damage (reference Task 102);

— Underwater—Examine for External Corrosion (reference Task 103).

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

This section intentionally left blank.

Terms applicable to this task:

bonding
The joining of the coating system and the pipeline in a manner where they are adhered or united by means of adhesive, heat, or pressure.

coating abnormalities:

— **coating disbondment**
Failure of the bond between the coating and the pipe's surface.

— **cracking—as it relates to coatings**
A physical separation to otherwise bonded coating that has an appearance of fissures.

— **holiday**
An undesirable discontinuity or break in the coating system. Electronic testing devices detect flaws in the protective coating.

coating abnormality causes
Change or failure of the coating attributed to one or several of the following:

— formulation-related (e.g. checking, cracking, discoloration, and similar phenomena);

— improper coating selection;

— incompatibility with the surface over which it is applied;

— improper or poor surface preparation;

— improper application (e.g. inadequate thickness, pinholes, overspray, improper drying, and improper curing);

— adhesion-related, structural surface issues (e.g. sharp edges, crevices, skip welds, and back-to-back angles);

— exterior forces (e.g. chemical exposure, abrasion, reverse impact, and severe weathering).

marine growth
The covering of marine plants, animals, and other organisms found on parts of man-made structures that are fully submerged in the sea or intermittently immersed during the tidal cycle. Marine growth can be described as either hard or soft and can be categorized into different levels based on the thickness of the accumulated organisms:

— **light fouling**
  Marine growth thickness is less than 300 microns (0.3 mm).

— **moderate fouling**
  Marine growth thickness is between 300 microns (0.3 mm) and 1 mm.

— **heavy fouling**
  Marine growth thickness is greater than 1 mm.

pipeline coating types
Pipeline coating types include the following:

— asphalt coatings;

— coal tar coatings;

— extruded coatings;

— fusion-bonded epoxy coatings;

— petrolatum coating products;

— shrink sleeve products;

— tape coatings.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of coating abnormalities (e.g. blistering, checking, cracking, wrinkling, delamination, disbondment).	Implement mitigation measures per the operator's procedures.
Coating type found to be inconsistent with documentation.	Document and notify the appropriate operator personnel.
Evidence of release: Stream of bubbles, globules of oil, oil slick, or rainbow sheen.	Discontinue the task and make immediate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Inspect area for evidence of a release. If the inspection identifies integrity issues that are not safe, discontinue the task and make immediate notifications.	Helps ensure that the pipeline is safe for operation and continued task performance. Look for a stream of bubbles, globules of oil, oil slick, or rainbow sheen.

Step	Action	Explanation
2	Perform visual or tactile inspection to verify the type of existing coating.	It is necessary to be able to identify the type of coating that exists on the pipe so that a proper coating inspection can be conducted.
3	Measure and classify marine growth.	Identify hard or soft growth and the percentage of coverage using visual or tactile inspection. Measure the thickness of marine growth using a probe, soft tape measure, or other appropriate equipment.
4	Examine the exposed coated pipe and determine if there are any flaws, holidays, or abnormalities in the coating.	Visual or tactile inspection of the coating is critical to identifying potential risks that need further assessment to avoid future leaks or failures.
5	Identify the type(s) and location(s) of coating damage.	There are a variety of methods to describe the location of the damage. One of the more common methods is to locate the damage circumferentially with respect to a clock face. The location of the seam weld and the longitudinal distance to the nearest girth weld are also typically reported. The type(s) and location(s) of damage are used to determine later actions such as whether repairs are needed and, if so, what kind of repair is needed.
6	Document the findings and make notifications.	Follows the operator’s policies and procedures for appropriate documentation, notification protocol, and actions required.

Task 105—Underwater—Install Galvanic Anodes

1.0 Task Description

This task includes the installation of galvanic anodes on underwater pipeline facilities. This task is similar to Task 9.2 (Install Galvanic Anodes) but contains steps or equipment that are unique to an underwater environment.

This task begins with determining the most suitable locations for the galvanic anodes within design considerations. This task ends after the installation documentation is complete.

This task does not include but may lead to the performance of other covered tasks such as:

— Install Test Leads by Nonexothermic Welding Methods (reference Task 2.3);

— Install Test Leads by Exothermic Welding Methods (reference Task 2.4);

— Observe Excavation Activities (reference Task 32);

— Perform Backfilling (reference Task 39).

2.0 Knowledge Component

The purpose of this task is to provide a galvanic anode to provide cathodic protection (CP) system.

An individual performing this task shall have knowledge of:

a) CP systems and components comparable to AMPP Certification Level CP 2;

b) connection methods (connections are made in a test station with a lead connected to the structure being protected and across a shunt for measurement and testing; isolation of galvanic anodes may be necessary for additional testing of the structure);

c) galvanic anodes and their applications (galvanic anodes may be used for direct CP, shielding of electrical interference, spot protection, or alternating current mitigation; applications may be in various soil conditions, underwater or offshore, or where power for implied systems is unavailable);

d) types of anodes used in underwater applications (e.g. bracelet, sled, and platform).

Terms applicable to this task:

This section intentionally left blank.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Unexpected hazardous liquid or carbon dioxide encountered. Evidence of release: Stream of bubbles, globules of oil, oil slick, or rainbow sheen.	Eliminate ignition source(s) and notify appropriate personnel.
Discovery of damage (e.g. mechanical damage and corrosion).	Implement mitigation measures per the operator's procedures.
A component is found in an inoperable condition.	Notify the appropriate personnel to take actions as specified by the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Determine the type of anode, location, and installation method to be used.	Bracelet, sled, and weld-on anodes are typically made from materials such as aluminum, zinc, and magnesium. They are installed by mechanical or welding methods.
2	Install anode(s) according to the manufacturer's instructions.	Prepare the area and install the anode. Bracelet anodes are two halves connected around the structure or pipeline. Sled anodes are located on the sea bottom next to the structure or pipeline.
3	Attach bonding strap, pigtail, or cable to achieve electrical continuity.	Achieve electrical continuity by a bonding strap, contact bolt, or wet welding.
4	Perform a post-installation inspection.	Perform visual or tactile inspection to check connections for gaps and adequate number of nuts. Verify electrical continuity.
5	Take proximity and/or contact readings and record readings.	Place the probe a few inches to a few feet away from the structure or pipeline for proximity readings. Place the tip of the contact probe on the surface of the structure or pipeline for contact readings. Readings should be reviewed as they are taken to ensure that measurements fall within the desired range with the correct polarity. If readings are outside desired range or are erratic or floating, implement mitigation measures per operator's procedures.
6	Document installation as required by the operator's procedures.	Documentation is necessary to maintain a record of installed anode locations.

Task 120—Underwater—Install Pipe-end Connectors

1.0 Task Description

This task involves the installation of pipe-end connectors (e.g. mechanical gripping, cold forged) on underwater pipelines.

This task begins with preparation of the carrier pipe. This task ends with an annulus test to confirm that the connector has been properly installed.

2.0 Knowledge Component

An individual performing this task shall have knowledge of:

a) methods to prepare the pipeline surface;

b) tools and materials required to bevel pipe ends to the appropriate specifications;

c) torquing procedures and bolt patterns.

Terms applicable to this task:

pipe-end connector
The pipe-end or flange-end connector is a slipover mechanical connector used for tie-ins and repairs of underwater pipelines and risers. The mechanical locking assembly is secured to the pipeline to provide a flanged or mechanical clamped connection without welding.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Anomaly or other defect on carrier pipe inside the area of application.	Notify the operator or appropriate individual.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Prepare the pipeline surface according to the manufacturer's specifications.	Proper preparation is required to ensure the connector forms a seal.
2	Confirm the pipeline has acceptable wall thickness and bevel ends per the manufacturer's specifications.	Visual or tactile inspection to confirm that the pipeline end is prepared.
3	Prepare the end connector according to the manufacturer's specifications.	Confirm the type of end connector and ensure that seals are free of debris.
4	Install end connector to the specified insertion depth and tighten bolts using the proper sequence and torque per the manufacturer's specifications.	Ensure proper installation of the pipe end connector.
5	Confirm integrity of the seals.	Perform an annulus test to confirm adequate seal.
6	Document installation as required by the operator's procedures.	Documentation is necessary to maintain a record of installed pipe-end connector location.

Task 140—Underwater—Locate Line and Install Temporary Marker

1.0 Task Description

This task involves locating underwater pipelines utilizing sonar, probes, or water jets, etc. It also includes placing temporary markers (e.g. sonar reflectors, buoys, cane poles). This task is similar to Task 14.1 (Locate Line) and Task 14.5 (Install, Inspect, and Maintain Temporary Marker) but contains steps or equipment that are unique to an underwater environment.

This task begins when the need to locate a line has been identified. This task ends when the line is temporarily marked.

This task does not include but may lead to the performance of other covered tasks such as:

— Install, Inspect, and Maintain Permanent Marker (reference Task 14.2).

2.0 Knowledge Component

This task is performed to verify the location of the pipeline and place temporary markers.

An individual performing this task shall have knowledge of:

a) pipeline maps, mapping software, drawings, blueprints, and GPS;

b) methods used to locate pipe (e.g. bottom sweep, hand probing, water probing, hand jetting, scanning sonar, and gradiometer);

c) signal interference or unexpected changes in frequency and/or depth readings;

d) types of temporary markers (e.g. cane poles, buoys, sonar reflector, and sonar pinger);

e) One-Call notification system and One-Call laws (may vary from state to state).

Terms applicable to this task:

bottom sweep
A line locating method in which a diver utilizes a rope or line connected to a clump weight or stationary object. Topside personnel direct the diver to move in a grid or circular pattern to determine the location of an asset or identify obstructions or terrain prior to installing an asset. This method allows divers to cover a larger area more efficiently than visually searching the seabed.

buoys
A visual line marker used in shallow water in which a rope connected to the buoy is tied to the pipeline or a weight that is placed directly above or immediately next to the pipeline. There are several types of surface and mid-water buoys, such as foam buoys, Norwegian buoys, and milk jug buoys.

cane poles
A visual line marker used in shallow water. They are typically used in marshes and swamps with soft bottom consistencies.

gradiometer
A device used to detect variations or anomalies in the Earth's magnetic field. It can identify disturbances caused by ferromagnetic objects, such as buried pipelines.

hand jetting
A line locating method in which a diver held jet nozzle is aimed in the direction of the pipeline to remove sea bottom material using a stream of water.

pneumofathometer
A depth-measuring device consisting of an open-end hose fixed to the diver, with the surface end connected to a gas supply and pressure gauge (usually marked in feet of seawater or FSW). The gauge measures the pressure required to discharge water to the diver's depth.

scanning sonar
Equipment used for underwater mapping and imaging. It emits sound waves and analyzes their echoes to create an image of the sea bottom that can be used to identify exposed pipelines, existing ditches, debris, sonar reflectors, and sea bottom contour.

sonar pinger
A signaling device that can be attached to an underwater site or instrument package. Using the pinger receiver, an instrument a diver carries, the sonar signal transmitted by the pinger can easily be detected and followed to its source.

sonar reflector buoy
A sonar line marker that is attached to the pipeline. The buoy should be located approximately 3–4 ft above the sea bottom.

sonar reflector pole
A sonar line marker that is attached to a pole which is inserted into the sea bottom next to the pipeline. The reflector should be located approximately 3–4 ft above the sea bottom.

water probing
A line locating method in which a long, narrow instrument is connected with a hose to a pump on the surface to confirm location or measure depth of buried pipe.

Abnormal operating conditions (AOCs) associated with the performance of this task include the following:

AOC Recognition	AOC Reaction
Discovery of free-span pipeline.	Notify appropriate pipeline personnel.
Pipeline location does not match pipeline maps.	Notify map owner and follow operator procedure to update map.
Line locating equipment is inoperable or not properly calibrated.	Stop task activities, determine cause of malfunction and required calibration settings, and remediate per the manufacturer's recommendations or specifications.
The right-of-way is inaccessible.	Make appropriate notifications according to the operator's procedures.
Misplaced permanent line marker.	Make appropriate notifications according to the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual shall perform the following steps:

Step	Action	Explanation
1	Determine the approximate location of the pipeline section, by using the most current drawings, maps, and/or GPS.	Drawings and/or pipeline maps are used to assist in locating the pipeline.
2	Determine method for locating the pipeline and review job requirements to determine site conditions that could affect task performance.	Topside and diver personnel are involved in this step. Locating methods are determined by the location characteristics, depth of the water, and operator procedure.
3	Check to ensure that locating equipment is in proper working order in accordance with the manufacturer's recommendations.	Equipment needs to be operating properly to accurately locate pipelines. Ensure that the locating equipment is properly charged and calibrated. If equipment is not working properly, stop task activities, determine cause of malfunction, and remediate per the manufacturer's recommendations.
4	Use appropriate line locating equipment and/or methods to determine the location of the pipeline.	Determine pipeline location by appropriate locating method according to the operator's procedures.
5	Determine pipeline depth.	Locate pipeline and take pneumofathometer readings as directed by topside personnel.
6	Adequately mark the pipeline so that its location is accurately known. Temporary markers should be located directly over the pipeline.	Properly install temporary markers. When a temporary marker cannot be located directly over the pipeline, an offset marker shall be installed according to the operator and state requirements.

Annex C
(informative)

Covered Task Development

API 1161 has been revised several times. Annex C is a record of the development of the covered task list. This includes tasks previously published and subsequently removed, and tasks considered for publication but rejected.

Covered Task Number	Covered Task Title (Last Publication)	195 Reference	Check Mark if Applicable											Publication Comments (Published Comments)
			Task Performed on Pipeline	Operations or Maintenance Task	Required by 195	Affects Pipeline Operation/Integrity	1st Edition (2000)	2nd Edition (2012)	3rd Edition (2014)	4th Edition (2019)	5th Edition (2021)	6th Edition (2025)	Considered but Rejected	
1	Conduct Annual Surveys to Electrically Inspect Unprotected Bare Pipe		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 1.1, 1.2, 1.3, 1.4, and 1.5 in 2nd ed.
1.1	Measure Structure-to-soil Potentials	195.573(a) 195.573(b) 195.575(c)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Measurement of Structure-to-soil Potentials” in 3rd ed. to “Measure Structure-to-soil Potentials” in 4th ed.
1.2	Conduct Close Interval Survey	195.573(a) 195.573(b) 195.575(c)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
1.3	Test to Detect Interference	195.577(a)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
1.4	Inspect and Perform Electrical Test of Bonds	195.573(a) 195.573(b) 195.575(c)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
1.5	Inspect and Test Electrical Isolation	195.573(a) 195.573(b) 195.575(c)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
2	Maintain Test Leads		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 2.1, 2.2, 2.3, and 2.4.
2.1	Verify Test Lead Continuity	195.567	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
2.2	Repair or Replace Damaged Test Lead	195.567	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
2.3	Install Test Leads by Nonexothermic Welding Methods	195.567	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
2.4	Install Test Leads by Exothermic Welding Methods	195.567	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
3	Obtain a Voltage and Current Output Reading from a Rectifier to Verify Proper Performance	195.573(c)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		Title changed from “Inspect Rectifier” in 1st ed. to “Obtain a Voltage and Current Output Reading from a Rectifier to Verify Proper Performance” in 2nd ed.
	Obtain a Voltage and Current Output Reading from a Rectifier	195.573(c)	✓	✓	✓	✓	—	—	—	—	—	—		Considered but never published. Task elements included in Task 3.
	Check for Proper Operation of a Rectifier	195.573(c)	✓	✓	✓	✓	—	—	—	—	—	—		Considered but never published. Task elements included in Task 3.
4	Maintain Rectifier		✓	✓	✓	✓	✓	-	-	-		-		Task replaced with 4.1, 4.2, and 4.3.
4.1	Troubleshoot Rectifier	195.573(c)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
4.2	Repair or Replace Defective Rectifier Components	195.573(c)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
4.3	Adjust Rectifier	195.573(c)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Adjustment of a Rectifier” in 3rd ed. to “Adjust Rectifier” in 4th ed.
5	Inspect Buried Pipe When Exposed		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 5.1, 5.2, and 5.3.
5.1	Examine for Mechanical Damage on Buried or Submerged Pipe	195.452(h) 195.569	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
5.2	Examine for External Corrosion on Buried or Submerged Pipe	195.452(h) 195.569	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
5.3	Inspect the Condition of External Coating on Buried or Submerged Pipe	195.452(h) 195.569	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
6	Electrically Inspect Bare Pipe	195.573 b	✓	✓	✓	✓	✓	—	—	—	—	—		At the time of 2nd ed. publication, it was determined that this task did not meet the Four-part Test, and it was removed from Annex A.
7	Prevention of Atmospheric Corrosion		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, and 7.7.
7.1	Perform Visual Inspection of Atmospheric Coatings	195.583	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Visual Inspection of Atmospheric Coatings” in 3rd ed to “Perform Visual Inspection of Atmospheric Coatings” in 4th ed.

Covered Task Number	Covered Task Title (Last Publication)	195 Reference	Check Mark if Applicable											Publication Comments (Published Comments)
			Task Performed on Pipeline	Operations or Maintenance Task	Required by 195	Affects Pipeline Operation/Integrity	1st Edition (2000)	2nd Edition (2012)	3rd Edition (2014)	4th Edition (2019)	5th Edition (2021)	6th Edition (2025)	Considered but Rejected	
7.2	Prepare Surface for Coating Using Hand and Power Tools	195.581(a)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
7.3	Prepare Surface for Coating by Abrasive Water Blasting	195.581(a)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
7.4	Prepare Surface for Coating by Abrasive Blasting Methods Other Than Water	195.581(a)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
7.5	Apply Coating Using Hand Application Methods	195.581(a)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
7.6	Apply Coating Using Spray Applications	195.581(a)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
7.7	Perform Coating Inspection	195.561	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
8	Measure Wall Thickness of Pipe		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 8.1, 8.2, and 8.3.
8.1	Measure Pit Depth with Pit Gauge	195.585 195.587	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
8.2	Measure Wall Thickness with Ultrasonic Meter	195.585 195.587	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
8.3	Measure Corroded Area	195.585 195.587	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
9	Cathodic Protection Remediation		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 9.1, 9.2, 9.3, 9.4, 9.5, and 9.6.
9.1	Install Bonds	195.575	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
9.2	Install Galvanic Anodes	195.577(b)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
9.3	Install Rectifiers	195.563	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
9.4	Install Impressed Current Groundbeds	195.577(b)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
9.5	Repair Shorted Casings	195.571	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
9.6	Install Electrical Insulating Device	195.575	✓	✓	✓	✓	—	✓	✓	✓	✓	—		Task replaced with 9.6.1, 9.6.2, 9.6.3, and 9.6.4.
9.6.1	Install Electrical Insulating Device—Piping Isolation	195.575	✓	✓	✓	✓	—	—	—	—	—	✓		
9.6.2	Install Electrical Insulating Device—Casing Isolation	195.575	✓	✓	✓	✓	—	—	—	—	—	✓		
9.6.3	Install Electrical Insulating Device—Isolation Joints	195.575	✓	✓	✓	✓	—	—	—	—	—	✓		
9.6.4	Install Electrical Insulating Device—Lightning Protection and Electrical Grounding	195.575	✓	✓	✓	✓	—	—	—	—	—	✓		
10	Monitoring for Internal Corrosion		✓	✓	✓	✓	✓	—	—	—	—			Task replaced with 10.1 and 10.2.
10.1	Insert and Remove Coupons	195.579(a) 195.579(b)(2)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
10.2	Monitor Probes (Online)	195.579(a) 195.579(b)(2)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
11	Monitor and Control the Injection Rate of the Corrosion Inhibitor	195.579(b)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		1. Title changed from “Monitor Internal Corrosion” in the 1st ed. to “Monitoring and Controlling the Injection Rate of the Corrosion Inhibitor” in the 2nd ed. 2. Title changed from “Monitoring and Controlling the Injection Rate of the Corrosion Inhibitor” in the 3rd ed. to “Monitor and Control the Injection Rate of the Corrosion Inhibitor” in the 4th ed.

Covered Task Number	Covered Task Title (Last Publication)	195 Reference	Check Mark if Applicable											Publication Comments (Published Comments)
			Task Performed on Pipeline	Operations or Maintenance Task	Required by 195	Affects Pipeline Operation/Integrity	1st Edition (2000)	2nd Edition (2012)	3rd Edition (2014)	4th Edition (2019)	5th Edition (2021)	6th Edition (2025)	Considered but Rejected	
12	Perform Visual Inspection of Internal Pipe Surface	195.579(c)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		1. Title changed from “Inspect Internal Pipe Surfaces” in the 1st ed. to “Visual Inspection of the Internal Pipe Surface” in the 2nd ed. 2. Title changed from “Visual Inspection of the Internal Pipe Surface” in the 2nd ed. to “Visually Inspect Internal Pipe Surface” in the 3rd ed. 3. Title changed from “Visually Inspect Internal Pipe Surface” in the 3rd ed. to “Perform Visual Inspection of Internal Pipe Surface” in the 4th ed.
13	Application and Repair of External Coatings		✓	✓	✓	✓	✓	—	—	—	—	—		Considered breaking apart task but content was included in 7.2, 7.3, 7.4, 7.5, and 7.6.
	Prepare Surface for Coating Using Hand and Power Tools	195.581(a)	✓	✓	✓	✓	—	—	—	—	—	—		Task not published and content covered in Task 7.2.
	Perform Water Pressure Cleaning	195.581(a)	✓	✓	✓	✓	—	—	—	—	—	—		Task not published and content covered in Task 7.3.
	Prepare Surface for Coating by Abrasive Blasting	195.581(a)	✓	✓	✓	✓	—	—	—	—	—	—		Task not published and content covered in Task 7.4.
	Apply Coating Using Hand Application Methods	195.581(a)	✓	✓	✓	✓	—	—	—	—	—	—		Task not published and content covered in Task 7.5.
	Apply Coating Using Spray Applications	195.581(a)	✓	✓	✓	✓	—	—	—	—	—	—		Task not published and content covered in Task 7.6.
14	Place and Maintain Line Markers		✓	✓	✓	✓	✓	—	—	—	—	—		Task broken apart into 5 tasks (Inspect/Maintain Marker and Inspect/Maintain Aerial Line Markers never published).
14.1	Locate Line	195.410	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
14.2	Install, Inspect, and Maintain Permanent Marker	195.410	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
	Inspect and Maintain Marker		✓	✓	✓	✓	—	—	—	—	—	—		Task content added to 14.2.
	Inspect and Maintain Aerial Line Markers		✓	✓	✓	✓	—	—	—	—	—	—		Task content added to 14.2.
14.5	Install, Inspect, and Maintain Temporary Marker	195.442(c)(4 and 5)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
15	Inspect Surface Conditions of Right of Way		✓	✓	✓	✓	✓	—	—	—	—	—		Task broken apart into two tasks (Reporting Protocols never published).
15.1	Perform Visual Inspection of Surface Conditions of Right-of-way	195.412	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Visually Inspect Surface Conditions of Right-of-way” in the 3rd ed. to “Perform Visual Inspection of Surface Conditions of Right-of-way” in the 4th ed.
	Reporting Protocols		✓	✓	✓	✓	—	—	—	—	—	—		Task content included in Task 15.1.
16	Inspect Navigable Waterway Crossing		✓	✓	✓	✓	✓	—	—	—	—	—		Task broken apart into three tasks (Use of Sonar Equipment and Reporting Protocols never published).
16.1	Inspect Navigable Waterway Crossing	195.412 195.413	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
	Use of Sonar Equipment		✓	✓	✓	✓	—	—	—	—	—	—		Task content included in Task 16.1.
	Reporting Protocols		✓	✓	✓	✓	—	—	—	—	—	—		Task content included in Task 16.1.
17	Provide Temporary Marking of Buried Pipeline Prior to Excavation		✓	✓	✓	✓	✓	—	—	—	—	—		Task broken apart but never published breakout tasks, content covered in 14 series.
	Locate Line		✓	✓	✓	✓	—	—	—	—	—	—		Task removed and content added to Task 14.1.
	Install Marker		✓	✓	✓	✓	—	—	—	—	—	—		Task removed and content added to Task 14.5.
	Inspect and Maintain Marker		✓	✓	✓	✓	—	—	—	—	—	—		Task removed and content added to Task 14.5.
18	Inspection Following Excavation Activities and Leak Survey after Blasting		✓	✓	✓	✓	✓	—	—	—	—	—		Task broken apart but never published breakout tasks.

Covered Task Number	Covered Task Title (Last Publication)	195 Reference	Check Mark if Applicable: Task Performed on Pipeline	Operations or Maintenance Task	Required by 195	Affects Pipeline Operation/Integrity	1st Edition (2000)	2nd Edition (2012)	3rd Edition (2014)	4th Edition (2019)	5th Edition (2021)	6th Edition (2025)	Considered but Rejected	Publication Comments (Published Comments)
	Utilize Leak Survey Techniques		✓	✓	✓	✓	—	—	—	—	—	—		Task removed and content added to Task 15.1.
	Monitor for Pressure Loss		✓	✓	✓	✓	—	—	—	—	—	—		Task removed and content added to 43.3 and 63.3.
19	Maintain Valves		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 19.1, 19.2, 19.3, 19.4, 19.5, 19.6, and 19.7.
19.1	Perform Valve Body Winterization or Corrosion Inhibition	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Valve Body Winterization or Corrosion Inhibition” in the 3rd ed. to “Perform Valve Body Winterization or Corrosion Inhibition” in the 4th ed.
19.2	Perform Valve Lubrication	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Valve Lubrication” in the 3rd ed. to “Perform Valve Lubrication” in the 4th ed.
19.3	Perform Valve Seat Sealing	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Valve Seat Sealing” in the 3rd ed. to “Perform Valve Seat Sealing” in the 4th ed.
19.4	Perform Valve Stem Packing Maintenance	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Valve Stem Packing Maintenance” in the 3rd ed. to “Perform Valve Stem Packing Maintenance” in the 4th ed.
19.5	Adjust Actuator/Operator, Electric	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
19.6	Adjust Actuator/Operator, Pneumatic	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
19.7	Adjust Actuator/Operator, Hydraulic	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
20	Inspect Mainline Valves	195.420	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		Considered breaking apart task but breakout tasks never published.
20.1	Routine Walk-Around Inspection		✓	✓	✓	✓	—	—	—	—	—	—		Task content included in Task 20.
20.2	External Integrity Inspection		✓	✓	✓	✓	—	—	—	—	—	—		Task content included in Task 20.
20.3	Function Test Valve		✓	✓	✓	✓	—	—	—	—	—	—		Task content included in Task 20.
20.4	Leak Test Valve		✓	✓	✓	✓	—	—	—	—	—	—		Task content included in Task 20.
21	Repair Valves		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 21.1, 21.2, 21.3, 21.4, and 21.5.
21.1	Repair Valve Actuator/Operator, Pneumatic	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
21.2	Disassemble/Reassemble Valves	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Disassembly/Reassembly of Valve” in the 3rd ed. to “Disassemble/Reassemble Valves” in the 4th ed.
21.3	Perform Internal Inspection of Valves	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Internal Inspection of Valve and Components” in the 3rd ed. to “Perform Internal Inspection of Valves” in the 4th ed.
21.4	Repair Valve Actuator/Operator, Hydraulic	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
21.5	Repair Valve Actuator/Operator, Electric	195.420	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
22	Inspect, Test, and Calibrate Relief Valves		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 22.1 and 22.2.
22.1	Inspect Tank Pressure/Vacuum Breakers	195.432	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
22.2	Inspect, Test, and Calibrate Highly Volatile Liquid Tank Pressure-relief Valves	195.428(b)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
23	Maintain/Repair Relief Valves		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 23.1 and 23.2.
23.1	Maintain/Repair Relief Valves	195.428	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
23.2	Inspect, Test, and Calibrate Relief Valves	195.428	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Maintain/Repair Pressure Limiting Devices” in the 2nd ed. to “Inspect, Test, and Calibrate Relief Valves” in the 3rd ed.
24	Inspect, Test, and Calibrate Pressure Limiting Devices		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 24.1 and 24.2.

Covered Task Number	Covered Task Title (Last Publication)	195 Reference	Check Mark if Applicable: Task Performed on Pipeline	Operations or Maintenance Task	Required by 195	Affects Pipeline Operation/Integrity	1st Edition (2000)	2nd Edition (2012)	3rd Edition (2014)	4th Edition (2019)	5th Edition (2021)	6th Edition (2025)	Considered but Rejected	Publication Comments (Published Comments)
24.1	Maintain/Repair Pressure-limiting Devices	195.428(a)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Inspect, Test, and Calibrate Pressure-limiting Devices” in the 2nd ed. to “Maintain/Repair Pressure-limiting Devices” in the 3rd ed.
24.2	Inspect, Test, and Calibrate Pressure-limiting Devices	195.428(a)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Inspect, Test, and Calibrate Relief Valves” in the 2nd ed. to “Inspect, Test, and Calibrate Pressure-limiting Devices” in the 3rd ed.
25	Inspect, Test, and Calibrate Pressure Switches and Transmitters		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 25.1 and 25.2.
25.1	Inspect, Test, and Calibrate Pressure Switches	195.428(a)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
25.2	Inspect, Test, and Calibrate Pressure Transmitters	195.428(a)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
26	Verify or Set Protection Parameters for Programmable Controllers and/or Instrumentation Control Loops	195.428	✓	✓	—	✓	✓	—	—	—	—	—		At the time of the 2nd ed. publication, it was determined that this task did not meet the Four-part Test, and it was removed from Annex A.
27	Inspect and Repair Breakout Tanks		✓	✓	✓	✓	✓	—	—	—	—	—		Replaced with 27.1, 27.2, and 27.3.
27.1	Perform Routine Inspection of Breakout Tanks (API 653 Monthly or DOT Annual)	195.432	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Routine Inspection of Breakout Tanks (API 653 Monthly or DOT Annual)” in the 3rd ed. to “Perform Routine Inspection of Breakout Tanks (API 653 Monthly or DOT Annual)” in the 4th ed.
27.2	Perform API 653 Inspection of In-service Breakout Tanks	195.432(b)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “API 653 Inspection of In-service Breakout Tanks” in the 3rd ed. to “Perform API 653 Inspection of In-service Breakout Tanks” in the 4th ed.
27.3	Perform API 510 Inspection of In-service Breakout Tanks	195.432(c)	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “API 510 Inspection of In-service Breakout Tanks” in the 3rd ed. to “Perform API 510 Inspection of In-service Breakout Tanks” in the 4th ed.
	Hydrostatic Testing of Breakout Tanks	195.432(b)	✓	✓	✓	✓	—	—	—	—	—	—	✓	Should not be a stand-alone OQ task. This activity it is not covered under API Task 41 but is a part of API Task 27.2.
28	Provide Security for Pipeline Facilities		✓	—	✓	✓	✓	—	—	—	—	—		At the time of the 2nd ed. publication, it was determined that this task did not meet the Four-part Test, and it was removed from Annex A.
29	Protect Breakout Tanks from Static Electricity, Lightening, and Stray Electrical Currents		✓	✓	—	✓	✓	—	—	—	—	—		At the time of the 2nd ed. publication, it was determined that this task did not meet the Four-part Test, and it was removed from Annex A.
	Launching In-line Inspection Devices		✓	✓	—	✓	—	—	—	—		—	✓	Considered but never published. Task does not meet the Four-part Test.
	Receiving In-line Inspection Devices		✓	✓	—	✓	—	—	—	—		—	✓	Considered but never published. Task does not meet the Four-part Test.
30	Test Overfill Protective Devices	195.428	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
31	Inspect and Calibrate Overfill Protective Devices	195.428(d)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
32	Observe Excavation Activities	195.442(c)(6)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		1. Title changed from “Repair Overfill Protective Devices” in the 1st ed. to “Observation of Excavation Activities” in the 2nd ed. 2. Title changed from “Observation of Excavation Activities” in the 3rd ed. to “Observe Excavation Activities” in the 4th ed.
33	Move In-service Pipe	195.424	✓	✓	✓	✓	✓	—	—	—	—	✓		1. At the time of the 2nd ed. publication, it was determined that this task did not meet the third part of the Four-part Test. 2. Considered but never published. Task does not meet the Four-part Test. 3. Task was published because it was determined that it meets the third part of the Four-part Test as a performance-based task.
34	Inspect Existing Pipe Following Movement		✓	✓	—	✓	✓	—	—	—		—		At the time of the 2nd ed. publication, it was determined that this task did not meet the Four-part Test, and it was removed from Annex A.
35	Inspect Clearance of Existing Pipe to Underground Structures	195.250	✓	✓	✓	✓	✓	—	—			✓		
	Inspect the Depth of Cover and Clearance of Underground Pipe	195.248 195.250	✓	✓	✓	✓	—	—	—	—	—	—	✓	Moved this task to “considered but rejected.” Inspect the depth of cover should be added to line locating (Task 14.1) and Task 35 will be revived.

Covered Task Number	Covered Task Title (Last Publication)	195 Reference	Check Mark if Applicable											Publication Comments (Published Comments)
			Task Performed on Pipeline	Operations or Maintenance Task	Required by 195	Affects Pipeline Operation/Integrity	1st Edition (2000)	2nd Edition (2012)	3rd Edition (2014)	4th Edition (2019)	5th Edition (2021)	6th Edition (2025)	Considered but Rejected	
36	Abandoning, Safe-Disconnect, Purging, and Sealing of Pipeline Facilities		✓	✓	✓	✓	✓	—	—	—	—	—		At the time of the 2nd ed. publication, it was determined that this task was not applicable to liquids and was removed from Annex A.
37	Install, Maintain, and Inspect Aboveground Pipeline Supports	195.402(c)(10)	✓	✓	✓	✓	✓	—	—	—	—	—		1. Originally published as “Installation or Repair of Support Structures on Existing Aboveground Components.” 2. At the time of the 2nd ed. publication, it was determined that this task did not meet the Four-part Test and was removed from Annex A. 3. Task was balloted and approved to be added back in the 4th ed. as “Install, Maintain, and Inspect Aboveground Pipeline Supports.”
38	Inspection Activities for Tie-ins, Pipe Replacements, or Other Components Connecting to an Existing Pipeline		✓	✓	✓	✓	✓	—	—	—		—		Task replaced with 38.1, 38.3, 38.4, 38.5, 38.6, and 38.7.
38.1	Perform Visual Inspection of Pipe and Pipe Components Prior to Installation	195.206	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Visually Inspect Pipe and Pipe Components Prior to Installation” in the 3rd ed. to “Perform Visual Inspection of Pipe and Pipe Components Prior to Installation” in the 4th ed.
	Verify Nondestructive Weld Test		✓	✓	✓	✓	—	—	—	—		—		Considered but never published. Task content captured in tasks 38.4, 38.5, 38.6, and 38.7.
38.3	Perform Visual Inspection of Welds	195.228	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from "Visually Inspect that Welds Meet DOT Requirements" in 3rd ed. to "Perform Visual Inspection of Welds" in 4th ed.
38.4	Perform Nondestructive Testing—Radiographic Testing	195.234	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “NDT—Radiographic Testing” in the 3rd ed. to “Perform NDT—Radiographic Testing” in the 4th ed.
38.5	Perform Nondestructive Testing—Liquid Penetrant Testing	195.234	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “NDT—Liquid Penetrant Testing” in the 3rd ed. to “Perform NDT—Liquid Penetrant Testing” in the 4th ed.
38.6	Perform Nondestructive Testing—Magnetic Particle Testing	195.234	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “NDT—Magnetic Penetrant Testing" in the 3rd ed. to “Perform NDT—Magnetic Particle Testing” in the 4th ed.
38.7	Perform Nondestructive Testing—Ultrasonic Testing	195.234	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “NDT—Ultrasonic Testing” in the 3rd ed. to “Perform NDT—Ultrasonic Testing” in the 4th ed.
38.8	Perform Nondestructive Testing—Magnetic Flux Leakage Testing	195.234	✓	✓	✓	✓	—	—	—	—	—	✓		
	Perform Nondestructive Testing—Electromagnetic Testing	195.234	✓	✓	✓	✓	—	—	—	—	—	—		
	Perform Nondestructive Testing—Vacuum Box Inspection of Tank Welds		✓	✓		✓	—	—	—	—	—	—	✓	This task does not meet the third part of the Four-part Test because it is not specifically referenced in 49 *CFR* 195, nor is it specifically required to be performed to meet the requirements of API 650 and API 653 (IBR).
	Perform Nondestructive Testing—Diesel Penetrant Inspection of Tank Welds		✓	✓		✓	—	—	—	—	—	—	✓	This task does not meet the third part of the Four-part Test because it is not specifically referenced in 49 *CFR* 195, nor is it specifically required to be performed to meet the requirements of API 650 and API 653 (IBR).
	Perform Nondestructive Testing—Magnetic Flux Leakage Inspection of Tank		✓	✓	✓	✓	—	—	—	—	—	—	✓	Covered in Task 38.8.
	Perform Nondestructive Testing	195.234 195.422 195.452 g1XVI 195.588c4i 195.205	✓	✓	✓	✓	—	—	—	—	—	—	✓	Considered grouping NDT tasks together but decided keeping as separate tasks.
39	Perform Backfilling	195.246(a) 195.252	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		Title changed from “Backfilling a Trench Following Maintenance” in the 3rd ed. to “Perform Backfilling” in the 4th ed.
40	Perform General Pipeline Repair Activities		✓	✓	✓	✓	✓	—	—	—		—		Task replaced with 40.1, 40.3, 40.4, 40.5, 40.6, 40.7, 40.8, and 40.9.
40.1	Fit Full Encirclement Welded Split Sleeve (Oversleeve, Tight-fitting Sleeve, etc.)	195.422	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		

Covered Task Number	Covered Task Title (Last Publication)	195 Reference	Task Performed on Pipeline	Operations or Maintenance Task	Required by 195	Affects Pipeline Operation/Integrity	1st Edition (2000)	2nd Edition (2012)	3rd Edition (2014)	4th Edition (2019)	5th Edition (2021)	6th Edition (2025)	Considered but Rejected	Publication Comments (Published Comments)
			Check Mark if Applicable											
40.2	Oversleeve		✓	✓	✓	✓	—	—	—	—		—		Considered but never published. Task content captured in Task 40.1.
40.3	Apply Composite Sleeve	195.422	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
40.4	Install Mechanical Bolt-on Split Repair Sleeve	195.422	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
40.5	Install Weldable Compression Coupling	195.422	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
40.6	Install and Remove Plugging Machine	195.422	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
40.7	Install and Remove a Tap 2 in. and Under on a Pipeline System	195.422	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		1. Title changed from "Hot Tapping a Hole 2 inches or Under" in the 2nd ed. to "Installing a Tap 2 in. and Under on a Pipeline System" in the 3rd ed. 2. Title changed from "Installing a Tap 2 in. and Under on a Pipeline System" in the 3rd ed. to "Install a Tap 2 Inches and Under on a Pipeline System" in the 4th ed. 3. Agreed to change title from "Install a Tap 2 in. and Under on a Pipeline System" to "Install and Remove a Tap 2 in. and Under on a Pipeline System."
40.8	Install and Remove a Tap Larger Than 2 in. on a Pipeline System	195.422	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		1. Title changed from "Installing a Tap Larger Than 2 Inches on a Pipeline System" in the 3rd ed. to "Install a Tap Larger Than 2 Inches on a Pipeline System" in the 4th ed. 2. Agreed to change title from "Install a Tap Larger Than 2 in. on a Pipeline System" to "Install and Remove a Tap Larger Than 2 in. on a Pipeline System."
40.9	Install and Remove Completion Plug Larger Than 2 in. on a Pipeline System	195.422	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		1. Title changed from "Installation and Removal of a Completion Plug" in the 2nd ed. to "Install and Remove Completion Plug on Pipelines Larger Than 2 Inches" in the 3rd ed. 2. Agreed to update task name from "Install and Remove Completion Plug on Pipeline Larger Than 2 in." to "Install and Remove Completion Plug Larger Than 2 in. on Pipeline System."
	Plugging the Pipeline with the Lock-O-Ring Completion Plug		✓	✓	✓	✓	—	—	—	—	—	—	✓	Task considered but never published. Content captured in tasks 40.9 and 40.11.
40.11	Install and Remove Completion Plug 2 in. and Under on a Pipeline System	195.422	✓	✓	✓	✓	—	—	—	—	✓	✓		Agreed to update task name from "Install and Remove Completion Plug on a Pipeline 2 in. and Under" to "Install and Remove Completion Plug 2 in. and Under on a Pipeline System."
40.12	Cutting on Steel Pipeline	195.422	✓	✓	✓	✓	—	—	—	—	—	✓		
40.13	Perform Flange Bolting	195.422	✓	✓	✓	✓	—	—	—	—	—	✓		
40.14	Install Threaded Connections	195.422	✓	✓	✓	✓	—	—	—	—	—	✓		
40.15	Install and Monitor Vapor Barriers	195.422	✓	✓	✓	✓	—	—	—	—	—	✓		
	Install Mud Plugs						—	—	—	—	—	—	✓	Covered in task 40.15.
	Install Freeze Plugs						—	—	—	—	—	—	✓	Covered in task 40.15.
40.16	Remove Casings	195.422	✓	✓	✓	✓	—	—	—	—	—	✓		
40.17	Install Tubing	195.422	✓	✓	✓	✓	—	—	—	—	—	✓		
	Grinding, Sanding, or Buffing on Steel Pipeline	195.422	✓	✓	✓	✓	—	—	—	—	—	—		
41	Conduct Pressure Test	195.302 195.307 195.308	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		Title changed from "Conduct Pressure Tests" in the 1st ed. to "Conduct Pressure Test" in the 2nd ed.
42	Welding on Existing Pipeline Systems		✓	✓	✓	✓	✓	—	—	—	—	—		Task broken apart into subtasks.
	Repair of Arc Burns		✓	✓	✓	✓	—	—	—	—	—	—	✓	Task considered but never published. Content captured in Task 42.7.

Covered Task Number	Covered Task Title (Last Publication)	195 Reference	Check Mark if Applicable: Task Performed on Pipeline	Operations or Maintenance Task	Required by 195	Affects Pipeline Operation/Integrity	1st Edition (2000)	2nd Edition (2012)	3rd Edition (2014)	4th Edition (2019)	5th Edition (2021)	6th Edition (2025)	Considered but Rejected	Publication Comments (Published Comments)
	Repair of Defective Welds Other Than Welds Containing Cracks		✓	✓	✓	✓	—	—	—	—	—	—	✓	Task considered but never published. Content captured in Task 42.7.
	Repair of a Direct Pass on a Weld Containing a Defect Other Than a Crack		✓	✓	✓	✓	—	—	—	—	—	—	✓	Task considered but never published. Content captured in Task 42.7.
	Repair of Butt Welds Containing Cracks		✓	✓	✓	✓	—	—	—	—	—	—	✓	Task considered but never published. Content captured in Task 42.7.
	Repair of a Previously Repaired Area		✓	✓	✓	✓	—	—	—	—	—	—	✓	Task considered but never published. Content captured in Task 42.7.
	Replacement of a Weld or Cylinder of Pipe		✓	✓	✓	✓	—	—	—	—	—	—	✓	Task considered but never published. Content captured in Task 42.7.
42.7	Perform Welding	195.214 195.222 195.226 195.230	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Welding” in the 3rd ed. to “Perform Welding” in the 4th ed.
	Point to Point Verification	195.446(C)(2)	✓	✓	✓	✓	—	—	—	—	—	—	✓	Task considered but decided to incorporate as a step in other tasks instead of a stand-alone task.
43	Operations of Pipeline System		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 43.1, 43.2, 43.3, and 43.4.
43.1	Perform Start-up of a Liquid Pipeline (Control Center)	195.402 195.406 195.408 195.446	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Start-up of a Liquid Pipeline (Control Center)” in the 3rd ed. to “Perform Start-up of a Liquid Pipeline (Control Center)” in the 4th ed.
43.2	Perform Shutdown of a Liquid Pipeline (Control Center)	195.402 195.406 195.408 195.446	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Shutdown of a Liquid Pipeline (Control Center)” in the 3rd ed. to “Perform Shutdown of a Liquid Pipeline (Control Center)” in the 4th ed.
43.3	Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Control Center)	195.402 195.406 195.408 195.446	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
43.4	Operate Valves Remotely on a Liquid Pipeline System	195.402 195.406 195.408 195.446	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from “Remotely Operate Valves on a Liquid Pipeline System” in the 3rd ed. to “Operate Valves Remotely on a Liquid Pipeline System” in the 4th ed.
44	CPM Leak Detection		✓	✓	✓	✓	✓	—	—	—	—	—		Task replaced with 44.3, 44.4, 44.5, 44.6, 44.7, and 44.8.
	Inspection, Testing, and Calibrations of Leak Detection Equipment		✓	✓	✓	✓	—	—	—	—	—	—	✓	Task considered but never published. Content captured in tasks 44.3, 44.4, 44.5, 44.6, 44.7, and 44.8.
	Verify the Leak Detection System Meets Design Parameters		✓	—	—	✓	—	—	—	—	—	—	✓	Task considered but never published. Did not meet the Four-part Test.
44.3	Inspect, Test, and Maintain a Flow Computer for Hazardous Liquid Leak Detection	195.134 195.444	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		1. Title changed from “Inspect, Test, and Maintain a Liquid Pipeline Leak Detection Flow Computer” in the 2nd ed. to “Inspect, Test, and Maintain Flow Computer for Hazardous Liquid Leak Detection” in the 3rd ed. 2. Title changed from “Inspect, Test, and Maintain Flow Computer for Hazardous Liquid Leak Detection” in the 3rd ed. to “Inspect, Test, and Maintain a Flow Computer for Hazardous Liquid Leak Detection” in the 4th ed.
44.4	Inspect, Test, and Perform Corrective and Preventative Maintenance of Tank Gauging for Hazardous Liquid Leak Detection	195.444	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		1. Title changed from “Inspection, Testing, Corrective and Preventive Maintenance of Tank Gauging for Leak Detection” in the 2nd ed. to “Inspection, Testing, and Corrective and Preventive Maintenance of Tank Gauging for Hazardous Liquid Leak Detection” in the 3rd ed. 2. Title changed from “Inspection, Testing, and Corrective and Preventive Maintenance of Tank Gauging for Hazardous Liquid Leak Detection” in the 3rd ed. to “Inspect, Test, and Perform Corrective and Preventative Maintenance of Tank Gauging for Hazardous Liquid Leak Detection” in the 4th ed.

Covered Task Number	Covered Task Title (Last Publication)	195 Reference	Check Mark if Applicable											Publication Comments (Published Comments)
			Task Performed on Pipeline	Operations or Maintenance Task	Required by 195	Affects Pipeline Operation/Integrity	1st Edition (2000)	2nd Edition (2012)	3rd Edition (2014)	4th Edition (2019)	5th Edition (2021)	6th Edition (2025)	Considered but Rejected	
44.5	Prove Flow Meters for Hazardous Liquid Leak Detection	195.444	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
44.6	Maintain Flow Meters for Hazardous Liquid Leak Detection	195.444	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
44.7	Inspect, Test, and Maintain Gravitometers/Densitometers for Hazardous Liquid Leak Detection	195.444	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
44.8	Inspect, Test, and Maintain Temperature Transmitters for Hazardous Liquid Leak Detection	195.444	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from "Inspect, Test, and Maintain Temperature Transmitters" in the 2nd ed. to "Inspect, Test, and Maintain Temperature Transmitters for Hazardous Liquid Leak Detection" in the 3rd ed.
45	Operate Pressure Relieving Devices for Launching and Receiving Facilities	195.416 195.426 195.452 195.591	✓	✓	✓	✓	✓	—	—	—	—	✓		1. At the time of the 2nd ed. publication, it was determined that this task did not meet the third part of the Four-part Test. 2. Task was published because it was determined that it meets the third part of the Four-part Test as a performance-based task.
	Purge Gas from a Pipeline		✓	✓		✓	—	—	—	—	—	—	✓	Task out of document scope.
	Purge Air from a Pipeline		✓	✓		✓	—	—	—	—	—	—	✓	Task out of document scope.
	Leakage Survey		✓	✓		✓	—	—	—	—	—	—	✓	Task out of document scope.
	Perform Odorizer Inspection, Testing, Preventative and Corrective Maintenance		✓	✓		✓	—	—	—	—	—	—	✓	Task out of document scope.
	Investigate Outside Gas Leak		✓	✓		✓	—	—	—	—	—	—	✓	Task out of document scope.
	Perform Walking Gas Leakage Survey		✓	✓		✓	—	—	—	—	—	—	✓	Task out of document scope.
	Perform Mobile Gas Leakage Survey		✓	✓		✓	—	—	—	—	—	—	✓	Task out of document scope.
	Perform Vault Inspection and Maintenance		✓	✓		✓	—	—	—	—	—	—	✓	Task out of document scope.
	Conduct Explosive Atmosphere Detection and Alarm System Testing and Corrective Maintenance		✓	✓		✓	—	—	—	—	—	—	✓	Task out of document scope.
63.1	Perform Start-up of a Liquid Pipeline (Field)	195.402 195.406 195.408	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from "Start-up of a Liquid Pipeline (Field)" in the 2nd ed. to "Perform Start-up of a Liquid Pipeline (Field)" in the 4th ed.
63.2	Perform Shutdown of a Liquid Pipeline (Field)	195.402 195.406 195.408	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		Title changed from "Shutdown of a Liquid Pipeline (Field)" in the 2nd ed. to "Perform Shutdown of a Liquid Pipeline (Field)" in the 4th ed.
63.3	Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field)	195.402 195.406 195.408	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
63.4	Operate Valves Locally on a Liquid Pipeline System (Field)	195.402 195.406 195.408	✓	✓	✓	✓	—	✓	✓	✓	✓	✓		
101	Underwater—Measure Structure-to-electrolyte Potentials	195.573(a) 195.573(b) 195.575(c)	✓	✓	✓	✓	—	—	—	—	—	✓		
	Underwater—Measure and Describe Corrosion and Mechanical Damage						—	—	—	—	—	—	✓	Task considered but decided to capture content in tasks 102, 103, and 104.
102	Underwater—Examine for Mechanical Damage	195.452(h)	✓	✓	✓	✓	—	—	—	—	—	✓		
103	Underwater—Examine for External Corrosion	195.452(h)	✓	✓	✓	✓	—	—	—	—	—	✓		
104	Underwater—Inspect the Condition of External Coating	195.452(h)	✓	✓	✓	✓	—	—	—	—	—	✓		

Covered Task Number	Covered Task Title (Last Publication)	195 Reference	Check Mark if Applicable: Task Performed on Pipeline	Operations or Maintenance Task	Required by 195	Affects Pipeline Operation/Integrity	1st Edition (2000)	2nd Edition (2012)	3rd Edition (2014)	4th Edition (2019)	5th Edition (2021)	6th Edition (2025)	Considered but Rejected	Publication Comments (Published Comments)
105	Underwater—Install Galvanic Anodes	195.577(b)	✓	✓	✓	✓	—	—	—	—	—	✓		
	Underwater—Install Impressed Current Anodes	195.577(b)	✓	✓	✓	✓	—	—	—	—	—	—		
120	Underwater—Install Pipe-end Connectors	195.422	✓	✓	✓	✓	—	—	—	—	—	✓		
121	Underwater—Install and Remove a Plugging Machine	195.422	✓	✓	✓	✓	—	—	—	—	—	—		Task under consideration for future development.
122	Underwater—Install and Remove a Tap on a Pipeline System	195.422	✓	✓	✓	✓	—	—	—	—	—	—		Task under consideration for future development.
123	Underwater—Install and Remove Completion Plug on a Pipeline System	195.422	✓	✓	✓	✓	—	—	—	—	—	—		Task under consideration for future development.
124	Underwater—Perform Flange Bolting	195.422	✓	✓	✓	✓	—	—	—	—	—	—		Task under consideration for future development.
	Underwater—Install, Replace, or Repair Support Structures on Existing Pipelines	195.402(c)(10)	✓	✓	✓	✓	—	—	—	—	—	—		Task under consideration for future development.
	Underwater—Install Mechanical Clamps or Sleeves						—	—	—	—	—	—	✓	
140	Underwater—Locate Line and Install Temporary Marker	195.410 195.442(c)(4 and 5)	✓	✓	✓	✓	—	—	—	—	—	✓		Task under consideration for future development.
141	Underwater—Move In-service Pipe	195.424	✓	✓	✓	✓	—	—	—	—	—	—		Task under consideration for future development.
142	Underwater—Inspect the Depth of Cover and Clearance of Submerged Pipe	195.246(b)	✓	✓	✓	✓	✓	—	—	—	—	—		Task under consideration for future development.

Annex D
(informative)

Testing and Evaluation Guidance

D.1 Purpose

The purpose of this annex is to provide guidance for uniform administration of knowledge testing and performance evaluation to support operator qualification.

D.2 Objective

D.2.1 General

Knowledge testing and performance evaluation methods should be subject to well-documented internal controls and processes to ensure that proctor and evaluator personnel are qualified and the programs they deliver are regularly monitored. If training is used as part of the candidate's qualification process, then the scope, objective, and method of training needs to be defined in the provider's program. Audits by third parties may be performed to ensure a check and balance on program conformance.

In this annex, self-audit checklists are outlined and provided for:

— internal controls;

— test administration personnel;

— knowledge and skill measurements;

— security;

— audits.

D.2.2 Internal Controls

The checklist for internal controls is identified in Table D.1.

Table D.1—Internal Controls Checklist

<table>
<tr>
<td>
SELF-CHECK √
❒ Are there documented processes for:
— Test administration personnel:
a) Evaluator
b) Proctor
— Knowledge and skill measurements:
a) Knowledge testing
b) Evaluation process
c) Training
— Security:
a) Test security
b) Record control
— Audit process
</td>
<td>
❒ If yes,
— What processes are documented?
— Who is the custodian?
— Where are the documents retained?
— How is security/integrity maintained?
— What is the review cycle?
— Is there version control?
❒ If no,
— How are controls over processes maintained?
</td>
</tr>
</table>

D.2.3 Test Administration Personnel

D.2.3.1 Evaluator

The checklist for evaluators is identified in Table D.2.

Table D.2—Test Administration Personnel—Evaluator

SELF-CHECK √ ❒ Is there an established requirement for experience?	❒ If yes, — How is relevant experience validated? EXAMPLES: résumé, references, certification, etc. ❒ If no, — How is experience validated?
❒ Is there an established requirement for knowledge?	❒ If yes, — What are the requirements? EXAMPLES: trade school diploma, other education, etc. ❒ If no, — How is knowledge validated?
❒ Is there an established process for recertification or refresher training?	❒ If yes, — What is the process? ❒ If no, — How is continued acceptable knowledge ensured?
❒ Are responsibilities of the evaluator clearly established in the policies and procedures documents?	❒ If yes, — How are they conveyed to the evaluator? ❒ If no, — How are the evaluator's responsibilities established and conveyed?
❒ Are there policies and procedures in place to address evaluator misconduct?	❒ If yes, — What are the policies and procedures? ❒ If no, — How is misconduct addressed?

D.2.3.2 Proctor

The checklist for proctors is identified in Table D.3.

Table D.3—Test Administration Personnel—Proctor

SELF-CHECK √ ❒ Is there an established requirement for knowledge of the test administration process?	❒ If yes, — What is the requirement? a) Training b) Proctor procedures ❒ If no, — How are the requirements and processes validated?
❒ Are responsibilities of the proctor clearly established in the policies and procedures documents?	❒ If yes, — How are these responsibilities conveyed to the proctor? ❒ If no, — How are the proctor's responsibilities established and conveyed?

D.2.4 Knowledge and Skill Measurements

D.2.4.1 Knowledge Testing

The checklist for knowledge testing is identified in Table D.4.

Table D.4—Knowledge Testing

SELF-CHECK √ ❒ Is there a test development and ongoing validation process?	❒ If yes, — What is the test development process? EXAMPLES: industry standards, vetted by subject matter experts, reviewed, ongoing item review, item performance statistics, etc. ❒ If no, — How were the tests developed?
❒ Are there written processes in place for test administration?	❒ If yes, — What are the methods for delivery? EXAMPLES: computer based, paper based, item randomization, etc. ❒ If no, — What are the processes?
❒ Is there a retesting process?	❒ If yes, — What is the process? EXAMPLE: waiting period for retesting ❒ If no, — How is retesting addressed?
❒ Is there a process in place for candidates to challenge test questions?	❒ If yes, — What is this process? ❒ If no, — How is fairness to the test candidate and accuracy of the test questions ensured?
❒ Is remediation for testing available?	❒ If yes, — What is the remediation process? ❒ If no, — How is remediation addressed?

D.2.4.2 Evaluation Process

The checklist for the evaluation process is identified in Table D.5.

Table D.5—Evaluation Process

SELF-CHECK √ ❒ Is there an established evaluation process?	❒ If yes, — What is the process? ❒ If no, — How are evaluations conducted?
❒ Is there an evaluation development and ongoing validation process?	❒ If yes, — What is the process? a) Industry standard/criteria b) Internal/external subject matter expert validation c) Manufacturer's guidelines d) Operator-specific material ❒ If no, — How are the evaluation materials developed?
❒ Are there criteria for determining successful task performance?	❒ If yes, — What are these criteria? ❒ If no, — How is successful performance assessed?
❒ Is there a reevaluation process for failed evaluation and/or after period of nonperformance?	❒ If yes, — What is the process? ❒ If no, — How is reevaluation addressed?
❒ Is there a reevaluation process for significant changes to procedures or specifications that impact the performance of a covered task?	❒ If yes, — What is the process? ❒ If no, — How is reevaluation addressed?

D.2.4.3 Training for Individuals Performing Covered Tasks

The checklist for training is identified in Table D.6.

Table D.6—Training

SELF-CHECK √ ❒ Is there training available for each covered task?	❒ If yes, — How are the training materials developed? — How is training conducted? EXAMPLES: instructor led; self-paced (distance/computer); OJT If instructor led, how are the relevant knowledge, skills and abilities of the instructor determined? ❒ If no, — How does the candidate obtain the necessary knowledge and skills prior to the testing and performance evaluation?
❒ Is there a process to address significant changes that impact the performance of a covered task?	❒ If yes, — What is the process? — Is a knowledge and/or performance assessment necessary to validate? ❒ If no, — How does the candidate obtain the necessary knowledge and skills?

D.2.5 Security

D.2.5.1 Test Security

The checklist for test security is identified in Table D.7.

Table D.7—Test Security

SELF-CHECK √ ❒ Is there a process in place to protect the security of test items and test material?	❒ If yes, — What measures are taken to maintain security of testing materials? ❒ If no, — How is the security of testing materials maintained?
❒ Is there a process in place to maintain the security of the test development material?	❒ If yes, — What measures are taken to maintain security of development materials? ❒ If no, — How is the security of the development materials maintained?

D.2.5.2 Record Control

The checklist for record control is identified in Table D.8.

Table D.8—Record Control

SELF-CHECK √ ❒ Is there a system in place for securing sensitive information?	❒ If yes, — What measures are used to ensure the security of sensitive information? ❒ If no, — How is security maintained?
❒ Is there a secure records management system in place for qualification records?	❒ If yes, — Who has access? — What type of recordkeeping system is used? — What is the process for entering records into the recordkeeping system? ❒ If no, — How are qualification records maintained?
❒ Is there a data protection system?	❒ If yes, — What is the process for data backup? — What is the frequency? ❒ If no, — How are the data protected?

D.2.6 Audit

The checklist for audits is identified in Table D.9.

Table D.9—Audits

SELF-CHECK √ ❒ Is there an audit process in place to ensure that processes and/or procedures are followed?	❒ If yes, — What processes and procedures are audited? — How are objectivity and validity of the audit processes ensured? ❒ If no, — What methods are used to ensure that processes and procedures are followed?

Annex E
(informative)

Program Effectiveness Guide

E.1 Purpose

An operator qualification (OQ) program may include methods by which the program is measured for continued effectiveness. The purpose of this annex is to provide guidance in establishing a written process for measuring the OQ program's effectiveness.

Concepts of the "Plan–Do–Check–Act" principles outlined in API 1173 were utilized as a framework for this document.

E.2 Terms and Definitions

E.2.1
program effectiveness
The extent to which planned activities are completed and planned results achieved.

E.3 "Plan–Do–Check–Act" as Applied to Program Effectiveness

E.3.1 Plan

E.3.1.1 General

Establish objectives and processes necessary to measure and deliver results in accordance with the organization's policies and expected goals for its OQ program.

While not specifically required by the regulation, an operator may consider using this annex as a guide when developing processes for periodic review of the written OQ program and auditing program implementation. Operators should determine the process for incorporating program improvements based on the findings.

E.3.1.2 Plan Objectives

Program effectiveness objectives and processes should:

— support execution of the plan;

— address regulatory and legislative requirements;

— ensure that data, results, and findings are shared across relevant employees and contractors;

— be supported by sufficient resources to design, implement, monitor, and improve the plan.

E.3.1.3 Plan Checklists

E.3.1.3.1 General

An operator may refer to the following checklists when developing program effectiveness processes.

E.3.1.3.2 Records Management Checklist

- ❑ Is the management of your documentation in accordance with your plan?
  - ❒ Do the records conform to the operators' record retention policy?
- ❑ Are the documents complete, accurate, and verified for adherence with your plan?

E.3.1.3.3 Stakeholder Feedback Checklist

- ❑ Do your employees and evaluators have a way for providing feedback?
- ❑ Is feedback received from evaluators, employees, contractors, other affected individuals, and governing agencies reviewed regarding the following?
  - ❒ Training
  - ❒ Evaluation issues
  - ❒ Procedural issues
  - ❒ AOC recognition and reaction

E.3.1.3.4 On-site/Field Review Checklist

- ❑ Are the responsibilities of individuals under the qualification program clearly and formally defined?
- ❑ Are covered tasks being completed by qualified individuals or by unqualified individuals being directed and observed by a qualified individual within the qualification program's span of control?
- ❑ Are covered tasks being performed using the appropriate procedures?
- ❑ Are evaluations being performed using approved methods and evaluators?

E.3.1.3.5 Operator Qualification Program Review Checklist

- ❑ Are the individuals involved in the qualification program properly trained to perform their duties as stated in the OQ program?
  - ❒ Individuals conducting training and evaluations
  - ❒ Individuals performing OQ covered tasks
- ❑ Is the OQ program reviewed periodically and updated using data and information gained from policies and procedures, inspections and testing, integrity-related work, and incident investigations?
- ❑ Are suspended and revoked qualifications being managed as stated in the qualification program?
- ❑ Are changes to the qualification processes being communicated and implemented according to the qualification program?
  - ❒ How are the methods of evaluation deemed effective to measure individual qualifications? (Reference Annex D of this document.)

- ❒ Have the knowledge and skills being measured been adequately determined for the specific covered task? (Reference Annex D of this document.)
  - ❑ When changes are made to a covered task, which can include a knowledge and skills component, are they communicated:
    - ❑ internally?
    - ❑ to contractors?
    - ❑ to third-party service providers?
- ❒ When changes are made to a covered task or knowledge and skills, are qualification materials evaluated for changes to the applicable training or evaluation?
- ❒ Are subsequent qualification intervals evaluated for effectiveness?

E.3.1.3.6 Evaluator Review Checklist

- ❑ Is the evaluator competent in the covered tasks they are evaluating?
- ❑ Is the evaluator trained on evaluation methods, ethics, and documentation responsibilities?
- ❑ Is the evaluator properly conducting evaluations according to the operator's OQ program requirements?

E.3.1.3.7 Inspection Feedback Checklist

- ❑ Is internal inspection feedback evaluated?
- ❑ Is regulatory inspection feedback evaluated?

E.3.1.3.8 Third-party Data Providers Checklist

- ❑ Are third-party certifications (e.g. AMPP/NACE, ASNT) evaluated for compliance with the knowledge and skills requirements of corresponding covered task qualifications?
- ❑ Do the evaluation methods of third-party providers conform to the guidance provided in Annex D of API 1161?
- ❑ Do the evaluation methods of third-party providers conform to your plan?

E.3.1.3.9 Incident Review Checklist

- ❑ Are reviews of events or actions involving an OQ covered task that adversely affects the operations or integrity of the pipeline conducted?
- ❑ In the case of an incident investigation, are there policies and procedures in place to impose suspensions and/or revoke qualifications on those who contribute to incidents/accidents?
- ❑ If the incident was related to a qualified individual inadequately directing and observing an unqualified individual or more than one covered task:

   - ❒ Was the responsible person familiar with the span of control requirements?
   - ❒ Was the responsible person qualified in those tasks he/she directed and observed under span of control?

- ❑ If the incident was related to span of control not being followed, was the ratio of qualified-to-unqualified individuals communicated?
- ❑ If the incident was related to the qualified individual directing and observing more than one covered task at the same time, was the individual aware of the span of control requirements?
- ❑ If the incident was related to deficiencies in knowledge for the specific covered task, was training provided on that covered task?
- ❑ If the incident was related to an individual improperly or not using appropriate equipment:
   - ❒ Was the equipment specified?
   - ❒ Did the individual receive equipment-specific training?
   - ❒ Was the appropriate equipment used?
- ❑ If the incident was related to the individual failing to recognize or taking appropriate action during an AOC, was the AOC incorporated into the evaluation and training process?
- ❑ If the incident was related to the individual not taking appropriate action following recognition of an AOC, was the AOC incorporated into the evaluation and training process?

E.3.2 Do

Implement program effectiveness plan.

Execute the processes as designed in the planning step above.

E.3.3 Check

Review results compared with established objectives.

Program effectiveness results should provide adequate measures to:

— determine whether the operator's OQ program is meeting its intended goals;

— identify gaps and deviations as compared to established goals and objectives to provide opportunities for improvement.

E.3.4 Act

E.3.4.1 General

Take actions to continually improve process performance, including corrective actions between actual and planned results; analyze the differences to determine their root causes; and determine where to apply changes that will include improvement of the process or product.

E.3.4.2 Actions Checklist

- ❑ How are deficiencies identified in the program communicated to those responsible for managing the program?
- ❑ How are deficiencies validated and tracked for closure?
- ❑ How is performance communicated to management and program administrators?
- ❑ Is there a process in place for improvements to be added and implemented?

Annex F
(informative)

Management of Change Guidance

F.1 Scope

This guidance addresses considerations for the following:

— how operators manage changes to procedures, tools, standards, and other changes to the operator qualification (OQ) program;

— how these changes are incorporated into the qualification and evaluation methods for individuals performing covered tasks;

— the methods employed to communicate changes to the individuals performing covered tasks, whether operator employees or contractors.

F.2 Purpose

The OQ rule [49 *CFR* § 195.505(f) Qualification Program] requires that the operator communicates changes that affect covered tasks to individuals performing those covered tasks. To perform this effectively, the operator should have a change management methodology so that it knows when changes are occurring, what changes have an impact on covered task performance, the relative significance of the change and how it affects the continued qualification of individuals, and mechanisms to effectively communicate changes to qualified individuals.

The purpose of this annex is to provide guidance for uniform administration of a management of change process for OQ programs. Consideration of the following characteristics is important to determine whether the requirements of the rule have been met:

1) identification of the methods used to communicate changes to affected individuals;

2) means of ensuring that affected personnel are kept up-to-date on current requirements of the OQ program;

3) changes to the OQ plan and revisions to the plan are made and communicated to affected stakeholders.

F.3 Management of Change Considerations

Does the operator's OQ program identify how changes to procedures, tools, standards, and other elements used by individuals in performing covered tasks are communicated to the individuals, including contractor individuals, and how these changes are implemented in the evaluation method(s)?

The types of changes that a management of change procedure addresses may include the following:

— technology;

— equipment;

— procedural;

— organizational.

Consideration should be made for both permanent or temporary changes. The process should incorporate planning for the effects of the change for each of these situations:

— Does the operator’s program identify changes that affect covered tasks and how those changes are communicated, when appropriate, to affected individuals?

— Does the operator’s program identify and incorporate changes that affect covered tasks?

— Does the operator’s program include provisions for the communication of changes (e.g. who, what, when, where, and why) in the qualification program to the affected individuals?

— Does the operator incorporate changes into initial and subsequent evaluations?

— Are contractors supplying individuals who perform covered tasks for the operator notified of changes that affect task performance and thereby the qualification of these individuals?

Operators shall consider how changes to their operations and maintenance procedures, systems, and equipment may affect their OQ program.

The operator should periodically identify changes that need to be communicated to its workers and addressed in its OQ program.

The operator should ensure that the person responsible for managing the OQ program is:

— aware of the need and the importance of ensuring qualified personnel are prepared for changed conditions;

— communicating changes affecting covered tasks to the individuals who perform the task;

— fully aware of the written OQ program provisions to address and manage changes to its systems;

— adjusting evaluations for affected tasks if changes have occurred that trigger this provision.

Annex G
(informative)

Abnormal Operating Conditions Guidance

G.1 Purpose

This annex provides guidance to identify abnormal operating conditions (AOCs) for inclusion in the AOC section of individual covered task standards.

Operators can use all, part, or none of this method to identify AOCs, as alternative and equally valid methods exist.

G.2 Objective

Annex B includes a set of normative covered task standards that may be adopted by the operator as part of their qualification program. Each covered task standard includes a section that documents AOCs specific to the performance of the covered task that should be evaluated when individuals are being qualified to perform the work described in the covered task standard.

Guidance is provided to distinguish AOCs from emergencies, abnormal operations (AOs), and safety-related conditions, which are other 49 *CFR* Part 195 regulatory terms that should not be confused with AOCs. Guidance is also provided to eliminate potential AOCs that are related to improper task performance or are generic in nature and not directly related to the task being performed.

G.3 Terms and Definitions

For the purposes of this annex, the following terms and definitions apply.

G.3.1
component
Any part of a pipeline that may be subjected to pump pressure including, but not limited to, pipe, valves, elbows, tees, flanges, and closures.

G.3.2
pipeline condition
A circumstance that affects the appearance, quality, or working order of a pipeline, pipeline component, or the pipeline system.

G.4 Abnormal Operating Conditions

G.4.1 General

An AOC is defined in Section 3 of this document.

G.4.2 Distinguishing Between Emergencies and Abnormal Operating Conditions

Emergencies are defined as follows in 49 *CFR* § 195.402(e)(2):

— fire or explosion occurring near or directly involving a pipeline facility;

— accidental release of hazardous liquid or carbon dioxide from a pipeline facility;

— operational failure causing a hazardous condition;

— natural disaster affecting pipeline facilities.

Emergencies are different than AOCs and AOs. Emergencies involve significant consequences that cannot be easily addressed or resolved. Investigation after an AOC or an AO is identified may lead to the discovery of an emergency, but once identified, the response to the emergency shall follow an established emergency procedure.

An indication that an emergency may exist can be considered an AOC, but an actual emergency should not be identified as an AOC.

G.4.3 Distinguishing Between Abnormal Operations and Abnormal Operating Conditions

49 *CFR* Part 195 distinguishes between an AOC and an AO. Operators are mandated to have procedures in place by 49 *CFR* § 195.402(d)(1) for abnormal operations.

AO procedures describe how an operator responds to, investigates, and corrects the cause of the following events to provide safety when operating design limits have been exceeded:

— unintended closure of valves or shutdowns;

— increase or decrease in pressure or flow rate outside normal operating limits;

— loss of communications;

— operation of any safety device; or

— any other malfunction of a component, deviation from normal operation, or personnel error that could cause a hazard to persons or property.

The key distinction that should be made when interpreting between an AOC and an AO is related to the final point listed above. An AOC is a *condition* that *may indicate* a malfunction of a component or deviation from normal operations, whereas an AO would *require* a malfunction of a component or a deviation from normal operation to have occurred before it can be realized. Put another way, an AOC is an observation that something may be wrong and further investigation is warranted, whereas an AO occurs when something has gone wrong, and an established procedure shall be followed to mitigate the consequence and prevent a potential emergency. Investigating an AOC may lead to the discovery of an AO.

Both AOCs and AOs are designed to prepare individuals to recognize and react to abnormal situations, but they are distinguished by the degree of evidence that is available to the observer and the level of procedural control each operator shall establish to guide the response.

An indication that an AO may exist can be considered an AOC, but an actual AO should not be identified as an AOC.

G.4.4 Distinguishing Between Safety-related Conditions and Abnormal Operating Conditions

49 *CFR* § 195.55(a) has established a series of reportable safety-related conditions.

Safety-related conditions are related to reporting and overlap exists with AOs and emergencies. However, all safety-related conditions involve the identification of an actual malfunction of a component or an actual deviation from normal operations that preclude them from meeting the definition of an AOC.

Safety-related conditions should not be identified as an AOC.

G.4.5 Distinguishing Between Task Steps and Abnormal Operating Conditions

Conditions observed as a result of performing a task step that also meet the definition of an AOC should be identified as a task-specific AOC on the task standard.

For example, Task 15.1 (Perform Visual Inspection of Surface Conditions of Right-of-way) includes a task step directing the individual to “perform the visual inspection/patrol of the right-of-way.” If the individual identifies conditions such as stained soil, dead vegetation, or pipeline damage, which also meet the definition of an AOC, the task should include the appropriate response in the task step explanation and the recognition and response should be listed in the AOC section of the task standard.

G.4.6 Distinguishing Between Failure to Correctly Perform Tasks and Abnormal Operating Conditions

Operators are required to qualify individuals to correctly perform covered tasks. Failure by an individual to properly perform a covered task is a qualification issue.

A potential mode of task performance failure should be addressed as part of the qualification process and should not be identified as an AOC.

G.5 Identifying Abnormal Operating Conditions

Figure G.1 depicts the recommended process to identify AOCs. Table G.1 provides guidance on the decisions and actions listed in the process as they relate to the regulatory interpretation provided in this annex.

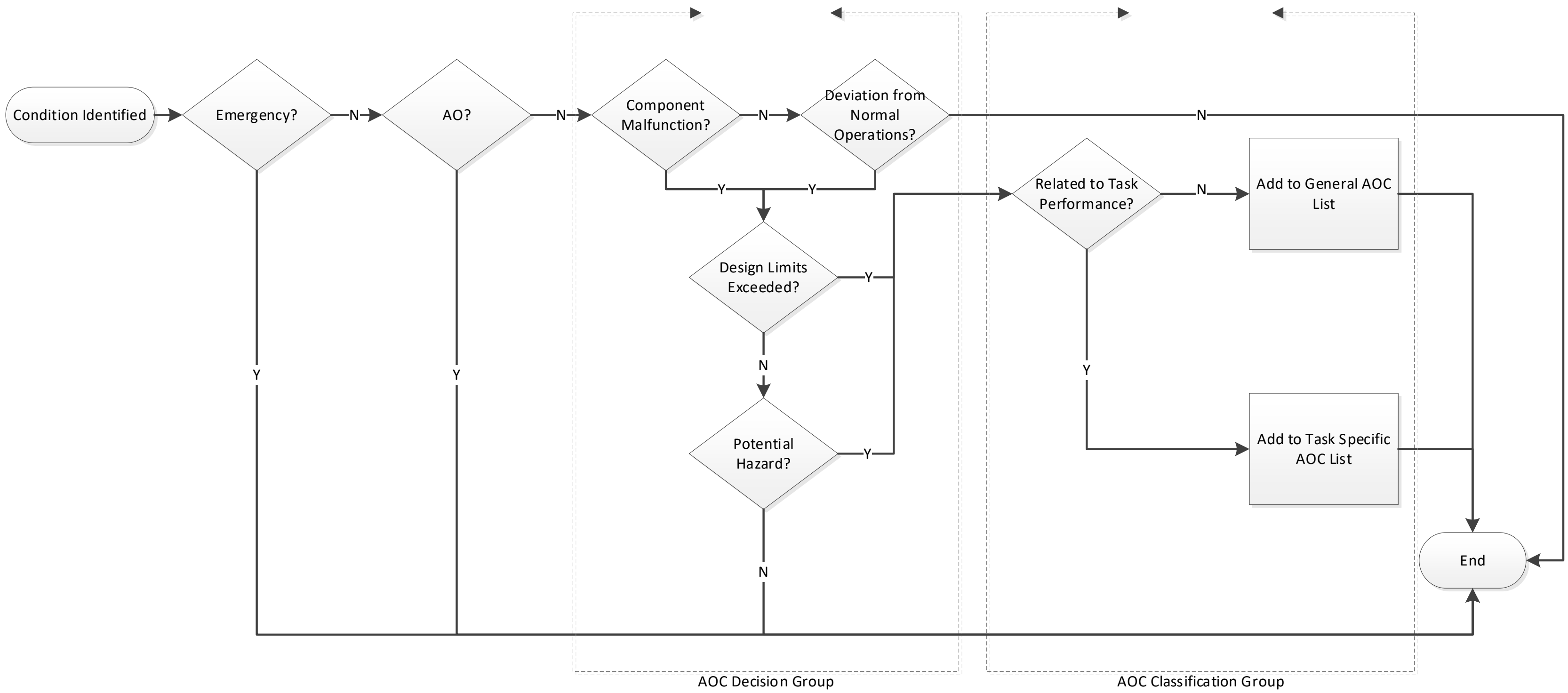

Figure G.1—Abnormal Operating Condition Identification Process

Table G.1—Abnormal Operating Condition Identification Process Description

	Condition Identified	The process begins with the identification of a “pipeline condition” as defined in G.3.2.
	Emergency Decision If yes, then no further action is required.	If the condition meets the definition of an emergency, then it is not an AOC. Operators should verify an emergency procedure exists to guide response to the condition.
	AO Decision If yes, then no further action is required.	If the condition meets the definition of an AO, then it is not an AOC. Operators should verify an AO procedure exists to guide response to the condition.
AOC Decision Group	**Component Malfunction or Deviation from Normal Operations Decision** If yes to either question, then proceed to “Design Limits Exceeded” decision. If no, then further action is not required.	For the condition to be deemed an AOC, it should indicate a malfunction of a component or a deviation from normal operations may have occurred.
	Design Limits Exceeded or Potential Hazard Decision If yes, then proceed to AOC Classification Group. If no, then further action is not required.	For the condition to be deemed an AOC, it should also indicate that design limits may have been exceeded or that it may result in a hazard(s) to persons, property, or the environment.
AOC Classification Group	**Related to Task Performance Decision** If no, then “Add to Generic AOC List.” If yes, then “Add to AOC Section of the Task Standard.”	AOCs not directly related to work being performed should not be in individual task standards.
	End	The process concludes after the identified condition has been appropriately classified.

Annex H
(informative)

Establishing Span of Control and Evaluation Intervals

H.1 Purpose

To establish maximum recommended task span of control and evaluation intervals, operators should determine the risk and difficulty of each covered task. In making risk and difficulty determinations, operators should consider subject matter expert input, system operating characteristics, company procedures, equipment used to perform covered tasks, and the company's history of near misses and accidents.

H.2 Process

H.2.1 Step One—Assess Risk

— Determine the risk of performing the task.

a) High risk consequences could be:

1) a product release that presents a hazard to persons, property, or the environment;

2) an injury resulting in hospital admission and/or fatality;

3) an evacuation or shelter-in-place order;

4) a fire or explosion causing significant monetary cost;

5) any consequence the operator deems high risk.

b) Moderate risk consequences could be:

1) an employee or contractor injury;

2) a fire causing moderate monetary cost;

3) any consequence the operator deems moderate risk.

c) Low risk does not meet the consequences for high or moderate risk and is not likely to lead to:

1) a product release;

2) injury or fatality;

3) fire or explosion.

NOTE This list is not intended to be all-inclusive.

H.2.2 Step Two—Assess Difficulty

— Determine the difficulty of performing the task.

a) High difficulty may require or include the following:

1) advanced knowledge and skill;

2) specialized training and/or certification;

3) the ability to analyze complex tasks;

4) nonsequential task steps;

5) significant time and effort;

6) unique environmental conditions.

b) Moderate difficulty may require or include the following:

1) intermediate knowledge and skill;

2) the ability to analyze routine tasks;

3) sequential task steps;

4) average time and effort.

c) Low difficulty may require or include the following:

1) basic knowledge and skill;

2) the ability to comprehend basic procedures;

3) the ability to apply principles;

4) minimal time and effort.

H.2.3 Step Three—Determine Span of Control and Evaluation Interval

When the levels of risk and difficulty have been determined, use Figure H.1 to identify the maximum recommended span of control and evaluation interval for the task. Operators should consider the frequency that an individual performs the task when determining evaluation intervals.

Operators should consider their system's operating characteristics, procedures, and equipment when determining span of control and evaluation intervals.

The ratio of qualified to nonqualified personnel may be reduced by the operator to zero (1:0) when, for example:

— a covered task requires a qualified individual by regulation (e.g. welding);

— a qualified individual cannot intervene to correct improper performance or react to an abnormal operating condition (e.g. hot tap).

NOTE The process described, including the span of control and evaluation interval maximum recommendations, is provided for operators to consider when establishing task management parameters.

TASK ANALYSIS		TASK MANAGEMENT	
Step One ASSESS RISK	**Step Two ASSESS DIFFICULTY**	**SPAN OF CONTROL**	**EVALUATION INTERVAL**
High Risk	High difficulty	1:1	36 months
	Moderate difficulty	1:1	36 months
	Low difficulty	1:1	36 months
Moderate Risk	High difficulty	1:1	36 months
	Moderate difficulty	1:2	48 months
	Low difficulty	1:3	48 months
Low Risk	High difficulty	1:3	48 months
	Moderate difficulty	1:4	60 months
	Low difficulty	1:5	72 months

Figure H.1—Risk and Difficulty Analysis

Bibliography

[1] API Standard 650, *Welded Tanks for Oil Storage*

[2] API Recommended Practice 1173, *Pipeline Safety Management Systems*

[3] ASME B31.3, *Process Piping*

[4] IEEE C2 [4], *National Electrical Safety Code*

[5] NFPA 70 [5], *National Electrical Code*

[4] Institute of Electrical and Electronics Engineers, 3 Park Avenue, New York, NY 10016, www.ieee.org.

[5] National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169, www.nfpa.org.

American
Petroleum
Institute

200 Massachusetts Avenue, NW
Suite 1100
Washington, DC 20001-5571
USA

202-682-8000

Additional copies are available online at www.api.org/pubs

Phone Orders:	1-800-854-7179	(Toll-free in the U.S. and Canada)
	303-397-7956	(Local and International)
Fax Orders:	303-397-2740	

Information about API publications, programs and services is available on the web at www.api.org.

Product No. D11616