Recommended Practice for Pipeline Operator Qualification (OQ)

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Suggested revisions are invited and should be submitted to the Standards Department, API, 1220 L Street, NW, Washington, DC 20005, standards@api.org.

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Introduction

Background

The original purpose of API 1161 was to provide Liquid Pipeline Operators (“Operators”) with a guidance document to aid in the development of a written Operator Qualification (OQ) program to comply with the new OQ regulation (49 *CFR* Part 195 Subpart G) which became effective October 26, 1999. At that time, the preamble to the final regulation was the only guidance available to assist Operators with program development and program compliance. Since then, the regulation has been revised; Pipeline and Hazardous Materials Safety Administration (PHMSA) has issued advisories, white papers, frequently asked questions (FAQs), protocols and other guidance documents; industry groups have formed and some have issued OQ standards; and Operators have gained compliance experience as their programs have matured. Therefore, it is the goal of the OQ workgroup to revise API 1161 to reflect the relevant additional information that was not available in 2000.

Program Requirements

Each Operator is required to have and follow a written OQ program that includes provisions to address the nine required elements of the OQ regulation. While the Operator has the flexibility to exceed the requirements of the regulation, it is important to note that any and all requirements included in the written program become enforceable.

Recommended Practice for Pipeline Operator Qualification

1 Scope

The purpose of this recommended practice is to provide guidance for developing and maintaining a compliant Operator Qualification (OQ) program. Operators may choose to use all, part or none of this document. Additionally, many components of this recommended practice also apply to Gas Transmission Lines regulated under 49 *CFR* 192. Therefore, Operators may choose to utilize the recommended practice as applicable for these lines.

Operators should be aware that the OQ regulation is applicable only to United States Department of Transportation (DOT) jurisdictional pipelines. For purposes of this document, the word “pipeline” is used interchangeably with pipeline, pipeline facility and pipeline system and any and all jurisdictional pipeline components as defined in 49 *CFR* Part 195.

This document is written to provide guidance for achieving compliance with the regulation at the time of publication and is comprised of four individual components: the Guidance Document, the API Covered Task List (Annex A), and the Covered Task Standards (Annex B) and Evolution of the Covered Tasks Annex C).

2 Abbreviations

For the purposes of this document, the following abbreviations apply.

AOC	abnormal operating conditions
API	American Petroleum Institute
CFR	*Code of Federal Regulations*
DOT	Department of Transportation
FAQ	frequently asked question
HQ	headquarters
NDT	nondestructive testing
OPID	Operator identification
OPS	Office of Pipeline Safety
OQ	Operator Qualification
PHMSA	Pipeline and Hazardous Materials Safety Administration

3 Guidance for Developing a Written Program

3.1 Roles and Responsibilities

Operators should define roles and responsibilities for the administration, management, and consistent implementation of the OQ program. Clear responsibilities for implementing the elements of the OQ program should be established and communicated to affected individuals. Responsibilities associated with the OQ program may include but are not limited to the following:

— central management and oversight of the OQ program;

— training, as appropriate;

— conducting and administering evaluations;

— recordkeeping;

— assigning covered tasks to individuals;

— verifying individuals' qualifications;

— managing contractors and other entities.

3.2 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.

3.3 Language

The Operator's OQ program should include a policy on language to ensure effective communication when non-English speaking individuals perform covered tasks. Options may include but are not limited to the following:

— maintain a single-language policy, whereby all individuals performing covered tasks speak the same language (i.e. English);

— utilize bilingual individuals to interpret for non-English speaking individuals performing covered tasks;

— ensure availability of acceptable qualification methods in applicable language(s).

3.4 Program Improvement

3.4.1 General

While not specifically required by the regulation, an Operator may consider developing processes for periodic review of the written program and auditing program implementation. Operators should determine the process for incorporating program improvements based on the findings.

3.4.2 Written Program Review

The purpose of a periodic review of the written program is to insure that it meets current regulatory compliance and any additional needs of the Operator. The Operator has the flexibility to structure the review as formally or informally as deemed necessary and should document the results and identify appropriate modifications, if any.

3.4.3 Internal Audit

The purpose of an internal audit is to assure the program is being implemented as written. The Operator has the flexibility to structure the audit as formally or informally as deemed necessary and should document the results of the audit and identify appropriate modifications, if any.

4 Element 1: Identify Covered Tasks

4.1 General

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

— is performed on a pipeline facility; and

— is an operations or maintenance task; and

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

— affects the operations or integrity of the pipeline.

The four criteria listed above shall be referred to hereafter as the four-part test.

4.2 Guidance on Identifying Covered Tasks

4.2.1 General

In developing the covered task list, the Operator shall consider tasks performed on the pipeline facility, regardless of who performs them (employees, contractors, subcontractors, or other entities such as other pipeline Operators or those with access to the Operator's equipment). For example, if an Operator contracts out pipeline repair activities, those activities shall be considered in the identification of covered tasks.

The Operator has flexibility to determine how to accomplish covered task identification. The Operator should document the method and justification for selecting covered tasks. Options for establishing a covered task list may include but are not limited to the following two methods.

4.2.2 Adoption of an Industry-Developed Covered Task List

Industry and technical associations, qualification product providers, and others have developed covered task lists through subject matter expert consensus. The Covered Task List developed by API (in conjunction with the Operator Qualification workgroup under the Pipeline Committee) is attached to this document as Annex A. The Operator should take additional steps if adopting such a list and at a minimum, should compare the covered task list to its operations and maintenance activities in order to ensure completeness. The Operator has the flexibility to combine or separate covered tasks as suitable to its operations and, if gaps are identified should apply the four-part test to add or delete covered tasks as applicable.

4.2.3 Analysis of Operations and Maintenance Activities

An analysis of operations and maintenance activities may be used in the process of determining which activities should be included in an Operator's covered task list. Items to be considered when conducting activity identification and analysis may include, but are not limited to the following:

— *CFR* Part 195;

— state or local requirements;

— operations, maintenance and safety procedures;

— industry developed covered task list(s);

— applicable Pipeline and Hazardous Materials Safety Administration (PHMSA) Advisory Bulletins.

It may be helpful to record each applicable activity on a master list, and document the answers to the four-part test questions, adding justification notes as needed. This method of documentation will produce a list of covered and non-covered tasks and may assist in regulatory and internal reviews. Subject matter experts, regulatory compliance personnel, and others may be enlisted to assist in the identification and analysis of activities. Operators have the flexibility to include additional tasks that do not meet the four-part test.

4.3 Guidance on Interpreting the Four Part Test

4.3.1 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 by the pipeline right of way) or that are connected by signals through the air 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. A component that is disconnected, but not physically removed from the pipeline facility, would meet the requirement of Part 1 of the four-part test.

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

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

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

The Operator should review all Subparts of 195, applicable PHMSA Advisory Bulletins, and state and local requirements to ensure completeness of all tasks. Operations and maintenance tasks are not limited to those tasks addressed in 195 Subpart F.

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

Operators shall consider tasks that, if performed incorrectly, could adversely affect the operations or integrity of the pipeline, during or after the performance of the task. Operations include actions taken to facilitate storage or movement of product through a regulated pipeline. The integrity of the pipeline refers to the pipeline's ability to operate safely and to withstand the stresses imposed during operations.

5 Element 2: Ensure, Through Evaluation, that Individuals Performing Covered Tasks are Qualified

5.1 General

As defined in the regulation, qualified means that an individual has been evaluated and can: (a) perform assigned covered tasks and (b) recognize and react to abnormal operating conditions associated with those tasks.

5.2 Guidance on Establishing Criteria for Qualification through Evaluation

5.2.1 General

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

Qualification is the result of a process determined by the Operator that includes successful completion of task specific evaluation(s) with the associated AOCs, documentation and any other requirements as documented in the program whereas an evaluation is a step in the qualification process.

5.2.2 Qualification

5.2.2.1 General

The Operator has several decision points when developing a qualification process. At a minimum, consideration should be given to the covered task, the individual or groups of individuals to be qualified and the type of qualification. The resulting qualification process(es) should be documented.

5.2.2.2 Covered Task

The Operator should review the covered tasks to determine the appropriate evaluation method(s) and other qualification requirements. Items to be considered may include but are not limited to the following:

— scope and complexity of the covered task;

— level of knowledge and/or skill needed to perform the covered task;

— any other factors as determined by the Operator.

5.2.2.3 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 and may utilize the same evaluation methods and other qualification requirements for all groups of individuals (employees, contractors, subcontractors, or other entities such as other pipeline Operators or those with access to the Operator's equipment) or, may establish different requirements for different groups. The Operator may establish provisions in its Program to accept qualifications from other entities' internal OQ Programs.

5.2.2.4 Type of Qualification

Types of qualification should be considered when determining evaluation methods and other qualification requirements. Requirements may differ by type of qualification (e.g. initial qualifications, current qualifications prior to an expiration date, qualifications that have exceeded an expiration date or qualifications which may require additional actions as described in Element 4 and Element 5).

5.2.3 Evaluations

As stated in the regulation, evaluation is the process, established and documented by the Operator, to determine an individual's ability to perform a covered task by any of the following:

— written examination;

— oral examination;

— work performance history review (see note);

— observation during:

  — performance on the job (see note),

  — on the job training,

  — simulation;

— other forms of evaluation.

NOTE Neither work performance history review nor observation of performance on the job can be used as a sole evaluation method. These methods may be used in conjunction with other allowable methods of evaluation.

5.2.4 Evaluation Methods

Written and oral examinations consist of standard, pre-determined questions and should contain a sufficient number of questions to adequately measure the knowledge required to perform a covered task. A written examination is a knowledge test on paper or electronic format; whereas oral examination is a verbal knowledge test. Consideration should be made for the role of a proctor and/or evaluator to ensure tests are administered in a secure and controlled setting.

Work performance history review (WPHR) is a structured, documented review of an individual's task-related performance records. WPHR was originally established to aid Operators in transitioning their employees past work experience to meet the requirements of the regulation. If an Operator chooses to use WPHR as an evaluation method, the following steps should be completed and documented at a minimum:

— 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 (Part 195) caused by an error in performing a covered task; and,

— verification that the individual has successfully performed the covered task on a regular basis.

Observation during performance on the job is a casual, unstructured observation.

Observation during on the job training is a performance evaluation conducted at the conclusion of training on a covered task. (See other forms of evaluation.)

Observation during simulation can be any of several evaluation methods described as follows:

— simulated 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 intended performance of the covered task without physically touching the equipment.

Other forms of evaluation are as follows.

— Performance evaluations are formal, structured observations to measure skills and knowledge. An individual independently performs a covered task in a real-time or simulated environment while an evaluator assesses his/her skills based on a set of predetermined and documented criteria (such as a checklist).

— Professional certifications (e.g. NACE, ASNT, API, ANSI) that include evaluation.

5.2.5 Evaluation Material

Evaluations should assess an individual's knowledge and skills necessary to perform a task. An Operator has the option to develop internal evaluation materials or utilize material developed by third party organizations.

If developing internal evaluation material, the Operator may base the evaluations on Operations and Maintenance procedures. If using third party vendors, it is the responsibility of the Operator to assess the vendors' processes and materials to ensure that all requirements are met.

The Operator may consider periodically reviewing and updating evaluations to ensure they meet requirements.

5.2.6 Evaluation Process

Items to be considered when developing an evaluation process may include but are not limited to the following.

- Pass/fail criteria:
  - number of unsuccessful attempts allowed;
  - consequences of failure.
- Process for communicating evaluation results.
- Evaluator minimum requirements.
  - The Operator may consider providing formal training for the evaluator to ensure he/she understands the evaluation process and his/her role. The Operator may also consider if the evaluator should be qualified on the task he/she is evaluating when the evaluation is performed on live pipe and there are no other qualified individuals to direct and observe.
- Proctor minimum requirements.
- Rules to ensure integrity of evaluations:
  - fair and consistent administration;
  - security of test questions and answer banks.
- Documentation requirements.

5.2.7 Abnormal Operating Conditions (AOC)

As stated in the regulation, qualification shall include an evaluation of the individual's ability to recognize and react to AOCs associated with covered tasks.

The Operator has the flexibility to determine method(s) for ensuring individuals can recognize and react to AOCs. These methods may include but are not limited to the following:

- develop a stand-alone AOC evaluation;
- incorporate AOCs into task evaluation;
- review AOCs in pre-job meetings and document review;
- review AOCs in periodic meetings and document review;
- any combination of the above.

As defined in the regulation, an AOC means 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.

Identifying AOCs for covered tasks includes but is not limited to the following.

— Analyzing the covered task procedures to identify any steps that, if performed incorrectly, could lead to a release, overpressure or other potentially hazardous condition. Upon identification of these steps, determine and document the abnormal operating condition and the recognition and appropriate corrective response.

5.3 Other Circumstances that Require Qualification Considerations

5.3.1 New Construction

The Operator's OQ program should address how the OQ regulation applies to new construction. As defined by PHMSA, new construction is the act of building a pipeline facility, or expanding an existing pipeline facility (as in looping a pipeline segment, which may also be construction 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. New construction ends when the pipeline facility is being commissioned or during the act of connecting to an active pipeline (the tie-in).

5.3.2 Mergers and Acquisitions

The Operator's program should include provisions for mergers and acquisitions and in such event shall ensure qualified individuals perform covered tasks.

When individuals are included in the acquisition and will remain qualified under the acquired asset's OQ program, the Operator should make every effort to obtain that program prior to the acquisition and review it for completeness and acceptability. Sections to be reviewed may include but are not limited to the following:

— covered task list;

— abnormal operating conditions;

— span of control;

— requalification intervals;

— individuals' qualifications;

— contractor management;

— evaluation criteria.

Once the program has been reviewed, the Operator has several options which may include but are not limited to the following:

— accept all or part of the acquired program;

— reject the acquired program;

— temporarily accept all or part of the acquired program.

The Operator should document the process and OQ program actions taken during the merger or acquisition.

Even in the event no individuals are acquired with a merger or acquisition, the Operator should determine if revisions to the program or additional covered tasks or AOCs are necessary due to differences in product transported, technology, or equipment.

The Operator may also review the acquired program for best practices and determine which, if any, components should be incorporated.

6 Element 3: Allow Individuals that are Not Qualified Pursuant to the Regulation to Perform a Covered Task if Directed and Observed by an Individual that is Qualified

6.1 General

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

6.2 Guidance on Allowing Non-qualified Individuals to Perform Covered Tasks

Each task should be assessed to determine how many non-qualified individuals, if any, can perform a task while being directed and observed by a qualified person. Criteria should be established for determining the ratio of qualified vs. non-qualified individuals who can safely perform the covered tasks (span of control). Operators should take into account the task's complexity, criticality and normal working conditions when determining the maximum span of control. Typical industry spans of control range from 1:0 through 1:5. It is recommended the Operator not exceed spans above 1:5. When establishing the maximum span of control, options to consider include, but are not limited to the following:

— develop span of control ratios internally;

— adopt span of control ratios as developed by an industry or technical association.

The Operator may consider reducing span of control when actual jobsite conditions (i.e., language barriers, weather conditions, excess noise), limit the qualified individual's ability to direct and observe nonqualified individuals. The Operator may consider the impact of training on span of control. If the Operator sets the span of control for tasks at 1:0, then the Operator may consider including a provision in the program to allow a non-qualified individual to perform covered tasks during on-the-job training.

In addition, the program should state that the qualified individual shall be in close proximity to the non-qualified individual so that he/she may intervene if the task is being performed incorrectly and can respond to an AOC if one should arise.

7 Element 4: Evaluate an Individual if the Operator has Reason to Believe that the Individual's Performance of a Covered Task Contributed to an Accident/Incident as Defined in the Regulation

7.1 General

Operators shall review an individual's qualification upon determination that the individual's performance of a covered task(s) contributed to an incident.

7.2 Guidance on Determination of Appropriate Action Following Individual's Involvement in an Incident or Accident

If the Operator determines that an individual's performance of a covered task contributed to a PHMSA defined accident, the Operator should determine if the covered task(s) was performed improperly. The Operator may consider, but is not limited to, the following reasons:

— lack of individual's knowledge, skill, or ability;

— deficiency in procedure;

— human factors not related to OQ.

The Operator should determine and execute appropriate action(s) to ensure qualification and effectiveness. Appropriate actions to be taken may include, but are not limited to the following:

— restrict individual's performance of covered task;

— provide training for individual;

— conduct procedure review with individual;

— evaluate and/or qualify individual;

— revise the procedure(s);

— revise the OQ program;

— other actions as warranted;

— no action required.

Operators should document the results of the review including any actions taken.

8 Element 5: Evaluate an Individual if the Operator has Reason to Believe that the Individual is No Longer Qualified to Perform a Covered Task

8.1 General

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

8.2 Guidance on Determining if an Individual Should No Longer be Qualified

Operators should develop a process to determine if and when an individual is no longer qualified to perform a covered task. Reasons an individual may no longer be qualified, other than an accident or incident as defined by DOT Part 195 may include but are not limited to the following:

— failure to properly perform a covered task;

— extended leave;

— prolonged period of non-performance of a covered task;

— loss of motor skills, vision, or impairments as determined by a medical professional.

The Operator has the flexibility to establish a policy that applies to all affected individuals, or may choose to determine qualification on an individual basis, or a combination of both. It may be helpful to consider the following.

— If covered tasks were performed improperly, does the individual lack knowledge, skill or ability?

— If extended leave was involved, consider the following.

  — Did the reason for leave affect the individual's ability to perform covered tasks?

  — Have procedures changed during leave of absence?

  — Have qualifications expired during leave of absence?

  — How much experience does the individual have at performing the covered tasks?

— How much time elapsed since the last performance of the covered tasks?

— Are there other contributing factors to consider?

In the event the individual is no longer qualified, the Operator may consider additional actions, which may include but are not limited to the following:

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

— training;

— re-evaluation;

— procedure review;

— no action required.

9 Element 6: Identify Those Covered Tasks and the Intervals at Which Evaluation of the Individual's Qualifications is Needed

9.1 General

Operators shall establish re-evaluation intervals for each covered task.

9.2 Guidance on Developing Re-evaluation Intervals

When developing intervals, the Operator has the option of utilizing evaluation intervals established by an industry association or other entity or developing Operator specific intervals. However, an evaluation interval of 36 months is recommended based on current practice. An Operator may choose to extend this timeframe as needed for scheduling flexibility. Any extension should be documented in the Operator's OQ Program. If the Operator chooses to adopt an industry developed interval, the Operator should review the interval to ensure the requirements of the Operator specific program are met.

When developing intervals internally, the Operator should develop and document the rationale used to determine the intervals and may consider the following:

— complexity of the task (how difficult is the task to perform?);

— criticality of the task (how does the task impact safety and integrity of the pipeline facility?);

— frequency of performance of the task (how often is the task performed?).

The Operator may consider establishing a method of notifying individuals prior to the expiration of the qualification.

10 Element 7: Communicate Changes that Affect Covered Tasks to Individuals Performing Those Covered Tasks

10.1 General

The Operator shall have a mechanism for communicating changes that affect covered tasks.

10.2 Guidance on Developing Processes to Communicate Changes that Affect Covered Tasks

Changes that affect covered tasks shall be communicated. The Operator should have processes in place for communicating the change to the affected individuals.

Examples of changes that affect covered tasks may include the following:

— task addition or deletion;

— revisions or additions to identified AOCs;

— policies, procedures, and standards;

— tools, equipment, or technology;

— evaluation methods, materials and criteria;

— suspension and disqualification processes;

— re-evaluation intervals;

— span of control.

Significant changes to covered tasks may necessitate additional evaluation to maintain qualification.

11 Element 8: Provide Training, as Appropriate, to Ensure that Individuals Performing Covered Tasks Have the Necessary Knowledge and Skills to Perform the Tasks in a Manner that Ensures the Safe Operation of Pipeline Facilities

11.1 General

The Operator should address the role of training in the qualification of individuals.

11.2 Guidance on Providing Training, as Appropriate

It is important to note that the term “training” is often used incorrectly in reference to evaluation and qualification. Training is the act of facilitating the learning, development and improvement of new and existing knowledge and skills and not the evaluation or qualification of those knowledge and skills.

There may be circumstances that require training to ensure individuals have the knowledge and skills required for qualification.

Examples of when training may be appropriate include but are not limited to the following:

— initial qualification;

— suspension or disqualification;

— revisions to policies and procedures;

— changes to tools, equipment or technology;

— failed evaluation.

Training delivery methods may include but are not limited to the following:

— on-the-job training (OJT) program;

— instructor led training;

— computer based training;

— self study.

12 Element 9: Notify the Administrator or a State Agency Participating Under 49 U.S.C. Chapter 601 if the Operator Significantly Modifies the Program After the Administrator or State Agency Has Verified that it Complies with the Regulation.

12.1 General

Operators are required to identify significant modifications that would require notification and submission to PHMSA and appropriate state regulatory agencies.

12.2 Guidance on Determining a Significant Change

Operators should determine what changes would be considered significant changes to the OQ Program. Examples of changes that may be considered significant include:

— modifications to covered task list;

— modifications to evaluation process;

— modifications to qualification process;

— revisions to span of control;

— wholesale changes made to the Operator's OQ program (e.g. consolidation of programs following a merger or acquisition, changes to roles and responsibilities or other changes the Operator deems significant).

12.3 Guidance on Transmitting OQ Program Revisions

Operators should send notifications of significant modification of an OQ Program to the Office of Pipeline Safety (OPS) Information Resource Manager by either e-mail or mail as follows.

EMAIL

InformationResourcesManager@phmsa.dot.gov

MAIL

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration
Office of Pipeline Safety
Information Resources Manager
1200 New Jersey Avenue, SE
East Building, 2nd Floor (PHP-10)
Room E22-321
Washington, DC 20590

The Operator should submit the complete OQ program accompanied by a revision/change log and the effective date of change(s). The OQ program should be notated such that changed areas of the program can be readily identified. Employee-specific information (i.e. social security numbers) and testing material do not need to be sent.

Additionally, each notification to PHMSA should include the following:

1) Operator identification [OPID(s)], Operator name(s), headquarters (HQ) address;

2) name of individual submitting notification;

3) data/email/phone number;

4) commodity (gas/liquid/both);

5) PHMSA Region(s) where pipeline(s) operates;

6) names of respective facilities or pipeline systems where changes apply.

NOTE Operators subject to pipeline safety regulations by state agencies are required to send OQ notifications directly to each affected state agency.

12.4 Recordkeeping

In addition to elements 1 through 9, the regulation requires that the Operator maintain the following records for all individuals performing covered tasks:

— 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. It is important to note that the five years begins on the last date the qualification was valid.

12.5 Guidance On Developing Recordkeeping Criteria

Operators may consider developing and documenting a process that ensures individuals performing covered tasks have valid qualifications. Examples of validation methods may include but are not limited to:

— hard copy records;

— electronic records;

— ID cards.

Qualification records may be maintained by the Operator or a third party. It is important to note that different methods may be used to validate qualification for employees, contractors, subcontractors or other entities.

The Operator may 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 written program and all program revisions including covered task changes;

— communication of the written OQ Program;

— management of change, including the notification of applicable contractors;

— evaluation criteria;

— span of control;

— applicable training;

— re-evaluation records for cause;

— feedback from field personnel, accident and incident 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;

— log of revision.

Annex A
(normative)

Covered Task List

The Covered Tasks listed below were identified by API and may be adopted by the Operator as described in Clause 4.2 of this document.

COVERED TASK NUMBER	Covered Task Name
1.1	Measurement of Structure-to-Soil Potentials
1.2	Conduct Close Interval Survey
1.3	Test to Detect Interference
1.4	Inspect and Perform Electrical Test of Bonds
1.5	Inspect and Test Electrical Isolation
2.1	Verify Test Lead Continuity
2.2	Repair Damaged Test Lead
2.3	Install Test Leads by Non-Exothermic Welding Methods
2.4	Install Test Leads by Exothermic Welding Methods
3.0	Obtain a Voltage and Current Output Reading from a Rectifier to Verify Proper Performance
4.1	Troubleshoot Rectifier
4.2	Repair or Replace Defective Rectifier Components
4.3	Adjustment of Rectifier
5.1	Examine for Mechanical Damage on Buried or Submerged Pipe
5.2	Examine for External Corrosion on Buried or Submerged Pipe
5.3	Inspect the Condition of External Coating on Buried or Submerged Pipe
7.1	Visual Inspection of Atmospheric Coatings
7.2	Prepare Surface for Coating Using Hand and Power Tools
7.3	Prepare Surface for Coating by Abrasive Water Blasting
7.4	Prepare Surface for Coating by Abrasive Blasting Methods Other Than Water
7.5	Apply Coating Using Hand Application Methods
7.6	Apply Coating Using Spray Applications
7.7	Perform Coating Inspection
8.1	Measure Pit Depth with Pit Gauge
8.2	Measure Wall Thickness with Ultrasonic Meter
8.3	Measure Corroded Area
9.1	Install Bonds
9.2	Install Galvanic Anodes
9.3	Install Rectifiers

COVERED TASK NUMBER	Covered Task Name
9.4	Install Impressed Current Groundbeds
9.5	Repair Shorted Casings
9.6	Install Electrical Insulating Device
10.1	Insert and Remove Coupons
10.2	Monitor Probes (On-Line)
11.0	Monitoring and Controlling the Injection Rate of the Corrosion Inhibitor
12.0	Visually Inspect Internal Pipe Surface
14.1	Locate Line
14.2	Install, Inspect, and Maintain Permanent Marker
14.5	Install, Inspect, and Maintain Temporary Marker
15.1	Visually Inspect Surface Conditions of Right-of-Way
16.1	Inspect Navigable Waterway Crossing
19.1	Valve Body Winterization or Corrosion Inhibition
19.2	Valve Lubrication
19.3	Valve Seat Sealing
19.4	Valve Stem Packing Maintenance
19.5	Adjust Actuator/Operator, Electric
19.6	Adjust Actuator/Operator, Pneumatic
19.7	Adjust Actuator/Operator, Hydraulic
20.0	Inspect Mainline Valves
21.1	Repair Valve Actuator/Operator, Pneumatic
21.2	Disassembly/Re-assembly of Valve
21.3	Internal Inspection of Valve and Components
21.4	Repair Valve Actuator/Operator, Hydraulic
21.5	Repair Valve Actuator/Operator, Electric
22.1	Inspect Tank Pressure/Vacuum Breakers
22.2	Inspect, Test, and Calibrate HVL Tank Pressure Relief Valves
23.1	Maintain/Repair Relief Valves
23.2	Inspect, Test, and Calibrate Relief Valves
24.1	Maintain/Repair Pressure Limiting Devices
24.2	Inspect, Test, and Calibrate Pressure LImiting Devices
25.1	Inspect, Test, and Calibrate Pressure Switches
25.2	Inspect, Test, and Calibrate Pressure Transmitters
27.1	Routine Inspection of Breakout Tanks (API 653 Monthly or DOT Annual)
27.2	API 653 Inspection of In-Service Breakout Tanks

COVERED TASK NUMBER	Covered Task Name
27.3	API 510 Inspection of In-Service Breakout Tanks
30.0	Test Overfill Protective Devices
31.0	Inspect and Calibrate Overfill Protective Devices
32.0	Observation of Excavation Activities
38.1	Visually Inspect Pipe and Pipe Components Prior to Installation
38.3	Visually Inspect that Welds Meet DOT Requirements
38.4	NDT - Radiographic Testing
38.5	NDT - Liquid Penetrate Testing
38.6	NDT - Magnetic Particle Testing
38.7	NDT - Ultrasonic Testing
39.0	Backfilling a Trench Following Maintenance
40.1	Fit Full Encirclement Welded Split Sleeve (Oversleeve, Tight Fitting Sleeve, etc.)
40.3	Apply Composite Sleeve
40.4	Install Mechanical Bolt-On Split Repair Sleeve
40.5	Install Weldable Compression Couplings
40.6	Install and Remove Plugging Machine
40.7	Installing a Tap 2 in. and Under on a Pipeline System
40.8	Installing a Tap Larger Than 2 Inches on a Pipeline
40.9	Install and Remove Completion Plug on Pipelines Larger than 2 Inches
41.0	Conduct Pressure Test
42.7	Welding
43.1	Start-up of a Liquid Pipeline (Control Center)
43.2	Shutdown of a Liquid Pipeline (Control Center)
43.3	Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Control Center)
43.4	Remotely Operate Valves on a Liquid Pipeline System
44.3	Inspect, Test, and Maintain Flow Computer for Hazardous Liquid Leak Detection
44.4	Inspection, Testing, and Corrective and Preventative Maintenance of Tank Gauging for Hazardous Liquid Leak Detection
44.5	Prove Flow Meters for Hazardous Liquid Leak Detection
44.6	Maintain Flow Meters for Hazardous Liquid Leak Detection
44.7	Inspect, Test, and Maintain Gravitometers/Densitometers for Hazardous Liquid Leak Detection
44.8	Inspect, Test, and Maintain Temperature Transmitters for Hazardous Liquid Leak Detection
63.1	Start-up of a Liquid Pipeline (Field)
63.2	Shutdown of a Liquid Pipeline (Field)
63.3	Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field)
63.4	Locally Operate Valves on a Liquid Pipeline System

Annex B
(normative)

Covered Task Standards

Annex B is expected to include all of the updated Task Standards. As of the publication date of API 1161, 2nd Edition, this annex includes only those Task Standards approved by the governance group by ballot. This annex will continue to incorporate Task Standards as addenda as they are developed and approved by API. The Task Standards in this annex directly correlate to Annex A (Covered Task List), but will be published in no particular order.

The expected completion date for this annex is 18 months from publication of RP 1161 Rev. 2. At that time, this annex will be incorporated in full into the document.

As available, OQ Task Standards will be available at no cost on API's website and are accessible at:

http://www.api.org/1161TaskLists

Users of this document are directed to visit this website periodically to obtain the updated Task Standards as they are made available for publication.

OQ Task Name

Task 1.1 – Measurement of Structure-to-Soil Potentials

1.0 Task Description

This task involves taking a structure-to-soil reading with a half cell during an annual survey or cathodic protection analysis. The task begins with equipment selection and ends with documenting the results.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Cathodic protection systems used to understand the purpose and expected results of the measurement, including the type of reference cell to use in combination with a high impedance volt-ohm meter (VOM)

- Copper/copper sulfate half cells are used as the reference cell for most pipelines buried in soil
- Saturated KCI calomel reference electrodes
- Saturated silver/silver oxide half cells used in sea water

An example of a minimum requirement is a negative voltage of 850 millivolts for a copper/copper sulfate half cell.

Consideration must be made to account for IR drop when measuring structure-to-soil potentials. Voltage drops other than those across the structure-to-electrolyte boundary must be considered.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Voltage is less than minimum requirements	Verify the cathodic protection level and implement mitigation if insufficient.
Erratic or floating readings	Determine the cause of the erratic readings and repair the test leads or equipment, as needed.
Reverse polarity of readings	Document and implement corrective actions.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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.

Step	Action	Explanation
2	Identify the correct test point locations where measurements will be taken.	The reference electrode must be located to obtain accurate results. A structure may have several locations for taking measurements.
3	Correctly connect the test leads to the voltage meter and reference cell.	Improper connection of test leads will lead to inaccurate potential measurements.
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 to ensure that they are within the desired range of readings, including a check of the polarity.	Readings should be reviewed as they are taken to ensure that readings 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.
6	Document the readings as required by operator's procedure.	Documentation is critical to future analysis and identification of problem areas.

OQ Task Name

Task 1.2 – Conduct Close Interval Survey

1.0 Task Description

This task includes use of equipment to obtain and record structure-to-soil potential readings at specific intervals along the length of a located pipeline. The task begins after the pipeline is located and ends when data from the designated area is recorded.

Data analysis is not part of this covered task.

Examples of close interval surveys may include, but are not limited to, the following:

- "ON" survey
- Interrupted survey
- Depolarized survey

Locate Line is a separate covered task (Reference Task 14.1).

Measurement of Structure-to-Soil Potentials is a separate covered task (Reference Task 1.1).

2.0 Knowledge Component

An individual performing this task must have knowledge of cathodic protection systems and components comparable to NACE Certification Level CP 2 to include, but is not limited to, the following:

- 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. 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.
- "ON" Survey – Measures the potential difference between the structure and the ground surface as the cathodic protection current is applied.
- Interrupted (On/Off) Survey – Measures the potential difference between the structure and the ground surface as the cathodic protection current is switched on and off.
- Depolarized (Off) Survey – Measures the potential difference between the structure and the ground surface after the cathodic protection current has been switched off long enough for the structure-to-soil to stabilize.
- Data Logger – A digital device used to record multiple structure-to-soil potentials.
- Current Interrupter – A device that stops/interrupts the transfer of an electric charge used to cycle rectifiers, anodes, bonds, etc., on and off.
- "Instant Off" Potential – The polarized half-cell potential of an electrode taken immediately after the cathodic protection current is stopped. This process closely approximates the potential without IR drop.
- 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.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Erratic or floating readings	Determine the cause of the erratic readings, and repair the test leads or equipment, as needed.
Reverse polarity of readings	Document and notify the appropriate operator personnel immediately.

3.0 Skill Component

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

Step	Action	Explanation
1	Identify the test point locations where connections will be made.	To ensure that potentials taken are on the intended pipeline and are the most accurate readings.
2	Correctly connect the test leads, the voltage meter or data logger, and reference cell.	Improper connection of equipment will lead to inaccurate potential measurements.
3	Verify that current sources are operational (on for “ON”/interrupted surveys and turned off/disconnected for depolarized survey).	All current sources must be operational for an “ON”/interrupted survey, and all sources must be off or disconnected for a depolarization survey.
4	Place the reference cell directly above the pipeline being surveyed.	The reference electrode must be in contact with the electrolyte to obtain accurate results.
5	Select the instrumentation to include survey wire, voltmeter, data logger, reference electrodes, etc. to be used.	Incorrect or faulty equipment will not provide accurate results.
6	For interrupted surveys, install current interrupters 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.
7	Measure the structure-to-soil 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.
8	Verify data is recorded.	Readings are continuous and a lack of data may be a sign of equipment failure or faulty electrode location.
9	Document the readings as required by operator’s procedures.	Documentation is critical to future analysis and identification of problem areas.

OQ Task Name

Task 1.3 – Test to Detect Interference

1.0 Task Description

This task involves testing a cathodically protected structure for interference from other sources. The initial approach and physical assessment is to assess structures in related proximity to each other and their respective cathodic protection systems. This task begins with testing for direct current (DC) or alternating current (AC) interference and ends with documenting the results.

Measurement of Structure-to-Soil Potentials is a separate covered task (Reference Task 1.1).

Obtain a Voltage and Current Output Reading from a Rectifier to Verify Proper Performance is a separate covered task (Reference Task 3.0).

2.0 Knowledge Component

An individual performing this task must have knowledge of cathodic protection systems and components comparable to NACE Certification Level CP 2. This knowledge must include, but is not limited to, the following:

- Determining interference by analyzing abnormal DC currents or potentials or the presence of AC currents or potentials.
- 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.
- Interrupting a cathodic protection system to detect its influence on other structures. Installation of current interrupters on either or both systems is necessary to determine the extent of system interference.
- Troubleshooting cathodic protection systems.
- Documenting the readings and recommendations for future reference.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
The reading is outside of expected parameters.	Check for possible causes of unexpected readings such as reverse polarity, broken bond, or change in cathodic system.

3.0 Skill Component

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

Step	Action	Explanation
1	Select and show correct use of the instrumentation, test leads, and reference electrodes.	Incorrect equipment and/or improper usage will not provide accurate results.
2	Assess the area for other cathodic protection systems or sources of electrical interference.	Potential sources of electrical interference can be the sources of cathodic interference.
3	Measure the structure-to-soil 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 readings fall within the desired range. This may include a comparison to historical data at that location.
5	Interrupt rectifiers to determine if interference exists.	Interrupting one of the structure's cathodic protection 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.

OQ Task Name

Task 1.4 – Inspect and Perform Electrical Test of Bonds

1.0 Task Description

This task involves the visual and electrical inspection of connections related to the electrical connection (bond) of two or more structures. The inspection is to include testing for electrical continuity and the direction and magnitude of current flow. This task begins with identifying the location of the bond(s) and ends with the collection of data.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

How to identify the location and type of bond that is currently in place. Types of bonds may include critical and non-critical interference bonds. Other bonds that may be inspected include continuity bonds.

- Continuity bond – A connection, usually metallic, that provides electrical continuity between structures that can conduct electricity.
- Critical bonds are 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.

Voltmeters or multi-meters are used to take a voltage reading across a shunt. Bond currents are measured by taking a millivolt reading across a shunt, where the shunt is a defined resistance. This voltage reading is then divided by the shunt's resistance value to equal the current passing through the shunt (bond).

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Change in the current flow and/or direction across the bond (reverse polarity)	Ensure that readings were taken correctly, and notify operator personnel, as required.
Broken bond connection	Repair or request a repair and document.
Erratic or floating readings	Determine the cause of the erratic readings, and repair test leads or equipment as needed.

3.0 Skill Component

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

Step	Action	Explanation
1	Identify the bond locations where measurements will be taken.	To ensure that potentials and current measurements are taken at the correct location.

Step	Action	Explanation
2	Conduct a visual inspection of the bond test station for physical damage to the bond station, a damaged shunt, loose connections, disconnected wires, arcing across terminal, etc.	Faulty equipment can cause inaccurate results.
3	Select the instrumentation, including volt-ohm meter, ammeter, test leads, or reference cell.	Incorrect equipment and/or improper usage will not provide accurate results.
4	Make connections with the test equipment to take and record readings.	Equipment improperly connected or scaled incorrectly may yield faulty data.
5	Measure the potentials for each of the structures at the bond location.	This step allows for comparison of the pipe-to-soil 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 ensure that they are within a desired range of readings, including a check of the polarity.	Readings should be reviewed as they are taken to ensure that readings fall within 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.
9	Document readings as required by operator's procedures.	Documentation is critical to future analysis and identification of problem areas.

OQ Task Name

Task 1.5 – Inspect and Test Electrical Isolation

1.0 Task Description

This task involves the inspection and testing of electrical isolation to assure that isolation is adequate. The task begins with identification of the isolation device and ends when measurements have been taken and recorded.

Measurement of Structure-to-Soil Potentials is a separate covered task (Reference Task 1.1).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

How to identify the location and type of isolation device. Types of isolation devices may include insulated flanges, couplings, unions, monolithic insulating pipe joints, and non-metallic pipe and structural members.

Casings need to be electrically isolated from the carrier pipe so as not to shield carrier pipe from cathodic protection.

Proper use of equipment, which may include a reference cell and voltmeter or isolation (flange) tester. Most tests for isolation are based on potential differences in structures using a reference cell and voltmeter.

NOTE: Using the ohmmeter setting to check the effectiveness of an isolation joint is not reliable because of the parallel resistance paths through the soil.

Isolation (flange) testers 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 other isolation joints other than flanges.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Erratic or floating readings	Determine the cause of erratic readings and repair the test leads or equipment, as needed.

3.0 Skill Component

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

Step	Action	Explanation
1	Identify the isolation locations and isolation device where measurements will be taken.	This step is to ensure that measurements are taken at the correct location.
2	Conduct visual inspection of the isolation location for things such as physical damage to the test station, a damaged shunt, loose connections, disconnected wires, arcing across a terminal, etc.	Verifies that there is no visual damage.

Step	Action	Explanation
3	Select the instrumentation, including voltmeter, isolation (flange) tester, test leads, or reference cell.	Incorrect equipment and/or improper usage will not provide accurate results.
4	Make connections with the test equipment to take and record readings.	Incorrect equipment and/or improper usage will not provide accurate results.
5	If using a reference cell, measure the potential for each of the structures. The reference cell should remain in the same location during the measurements.	This step allows for a comparison of pipe-to-soil potentials in order to help determine if structures are isolated. If the difference in potential is approximately 100mV or greater, the isolation is effective. If the reading is less than 100mV, further testing may be necessary.
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 operator's procedures.	Documentation is critical to future analysis and identification of problem areas.

OQ Task Name

Task 2.1 – Verify Test Lead Continuity

1.0 Task Description

This task involves the electrical inspection of test leads connected to a structure. This task begins with identification of the test lead wire and ends when a determination is made about whether valid data may be obtained using the test lead wire. The inspection is to include testing for electrical continuity between the structure and the test station.

Install Test Leads by Non-Exothermic Welding Methods (Reference Task 2.3).

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

Measurement of Structure-to-Soil Potentials is a separate covered task (Reference Task 1.1).

2.0 Knowledge Component

An individual performing this task must have knowledge of:

- Measurement of a structure-to-soil potential taken at a test station that does not meet expected results (lower than anticipated, unstable, or erratic) may be indicative of a broken test lead.
- Using a multimeter to measure resistance between a structure and a test lead wire to determine if continuity exists.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Test lead wire is damaged or missing	Notify operator personnel as required.

3.0 Skill Component

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

Step	Action	Explanation
1	Identify the test lead to be tested.	This step is to ensure that measurements are taken on the intended test lead.
2	Select the proper instrumentation (voltmeter, reference electrodes, etc.) to be used and verify the proper operation.	Incorrect or faulty equipment will not provide accurate results.
3	Connect the voltage meter and/or reference cell.	Improper connection of equipment will lead to inaccurate potential measurements.
4	Measure the structure-to-soil 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 in order to determine continuity.
5	Record all required information per operator's procedures.	Up-to-date records are essential for maintaining a corrosion control system.

OQ Task Name

Task 2.2 – Repair Damaged Test Lead

1.0 Task Description

Test leads that do not exhibit continuity should be repaired if possible or replaced. This task involves the repair or replacement of test leads connected to a structure. This task begins when test lead damage has been identified and ends when repair or replacement has been completed.

Measurement of Structure-to-Soil Potentials is a separate covered task (Reference Task 1.1).

Verify Test Lead Continuity is a separate covered task (Reference Task 2.1).

Install Test Leads by Non-Exothermic Welding Methods is a separate covered task (Reference Task 2.3).

Install Test Leads by Exothermic Welding Methods is a separate covered task (Reference Task 2.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Measurement of a pipe-to-soil 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.
- Test lead is 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 measurements.

3.0 Skill Component

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

<table>
<tr><th>Step</th><th colspan="2">Action</th><th>Explanation</th></tr>
<tr><td>1</td><td colspan="2">Identify the test lead damage. Perform a visual inspection of the aboveground wire and components.
If the test station is intact, continuity must be verified.</td><td>The test lead connection may be loose, corroded, or disconnected; the wire may be broken; or the test station may be damaged or moved.</td></tr>
<tr><td rowspan="2">2</td><td colspan="2">Can the test lead damage be repaired?</td><td>Repair that can be made in the test station or in the immediate area may not require excavation of the pipeline.</td></tr>
<tr><td>Yes – Continue with Step 3.</td><td>No – Continue with Step 4.</td><td></td></tr>
<tr><td>3</td><td colspan="2">Repair the test lead damage. This repair may require reconnecting the lead to the test station or faceplate by stripping the insulation and reconnecting.</td><td>This step corrects the damage if it can be repaired above ground or in the immediate area of test station.</td></tr>
</table>

Step	Action	Explanation
4	Replace the test lead by connecting to the structure by exothermic weld or non-exothermic connection. 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 corrects the damage if the test lead is to be replaced.
5	Verify that the test leads function properly and are no longer damaged. Obtain a structure-to-soil potential to confirm that the test lead wire is functional. A continuity measurement between the test lead wire and the structure may also be obtained.	Checking the test lead repair is done by taking a structure-to-soil potential and/or by verifying continuity.
6	Document actions and readings.	Proper documentation is critical to future analysis and identification of problem areas.

OQ Task Name

Task 2.3 – Install Test Leads by Non-Exothermic Welding Methods

1.0 Task Description

This task involves the proper usage of equipment to install test leads on a structure by methods other than exothermic welding. This includes making an electrical connection by mechanical means which may include magnetic coupling, conductive epoxy, clamp, and/or split bolt connectors. The task begins after the test point is properly located and ends when the connection is made.

Verify Test Lead Continuity is a separate covered task (Reference Task 2.1).

Locate Line is a separate covered task (Reference Task 14.1).

Prepare Surface for Coating Using Hand and Power Tools is a separate covered task (Reference Task 7.2).

Apply Coating Using Hand Application Methods is a separate covered task (Reference Task 7.5).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Proper connection preparations such as cleaning metallic surfaces and/or connecting wires.
- Proper size clamps or split bolt connectors for a given wire size.
- Manufacturer's specifications if using a conductive epoxy.
- Manufacturer's recommended safety procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Identify the location where the test lead will be installed.	This step is to ensure 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 operator 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.

Step	Action	Explanation
4	Prepare the pipe surface for wire installation.	Ensures that the surface profile meets the manufacturer or operator's specifications. If foreign materials are not removed, it could cause a failure to bond or to be electrically continuous.
5	Install the wires to the structure using magnetic connection, epoxy adhesive or clamp method verifying metal to metal continuity.	The actual connection is dependent on operator requirements and the test lead location.
6	Document installation as required by the operator's procedures.	

OQ Task Name

Task 2.4 – Install Test Leads by Exothermic Welding Methods

1.0 Task Description

This task involves proper usage of the equipment to install test leads on a structure by exothermic weld. The task begins after the test point is properly located and ends when the connection is made.

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

Pin Brazing is another means of thermite welding using electrical current to melt solder to provide a connection.

Prepare Surface for Coating Using Hand and Power Tools is a separate covered task (Reference Task 7.2).

Apply Coating Using Hand Application Methods is a separate covered task (Reference Task 7.5).

Locate Line is a separate covered task (Reference Task 14.1).

Measure Wall Thickness with Ultrasonic Meter is a separate covered task (Reference Task 8.2).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Manufacturer's specifications indicate the proper size mold and charge for different size wires and structures. Different alloy charges are used for steel and cast/ductile iron structures. A charge is the mixture of a copper alloy and magnesium starting powder.
    - 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 must be used according to the manufacturer's procedure. This process involves heat above 2500° Fahrenheit, and all safety concerns must be addressed.
- Manufacturer's specifications for the Pin Brazing Method include the use of equipment which uses lower temperatures (approximately 600° Fahrenheit).
- The wall thickness of the pipe or pipe component must be verified and meet minimum requirements for the device being used.
- Surface to be welded must be cleaned to bare metal. Outside contaminants will prevent adherence of weld.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Burn through of the pipe wall causing a release and/or fire	Stop all hot work. Respond according to operator's emergency response procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Identify the location where the test lead will be installed.	This step is to ensure 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	Ensure 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 the pipe surface to receive an exothermic weld.	This step is to ensure that the surface profile meets manufacturer or operator specifications. If foreign materials are not removed, it could cause the exothermic weld to fail.
5	Remove sufficient insulation from wire and crimp the copper sleeve to bare the wire, as required.	Insulation must 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.
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 to 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	Carefully remove the slag with a hammer and wire brush. Verify adhesion of weld. File the sharp edges off of the exothermic weld.	This step ensures the integrity of the weld and prepares the surface to be coated.

OQ Task Name

Task 3.0 – Obtain a Voltage and Current Output Reading from a Rectifier to Verify Proper Performance

1.0 Task Description

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

This task does not include data analysis.

2.0 Knowledge Component

An individual performing this task must have knowledge of cathodic protection systems and components comparable to NACE Certification Level CP 1 to include, but is not limited to, the following:

- Using voltmeters
- Using clamp-on ammeters
- Calculating current from shunt factor and voltage measurement—current output may be calculated based on shunt factor (ratio) and voltage drop across the shunt
- Validating of display meters with observed readings and with remote read devices, if applicable
- Understanding the importance of proper rectifier output polarity
- Providing accurate documentation of gathered data and appropriate communication, if necessary

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

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.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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 cathodic protection.

Step	Action	Explanation
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 cathodic protection system.
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 accurate data is being received.
6	Record all required readings per operator's procedures.	Up to date records are essential to maintaining a corrosion control system. Notify operator personnel if readings are non-existent or reversed in polarity.

OQ Task Name

Task 4.1 – Troubleshoot Rectifier

1.0 Task Description

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

Repair or Replace Defective Rectifier Components is a separate covered task (Reference Task 4.2).

Adjustment of Rectifier is a separate covered task (Reference Task 4.3).

2.0 Knowledge Component

An individual performing this task must have knowledge of troubleshooting a rectifier and components comparable to NACE Certification Level CP 2 to include, but is not limited to, the following:

- Understanding of basic electricity, electrical circuits, and electrical schematics.
- Understanding the operation of rectifiers and the principles of converting AC current to DC current.
- Understanding 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, and surge protection.

3.0 Skill Component

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

Step	Action	Explanation
1	Check for proper operation of components to determine faulty component. Consult manufacturer's manual for detailed information.	Proper operation of components is necessary for rectifier operation.
2a	Check the AC voltage input. If none, check circuit breaker or fuse.	If circuit breaker or fuse is faulty, identify it for replacement.
2b	Verify power to the transformer, and check voltage from the output of the transformer.	If there is no voltage from the output, then the transformer is identified for replacement.
2c	If the transformer output is present, then check the DC voltage at the rectifier element (selenium stack or diode array) output.	If no DC voltage is present, then the rectifier element (selenium stack or diode array) is identified as faulty.
2d	Check the DC voltage output. If none, check the circuit breaker or fuse.	If the circuit breaker or fuse is faulty, identify it for replacement.
2e	If no components are found at fault, check all wires and wiring connections, including lightning arrestors and surge protection.	Identify any bad wires or connections as faulty.
3	Document faulty components.	Black Box.

OQ Task Name

Task 4.2 – Repair or Replace Defective Rectifier Components

1.0 Task Description

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

Troubleshoot Rectifier is a separate covered task (Reference Task 4.1).

2.0 Knowledge Component

An individual performing this task must have knowledge of rectifier operation and rectifier components such as the following:

- Understanding component operation such as AC supply, circuit breakers, transformers, rectifier elements (stack), shunts, display meters, adjustment links, DC output terminals, remote monitoring units, and surge protection.
    - A transformer is 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.
    - Rectifier elements or stacks are devices designed to allow current flow in one direction only. These stacks are used to convert alternating current to direct current in a rectifier.
    - Shunts are calibrated resistor links that allow current measurement in a rectifier.
    - A remote monitoring unit (RMU) is a device that transmits rectifier readings to a remote site via wireless media.
- Understanding the operation of rectifiers and the principles of converting AC current to DC current.

3.0 Skill Component

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

Step	Action	Explanation
1	Prior to performing any of the following steps, de-energize and verify the external AC supply to the rectifier is off.	To avoid electrical shock and personnel injury.
2a	If the AC breaker is at fault, complete the following on the primary AC breaker: ▪ 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.	Proper operation of the rectifier's AC breaker is essential to protect the rectifier components during power surges, electrical shorts, or component failures.

Step	Action	Explanation
2b	If AC fuses are faulty, complete the following on the primary AC fuses: ▪ Remove the fuse or fuses. ▪ Replace the defective fuse or fuses with a correct size fuse.	Proper operation of the rectifier's AC fuses is essential to protect the rectifier components during power surges, electrical shorts or component failures.
2c	If the transformer is faulty, complete the following on the transformer: ▪ 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.	Transformers are required to reduce the primary AC voltage to a lower adjustable AC voltage.
2d	If the rectifier element is faulty, complete the following on the rectifier element (stack): ▪ 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.	Rectifier stacks are required to change the AC current to the DC current.
2e	If the DC fuses are faulty, complete the following on DC fuses: ▪ Remove the fuse or fuses. ▪ Replace the defective fuse or fuses with a correct size fuse.	Proper operation of the rectifier's DC fuses is essential to protect rectifier components during power surges, electrical shorts, or component failure.
3	Record all required information.	Up-to-date records are essential to maintaining a corrosion control system.

OQ Task Name

Task 4.3 – Adjustment of Rectifier

1.0 Task Description

This task begins with a defined need of rectifier adjustment based on cathodic protection system requirements and ends with proper adjustment of the rectifier and documentation.

Measurement of Structure-to-Soil Potentials is a separate covered task (Reference Task 1.1).

Obtain a Voltage and Current Output Reading from a Rectifier to Verify Proper Performance is a separate covered task (Reference Task 3.0).

2.0 Knowledge Component

An individual performing this task must have knowledge of cathodic protection systems and components comparable to NACE Certification Level CP 2 to include, but is not limited to, the following:

- Basic electricity and electrical circuits
- Understanding of rectifier operation and adjustment methods (typically a mechanical adjustment link on the transformer output)
- Use of voltmeter and electrical measurements
- Measuring the structure-to-soil potential (DC and AC) (Covered Task 1.1). These measurements are used to determine cathodic protection and necessary current adjustments to the rectifier.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

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

3.0 Skill Component

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

Step	Action	Explanation
1	Identify rectifier needing adjustment.	
2	Determine the action to be taken. Either increase or decrease the output current with consideration of the entire system components, such as pipe-to-soil readings, bonds, etc.	Adjustments made to one rectifier may impact other system components.

Step	Action	Explanation
3	Increase/decrease the fine tap setting in progressive steps until the desired settings have been achieved. NOTE: Power should be off before making these adjustments. Tap settings are current-carrying connections and should be tightened prior to re-energizing the rectifier.	When the required output current is obtained, the adjustment is complete.
4	If the fine tap setting reaches its limit, set the fine tap to the lowest setting and increase or decrease the coarse tap setting by 1 tap. NOTE: Power should be off before making these adjustments. Tap settings are current-carrying connections and should be tightened prior to re-energizing the rectifier.	Incremental adjustments will prevent the current from exceeding design limits.
5	Adjustments should be based on indicators such as pipe-to-soil readings, historical data, or design criteria.	Rectifiers are part of an overall CP system and must be adjusted based on system requirements.
6	Record all required information per operator's procedures.	Up to date records are essential to maintaining a corrosion control system.

OQ Task Name

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

1.0 Task Description

Each time a pipeline is exposed, the operator must 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 like dents, gouges, etc. exist on the pipeline and to ensure proper documentation and reporting have occurred. This task begins after the pipeline surface has been prepared for inspection and ends after inspection results are documented and reported.

Measure Pit Depth with Pit Gauge is a separate covered task (Reference Task 8.1).

Measure Wall Thickness with Ultrasonic Meter is a separate covered task (Reference Task 8.2).

Examine for External Corrosion on Buried or Submerged Pipe is a separate covered task (Reference Task 5.2).

Inspect the Condition of External Coating on Buried or Submerged Pipe is a separate covered task (Reference Task 5.3).

Measure Corroded Area is a separate covered task (Reference Task 8.3).

Coating tasks are separate covered tasks (Reference 7-Series Tasks).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

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.

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

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

Gouge
A groove in which metal has been removed or displaced from the surface.

Scratch
A thin, shallow cut or mark on the surface.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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.	Helps ensure that the pipeline is safe for operation and continued task performance.

Step	Action	Explanation
	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 identify potential risks that need further assessment to avoid future leaks or failures.
4	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.
5	Document the findings, and make notifications.	Follows the operator's policies/procedures for appropriate documentation, notification protocol, and actions required.

OQ Task Name

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

1.0 Task Description

Each time a pipeline is exposed, the operator must 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 and ends after inspection results are documented and reported.

Measure Pit Depth with Pit Gauge is a separate covered task (Reference Task 8.1).

Measure Wall Thickness with Ultrasonic Meter is a separate covered task (Reference Task 8.2).

Measure Corroded Area is a separate covered task (Reference Task 8.3).

Examine for External Corrosion on Buried or Submerged Pipe is a separate covered task (Reference Task 5.2).

Inspect the Condition of External Coating on Buried or Submerged Pipe is a separate covered task (Reference Task 5.3).

Measure Corroded Area is a separate covered task (Reference Task 8.3).

Coating tasks are separate covered tasks (Reference 7-Series Tasks).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

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.

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

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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. If the observation 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.

Step	Action	Explanation
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 identify 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. 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.	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.
5	Document the findings, and make notifications.	Follows the operator's company policies/procedures for appropriate documentation, notification protocol, and actions required.

OQ Task Name

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 must 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 and ends after coating inspection results are documented and reported.

Examine for Mechanical Damage on Buried or Submerged Pipe is a separate covered task (Reference Task 5.1).

Examine for External Corrosion on Buried or Submerged Pipe is a separate covered task (Reference Task 5.2).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

Pipeline Coating Types
Pipeline coating types, at a minimum, may include one or more the following:

Asphalt Coatings
A pipeline coating that consists of a naturally occurring material which is derived either by mining (e.g., Gilsonite), or it is a residue from the distillation of asphaltic petroleum. Asphalt coatings vary in their chemical and physical characteristics. Asphalt properly applied to steel or concrete surfaces has good adhesion properties, can be applied to thickness up to 100 to 200 mils, and is chemically stable with good resistance to water, most chemicals, and salts.[1]

Coal Tar Coatings
A pipeline coating that is manufactured by dissolving processed coal tar pitch, or a blend of these pitches, in suitable solvents. The coating is cured by evaporating the solvents. Coal tar coatings are made in different consistencies; those without any inert filler and those which contain inert materials to build film thickness. Coal tar coatings have good resistance to weak acids, alkalis, salts, seawater, and other aggressive atmospheres. This coating provides protection by the exclusion of moisture and air from the underlying surface.[1]

Extruded Coatings
A dual layer pipeline coating that consists of an extruded polyethylene topcoat applied over a rubberized asphalt adhesive. Typically, the polyethylene coating or jacket is "yellow" in color. The nature of the high density polyethylene outer jacket is formulated to protect the asphalt adhesive during handling and installation. While applied in thin layer, the asphalt adhesive provides the primary protection from corrosion consistent with the properties of an asphalt coating.[2]

Fusion-Bonded Epoxy Coatings
A pipeline coating that consists of a powdered epoxy applied to a heated pipe by electrostatic methods (i.e., the powdered coating is attracted to the pipe by using the principles of static electricity). The powder gels and flows with the heat and then will cure and harden during cooling. The process creates a tight physical bond between the coating and the metal.[3]

Petrolatum Coating Products
Rust preventative products that contain petrolatum, which is a smooth, semisolid blend of mineral oil with waxes crystallized from residual-type petroleum lubricating oil. The wax molecules contain 30 to 70 carbon atoms and are straight chains with a few branches or napthene rings.

Shrink Sleeve Products
A shrink sleeve is a polymer sleeve that is applied to the pipe, most usually over a girth weld, and heated according to a specific procedure to cause the sleeve to shrink into place on the pipe, causing the adhesive to bond to the pipe and to the adjacent coatings it overlaps.

Tape Coatings
The tape system consists of a primer applied directly to the pipe surface, an inner-wrap tape layer that provides a corrosion barrier and an outer-wrap tape layer that provides mechanical protection.

Coating Abnormalities

Coating Abnormalities — 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), and exterior forces (e.g., chemical exposure, abrasion, reverse impact, and severe weathering).[1]

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 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.

Biological
Bacteria and fungi are the primary microorganisms that can act on coatings. There are two types of action. One is the activity of a microorganism due to dirt and contamination on the coating. In this case, the bacteria or fungi merely live on the surface of the coating and do not necessarily affect its protective nature. The second type is where the microorganisms actually uses the coating for food and derive their energy from it. Under certain conditions, coatings can be rapidly disintegrated by this type of action.[1]

Coating Methods

Spiral Wrap
A method used to apply coating in a continuous fashion around the circumference of the pipeline.

Cigarette Wrap
A method used to apply coating one wrap at a time around the circumference of the pipeline.

Coating Overlap
The amount one wrap of coating overlaps the adjacent wrap of coating.

Manufacturer Applied Coating
This application of the pipe coating is done in a coating mill or similar location under controlled environmental conditions. On-site testing is performed to ensure that the surface of the pipe is properly prepared, that the temperature of the pipe is controlled, that the applied coating

thickness meets specifications, and that the pipe is free of coating voids or holidays. Additional on-site laboratory testing may include the following: cathodic disbondment testing, bend testing, adhesion testing, and abrasion/impact test. The pipe is shipped to the installation site in a pre-coated condition with the ends of the pipe prepared to facilitate welding and joining procedures.

Field-Applied Coating
The application of the pipe coating is done in the field under variable environmental conditions. Typically, this includes the field coating of welded joints and/or fittings during original construction; or when required, during routine maintenance activities as the pipeline is exposed and the coating has been removed or repaired. The field coating may or may not be the same material as the parent pipe coating – but the application process and physical properties need to be compatible. Field coatings typically have a wider tolerance of surface preparation condition. The coating is typically hand applied but can be machine applied. Coating thickness and adhesion to the pipe surface can vary based on the consistency of the application.

[1]Munger, Charles G., *Corrosion Prevention by Protective Coatings*, National Association of Corrosion Engineers, 1984
[2]Open domain, Microsoft Explorer, (www.brederoshaw.com/solutions/yellow_jacket.htm)
[3]National Center for Construction Education and Research (NCCER), Pipeliner Training and Assessment Program (PTAP), Contren Learning Series, Module 61107-02, *Apply and Repair External Coatings on Buried and Submerged Pipe*

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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. If the observation 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.
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 identify potential risks that need further assessment to avoid future leaks or failures.
4	Identify the type and location of coating damage, if any. There are a variety of methods to determine 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.	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.
5	Document the findings and make notifications.	Follows the operator's policies/procedures for appropriate documentation, notification protocol, and actions required.

OQ Task Name

Task 7.1 – Visual Inspection of Atmospheric Coatings

1.0 Task Description

This task pertains to above-ground normally exposed pipeline components. This task begins when the component is identified for inspection is necessary and ends when the component has been visually inspected and properly documented.

The performance of this covered task may require the performance of other covered tasks such as Perform Coating Inspection (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 (8.1), Measure Wall Thickness with Ultrasonic Meter (8.2), Measure Corroded Area (8.3).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following types of coating failures:

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/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

Non-uniform 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.

3.0 Skill Component

To demonstrate proficiency of this task an individual must perform the following steps. These actions are not performed in sequence and can happen simultaneously:

Step	Action	Explanation
1	Confirm the correct location for inspection.	Ensure that the correct pipeline component is being inspected.
2	Identify and confirm type of surface to be evaluated (Coating/Paint/Bare).	This will help 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	Determine overall pipeline component condition and complete documentation.	
6	Record all required information per company procedure.	Up to date records are essential to maintaining corrosion control data.

OQ Task Name

Task 7.2 – Prepare Surface for Coating Using Hand and Power Tools.

1.0 Task Description

The task begins when the area of preparation is identified and ends when the surface is ready for coating application.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Surface conditions and which type of tool is needed for surface preparation.
- Hand Wash is the removal of oil, dirt, soil, grease, and other contaminants by hand with solvent and detergents, etc.
- Hand Tool Cleaning is 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 Power Tool Cleaning is 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.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Presence of atmospheric corrosion, pitting, etc.	Document as required.
	Notify appropriate personnel.
Unexpected Hazardous Liquid or Carbon Dioxide Encountered: Preparing surfaces for coating.	Eliminate ignition source.
	Notify appropriate personnel.
Pipeline Damage: Dents, gouges, scrapes, etc.	Notify appropriate personnel.

3.0 Skill Component

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

Step	Action	Explanation
1	In order to determine the proper method to use, visually inspect the surface area to be prepared.	This is necessary to determine if hand tool cleaning, power tool cleaning and/or hand washing is required.
2	Determine the proper steps and tools for cleaning and surface preparation.	
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 if present. NOTE: If coating to be applied meets existing coating the transition may be made by feathering the existing coating at the interface.	Address hazardous coatings (e.g. containing asbestos or lead) in accordance with regulatory requirements and Company procedures.
5	Ensure that surface preparation meets company standards or specifications.	
6	Record all required information per company procedure.	Up to date records are essential to maintaining corrosion control data.

OQ Task Name

Task 7.3 – Prepare Surface for Coating by Abrasive Water Blasting

1.0 Task Description

The task begins when the area of preparation is identified and the equipment is set up. The task ends when the surface is ready for coating application.

2.0 Knowledge Component

An individual performing this task must have knowledge of:

- Equipment set up logistics, and possible environmental concerns.
- Coating removal, cleaning and preparation of pipe to accept coating repair.
- Caution in operation due to hazards related to high pressure discharge.
- Coating manufacturer's specifications for application or repairs to the coating and in accordance to company safety and environmental guidelines.

Three types of abrasive water blasting are:

- Grit blast with shroud – grit is emitted in center of a water shroud.
- Sand injected water blast – sand or other medium is blended in water stream at nozzle.
- Slurry blast – water and grit mixed together in constantly agitated reservoir.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Presence of corrosion, pitting, etc.	Document as required.
	Notify appropriate personnel.
Unexpected Hazardous Liquid or Carbon Dioxide Encountered: Preparing surfaces for coating.	Eliminate ignition source.
	Notify appropriate personnel.
Pipeline Damage: Dents, gouges, scrapes, etc.	Notify appropriate personnel.

3.0 Skill Component

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

Step	Action	Explanation
1	Locate area to be abrasive water blasted.	This is necessary to determine where to set up equipment.
2	Set up equipment logistics per job requirements.	Ensures safe and efficient operations.
3	Visually inspect the surface area for contaminants prior to blasting.	
4	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.
5	Remove existing coating or mill scale, rust, or weld slag, etc. to achieve profile. NOTE: If coating to be applied meets existing coating the transition may be made by feathering the existing coating at the interface.	Address hazardous coatings (e.g. containing asbestos or lead) in accordance with regulatory requirements and Company procedures.
6	Ensure that surface preparation meets company standards or specifications.	
7	Record all required information per company procedure.	Up to date records are essential to maintaining corrosion control data.

OQ Task Name

Task 7.4 – Prepare Surface for Coating by Abrasive Blasting Other than Water

1.0 Task Description

This task involves surface preparation of a pipe surface using abrasive blasting media other than water. After the surface has been prepared, it is then ready for the coating to be applied or for inspection. The task begins with the identification of the area to be prepared and with equipment setup. The task ends when the surface is ready for the coating application and all required information has been completed per the operator's procedure.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Equipment setup logistics and possible environmental concerns associated with the handling and disposal of spent blast media and coating material.
- Coating removal, cleaning, and preparation of pipe to accept the coating application.
- Caution needed during operation due to hazards related to high pressure discharge.
- Coating manufacturer's specifications for application or repairs.
- Operator's safety and environmental guidelines associated with the handling and disposal of spent blast media and coating material.
- Awareness of comparative surface preparation standards for abrasive blast cleaning including the following:
  - White Metal (NACE No:1 / SSPC-SP5)
  - Near White Metal (NACE No: 2 /SSPC-SP10)
  - Commercial (NACE No: 3 / SSPC-SP6)
  - Brush Off (NACE No: 4 / SSPC-SP 7)
  - Industrial (NACE No:8 / SSPC-SP 14)
- Types of abrasive blasting including, but not limited to, the following:
  - Grit/Shot blast
  - Walnut Shell
  - Aluminum Oxide
  - Crushed Slag
  - Glass Bead
  - Soda Blast

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Presence of corrosion, pitting, etc.	Document as required.
	Notify appropriate personnel.
Unexpected Hazardous Liquid or Carbon Dioxide Encountered: Preparing surfaces for coating	Eliminate ignition source.
	Notify appropriate personnel.
Pipeline Damage: Dents, gouges, scrapes, etc.	Notify appropriate personnel.

3.0 Skill Component

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

Step	Action	Explanation
1	Identify the area to be abrasive blasted.	This step is necessary to determine where to setup equipment.
2	Setup equipment logistics per job requirements.	This step ensures safe and efficient operations.
3	Visually inspect the surface area for contaminants prior to blasting.	
4	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.
5	Remove existing coating or mill scale, rust, or weld slag, etc. to achieve specified or required profile. NOTE: If coating to be applied meets existing coating, the transition may be made by feathering the existing coating at the interface.	This step addresses hazardous coatings (e.g. containing asbestos or lead) in accordance with regulatory requirements and the operator's procedures.
6	Ensure that surface preparation meets the operator's standards or specifications.	
7	Record all required information per the operator’s procedure.	Up-to-date records are essential to maintaining corrosion control data.

OQ Task Name

Task 7.5 – Apply Coating Using Hand Application Methods

1.0 Task Description

This task applies to application of coating to a pipeline component by hand. This task begins when the qualified individual determines the type of coating to be used and ends after the coating has been applied to the component surface. Measurements for coating thickness are not included in this task.

The performance of this covered task may be preceded by other covered tasks to create the proper surface profile and level of cleanliness. These tasks include: Prepare Surface for Coating Using Hand and Power Tools (7.2), Prepare Surface for Coating by Abrasive Water Blasting (7.3), and Prepare Surface for Coating by Abrasive Blasting Methods Other than Water (7.4).

The performance of this covered task does not include but may lead to the performance of other covered tasks such as: Perform Coating Inspection (7.7).

2.0 Knowledge Component

An individual performing this task must have knowledge of:

Methods for applying coating by hand including:

- roller,
- brush,
- wrap,
- melting – hot sticks.

Definitions applicable to this task are as follows:

Sags
Non-uniform 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.

3.0 Skill Component

To demonstrate proficiency of this task an individual must perform the following steps. These actions are not performed in sequence and can happen simultaneously.

Step	Action	Explanation
1	Determine what type of coating is applicable to the specified pipeline component.	Check that coating applied has adequate coverage and thickness, if required.
2	Assemble the tools and equipment necessary for application as required by coating specification.	No further explanation required.
3	Follow applicable 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.
4	Prepare coating for application.	If applicable, mix coating according to manufacturer's coating specification. Ensure that coating has not exceeded shelf-life.
5	Ensure that weather conditions are suitable for coating operations.	Temperature of pipeline component and dew point are critical to ensure proper adhesion.
6	Apply per coating specification.	Apply at the proper wet film thickness.
7	Record all required information per company procedure.	Up to date records are essential to maintaining corrosion control data.

OQ Task Name

Task 7.6 – Apply Coating Using Spray Applications

1.0 Task Description

This task applies to application of coating to a pipeline component by spray method. This task begins when the qualified individual determines the type of coating to be used and ends after the coating has been applied to the component surface. Measurements for coating thickness are not included in this task.

The performance of this covered task may be preceded by other covered tasks to create the proper surface profile and level of cleanliness. These tasks include: Prepare Surface for Coating Using Hand and Power Tools (7.2), Prepare Surface for Coating by Abrasive Water Blasting (7.3), and Prepare Surface for Coating by Abrasive Blasting Methods Other than Water (7.4).

The performance of this covered task does not include but may lead to the performance of other covered tasks such as: Perform Coating Inspection (7.7).

2.0 Knowledge Component

An individual performing this task must have knowledge of:

Methods of applying coating by spraying include:

- High-Volume Low-Pressure (HVLP)
- Airless Spray

Definitions applicable to this task are as follows:

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

Over Spray
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.

3.0 Skill Component

To demonstrate proficiency of this task an individual must perform the following steps. These actions are not performed in sequence and can happen simultaneously:

Step	Action	Explanation
1	Determine what type of coating is applicable to the specified pipeline component.	Check that coating applied has adequate coverage and MIL thickness, if required.
2	Assemble the tools and equipment necessary for application as required by coating specification.	Ensure that the proper type of spray nozzle is selected and that the orifice corresponds to requirements for the particular coating.
3	Follow applicable coating specification.	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 Company procedures.
4	Prepare coating for application.	If applicable, mix coating according to coating specification. Ensure that coating has not exceeded shelf-life.
5	Ensure that weather conditions are suitable for coating operations.	Temperature of pipeline component and dew point are critical to ensure proper adhesion.
6	Apply per coating specification.	Apply at the proper wet film thickness.
7	Record all required information per company procedure.	Up to date records are essential to maintaining corrosion control data.

OQ Task Name

Task 7.7 – Perform Coating Inspection

1.0 Task Description

This task pertains to inspection of prepared surface to apply coating as well as measured coating thickness after application to ensure the proper specification is met. This task begins when surface preparation is complete and ends when inspection of applied coating is completed.

This task will be performed in conjunction with other covered tasks: Apply Coating Using Hand Application Methods (7.5), and Apply Coating Using Spray Applications (7.6).

2.0 Knowledge Component

An individual performing this task must have knowledge of:

Definitions applicable to this task are as follows:

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.

Orange Peel

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

Over Spray

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

Sags

Non-uniform 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.

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.

3.0 Skill Component

To demonstrate proficiency of this task an individual must perform the following steps. These actions are not performed in sequence and can happen simultaneously:

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 pursuant to the coating specification.	This ensures that there is a sufficient anchor pattern for the coating to adhere to.
3	After coating is applied (pursuant to Task 7.5 or 7.6), perform wet film test, if applicable.	Determine that coating meets specifications.
4	Perform dry film test in accordance with coating specification, if applicable .	Determine that the final coating thickness meets specifications.
5	Conduct pinhole/holiday test, if applicable.	This is used to determine whether coating anomalies exist.
6	Conduct adhesion test, if applicable .	No further explanation required.
7	Conduct Tooke test, if applicable.	This is used to ensure that layers of coating applied meet coating specifications.
8	Conduct Barcol Hardness test, if applicable.	Determines hardness of coating by measuring its resistance.
9	Record all required information per company procedure.	Up to date records are essential to maintaining corrosion control data.

OQ Task Name

Task 8.1 – Measure Pit Depth with Pit Gauge

1.0 Task Description

This task is used to measure 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 and ends when measurements are documented and proper notifications are made.

Measure Corroded Area is a separate covered task (Reference Task 8.3).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

The definition applicable to this task is as follows:

Wall Loss
Removal of metal caused by either mechanical damage (e.g. gouge or groove) or corrosion (e.g., general or pitting).

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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. If the observation 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.
2	Clean and remove debris from the area to be measured.	The presence of debris will interfere with obtaining an accurate reading.
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 ensuring that the pit gauge is supported on non-corroded surfaces. 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.	Ensures that measurement is from the pipe surface.
5	Move the depth indicator until it contacts the deepest part of the wall loss.	Necessary to determine maximum wall loss.

Step	Action	Explanation
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	Document the findings and make notifications.	Follow operator's policies/procedures for appropriate documentation, notification protocol, and actions required.

OQ Task Name

Task 8.2 – Measure Wall Thickness with Ultrasonic Meter

1.0 Task Description

Performing this task involves the use of an Ultrasonic Thickness (UT) Meter to accurately collect and record a wall thickness reading on the pipeline or related appurtenance. This task begins when a steel pipe surface is exposed and prepared for inspection and ends when measurements are documented and proper notifications are made.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

Calibrate
The process of assuring 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.

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.

Nominal Wall Thickness
The expected wall thickness determined by alignment sheets or other records.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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. If the observation 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.
2	Assemble, check, and calibrate UT 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 will interfere with accurate readings and need 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.

Step	Action	Explanation
5	Measure wall thickness by placing the transducer firmly into the couplant and ensuring it is oriented to the pipe surface according to 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.	Ensure 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.	Follow operator's policies/procedures for appropriate documentation, notification protocol, and actions required.

OQ Task Name

Task 8.3 – Measure Corroded Area

1.0 Task Description

While conducting this task, the individual creates a visual representation of the pipeline segment after the corrosion has been identified, including all areas of localized corrosion. This task begins when the steel pipe surface has been exposed and prepared for inspection and ends when measurements are documented and proper notifications are made.

Measure Pit Depth with Pit Gauge is a separate covered task (Reference Task 8.1).

Measure Wall Thickness with Ultrasonic Meter is a separate covered task (Reference Task 8.2).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

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 which have the potential to cause rapid wall loss.

Interaction
If two or more locations of localized corrosion are located in close proximity, the combination of effects may cause a loss of wall strength and must 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”).

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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. If the observation 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.

Step	Action	Explanation
2	Obtain proper tools for the work assignment, which may include a tape measure, pit gauge, ultrasonic gauge, metallic ruler, bridging bar, or other measuring devices to take accurate measurements.	Necessary equipment and tools required to complete task.
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 represented. 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 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.	This must be performed by an individual qualified on Task 8.1 "Measure Pit Depth with Pit Gauge" and/or Task 8.2 "Measure Wall Thickness with Ultrasonic Meter."
10	Obtain and determine nominal wall thickness.	This must be performed by an individual qualified on Task 8.2 "Measure Wall Thickness with Ultrasonic Meter."
11	Identify areas of greatest wall loss within each area of localized corrosion and obtain pit depth measurements.	This must be performed by an individual qualified on Task 8.1 "Measure Pit Depth with Pit Gauge" and/or Task 8.2 "Measure Wall Thickness with Ultrasonic Meter."
12	Document the findings and make notifications. Denote all areas of localized corrosion, distances between those areas and pit depth readings on the representation.	Follow the operator's policies/procedures for appropriate documentation, notification protocol, and actions required.

OQ Task Name

Task 9.1 – Install Bonds

1.0 Task Description

The purpose of a cathodic protection bond is to connect two or more structures electrically to better use cathodic protection systems and prevent possible structure damage caused by interference. This task begins with the defined need of a bond on cathodic protection system requirements and ends with installation of the bond.

Test to Detect Interference is a separate covered task (Reference Task 1.3).

Install Test Leads by Non-Exothermic Welding Methods is a separate covered task (Reference Task 2.3).

Install Test Leads by Exothermic Welding Methods is a separate covered task (Reference Task 2.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of cathodic protection systems and components comparable to NACE Certification Level CP 2 to include, but is not limited to, the following:

- Types of bonds, critical and non-critical. Critical bonds are bonds that, if disconnected, may be detrimental to one of the structures. Critical bonds are determined by an operator's procedures.
- Installing interference bond facilities at the location of current discharge, if possible.
- Bonds are metallic connections between structures. Exothermic (thermite) welding, pin brazing, or bolt-on 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.
- Shunts are commonly used between the structures to determine the current amplitude and polarity between the structures.
- Blocking diodes may become necessary to prevent current flow in the opposite direction, such as when bonding to DC traction systems.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Discover broken or damaged test lead or bond cable	Notify operator personnel for repair, as required.

3.0 Skill Component

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

Step	Action	Explanation
1	Identify the structures to be connected.	Structures to be bonded must be properly identified and marked for connections.

Step	Action	Explanation
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 will yield 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 resistance (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.

OQ Task Name

Task 9.2 – Install Galvanic Anodes

1.0 Task Description

Galvanic anodes are installed to provide cathodic protection for buried or submerged metallic structures. Galvanic anodes may be used for stray current mitigation. This task begins with determining the location and method of installation as designed and ends when the anode is installed and connected.

Install Test Leads by Non-Exothermic Welding Methods is a separate covered task (Reference Task 2.3).

Install Test Leads by Exothermic Welding Methods is a separate covered task (Reference Task 2.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of cathodic protection systems and components comparable to NACE Certification Level CP 2 to include, but is not limited to, the following:

- Knowledge of 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.
- Knowledge of the different types of galvanic anodes and their applications. Galvanic anodes may be used for direct cathodic protection, shielding of electrical interference, spot protection, or AC mitigation. Applications may be in various soil conditions, underwater or offshore, or where power for implied systems is unavailable.
- Galvanic anodes are typically supplied in special backfill (hydrated gypsum, bentonite clay, and sodium sulfate). This backfill must be wet for the anodes to start discharging current.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Discover broken or damaged test lead or bond cable	Notify operator personnel for repair, as required.

3.0 Skill Component

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

Step	Action	Explanation
1	Galvanic Anodes – Determine the most suitable location within design considerations.	A location that has high sub-surface moisture content is preferred. Moisture in the electrolyte is essential for proper operation of the anode.
2	Place the anode in an electrolytic environment that is moist.	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.

Step	Action	Explanation
3	Install the anode by placing in an augered hole or horizontal excavation. NOTE: Anodes must be removed from the manufacturer's protective packaging before installation.	Care needs to be exercised to minimize damage to the anode or its prepackaged backfill.
4	Wet down the anode prior to backfilling or prior to installation in the ground.	Galvanic anodes are typically supplied in special backfill (hydrated gypsum, bentonite clay, and sodium sulfate). This backfill must be wet for the anodes to start discharging current.
5	Uncoil the anode pigtail 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 must be taken to ensure that this lead wire is not damaged. This will prevent premature failure.
6	If the design is for direct connection, then the test lead is connected directly to the pipe. Install shunts for measurement of current flow and resistance (as required to limit current interchange) 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.
7	Backfill carefully with native soil backfill. Use rock-free backfill to pad the anode and the anode lead wire.	Care must be taken in the backfill process to ensure that the anode and its lead wire are not damaged.
8	Document installation as required by operator's procedures.	Documentation is necessary to maintain record of installed anode locations.

OQ Task Name

Task 9.3 – Install Rectifiers

1.0 Task Description

The installation of impressed current cathodic protection rectifiers is essential in protecting facilities against external corrosion. This task begins with the location selection and initial installation of connections to the structure being protected and the groundbed. This task ends when rectifier is installed, connected to the structure/anodes, and the installation is documented.

Adjustment of Rectifier is a separate covered task (Reference Task 4.3).

Install Test Leads by Non-Exothermic Welding Methods is a separate covered task (Reference Task 2.3).

Install Impressed Current Groundbeds is a separate covered task (Reference Task 9.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of cathodic protection systems and components comparable to NACE Certification Level CP 2 to include, but is not limited to, the following:

- Understanding of basic electricity and electrical circuits.
- Type of rectifier being installed, air cooled, oil cooled explosion proof, solar powered, etc.
- Mounting requirements, pole mount, or rack mount.
- 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.

No task-specific abnormal operating condition (AOC) identified; only general AOCs are applicable.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify, as designed, the rectifier for the location and service.	Rectifiers are available for non-hazardous 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 must be mounted securely using appropriately sized fasteners. Insecure fastening could lead to damage and bodily injury. NOTE: Installation must meet all applicable building and electrical codes.

Step	Action	Explanation
3	Connect the AC power feed wires through an appropriately sized conduit in accordance with the applicable sections of the National Electric Code, the National Electric 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 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. NOTE: The positive cable is connected to the anodes and the negative is connected to the structure.	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.
7	Test and verify that cables are correctly installed.	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 operator’s procedures.	Documentation is necessary to maintain record of rectifier installation.

OQ Task Name

Task 9.4 – Install Impressed Current Groundbeds

1.0 Task Description

Impressed current groundbeds are installed to provide cathodic protection for buried or submerged metallic structures. 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 that documentation has been completed as required.

Design of impressed current groundbeds is not included in this covered task.

Adjustment of Rectifier is a separate covered task (Reference Task 4.3).

Install Rectifiers is a separate covered task (Reference Task 9.3).

2.0 Knowledge Component

An individual performing this task must have knowledge of cathodic protection systems and components comparable to NACE Certification Level CP 2 to include, but is not limited to, the following:

- Knowledge of connection methods. 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.
- Impressed current anodes are installed in special backfill (coke breeze or other fill material).
- A header cable is a cable or wire to which the anode lead wires are connected.
- A splice connection is the electrical connection between the anode lead wire and the header cable/wire or between anodes. These splice connections must be carefully insulated to prevent the connection from oxidation.
- Adjustment of the rectifier is performed after the anode system is energized to set cathodic protection levels.

No task-specific abnormal operating condition (AOC) identified; only general AOCs are applicable.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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 rights-of-way that are separated from the pipeline. Locations are selected using criteria such as soil resistivity, topography, proximity to other structures, and geography to determine location.

Step	Action	Explanation
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): Install vertically or horizontally as designed for the location and typically more than a hundred feet away from pipeline. Distributed: Locate in close proximity to the structure and typically installed a minimum of ten feet from the structure.
3	Excavate a vertical hole or horizontal ditch for anode installation. NOTE: If coke breeze or other fill material is required by design to enhance current flow, it must be installed during the installation of the anodes.	Excavation techniques may include ditching, augering, drilling, etc. Anodes are also installed as replacement for expended anodes. Anodes must be installed in the soil or submerged in water that is electrically continuous with the pipeline backfill. (Common electrolyte.)
4	Carefully install anode in the excavated hole. Ensure that anodes are placed flat in horizontal installation or centered in bore for vertical installation. NOTE: Do not lift or lower the anode by its lead wire to prevent damage to the anode.	Anodes are to 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 lead to premature failure.
5	Install the anode header cable between the groundbed and the rectifier.	Care must be observed during this process, as any damage to the cable insulation will lead to premature failure of the groundbed. DC current will be discharged at any breaks in the cable insulation.
6	Backfill the vertical hole or horizontal ditch.	Anodes must be installed in the soil or submerged. Backfill material must be free of rocks and debris to prevent damage to cable insulation.
7	Document installation as required by operator's procedures.	Documentation is necessary to maintain record of groundbed installation. Documentation must include the number of anodes and the manner or spacing of installation.

OQ Task Name

Task 9.5 – Repair Shorted Casings

1.0 Task Description

The pipe and the pipe casing are designed to be electrically isolated from each other to allow cathodic protection for the pipe. Electrically shorting the casing to 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) have been exposed and ends when the pipeline casing is tested for isolation.

Measurement of Structure-to-Soil Potentials is a separate covered task (Reference Task 1.1).

Inspect the Condition of External Coating on Buried or Submerged Pipe is a separate covered task (Reference Task 5.3).

Install Test Leads by Exothermic Welding Methods is a separate covered task (Reference Task 2.4).

Locate Line is a separate covered task (Reference Task 14.1).

Observation of Excavation Activities is a separate covered task (Reference Task 32.0).

Backfilling a Trench Following Maintenance is a separate covered task (Reference Task 39.0).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Basic knowledge of casing systems including end seals, insulators, and vent connections.
  - Casings are oversized pipe required in some instances to reduce external load on the pipeline, such as railroad crossings, interstate highways, etc.
  - 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.
  - Isolating spacers are installed on the pipeline to prevent metallic contact with the casing. Spacers must have sufficient mechanical strength to withstand installation and to maintain isolation.
  - 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 non-metallic material.
- Metallic shorts are caused by metal to metal contact between the pipe and casing.
- Electrolytic shorts are caused by material in casing that provides a current path between the pipe and casing such as water or soil.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Unexplained hydrocarbon encountered	Take action, if qualified, and notify personnel of observed condition, as required.
Fire/explosion	Take action, if qualified, and notify personnel of observed condition, as required.
Pipeline damage	Take action, if qualified, and notify personnel of observed condition, as required.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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 location of metal contact which may be near end seal or other location in casing.
4	If pipe has settled, then center the carrier pipe within the casing if possible. NOTE: Pipeline/casing support must be performed in accordance with engineering procedures or work plans to prevent damage to pipeline.	This is to ensure there is no contact with the carrier pipe and casing. If pipe has to be lifted, follow procedures for moving in-service pipe. On long casings, cutting off excess casing may eliminate the casing short.
5	If coated pipeline, ensure coating is bonded to carrier pipe. NOTE: Inspect the Condition of External Coating on Buried or Submerged Pipe is a separate covered task (Task 5.3).	Coating is necessary for good cathodic protection 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 no metallic contact is found, an electrolytic condition may be the cause of elevated potentials on the casing.	Potentials on a casing may be elevated due to an electrolytic condition.
8	Resolution of electrolytic condition may require removal of the electrolyte material in the casing if possible. Resolution of an electrolytic condition may not be necessary.	Excess material in casing should be removed (blown out) if possible while end seals are removed.
9	Replace the end seal.	
10	Install the test leads as required. NOTE: Install Test Leads by Exothermic Welding Methods is a separate covered task (Task 2.4). NOTE: Measurement of Structure-to-Soil Potentials is a separate covered task (Task 1.1).	Test leads on both the carrier pipe and casing may be required for testing casing isolation. NOTE: Conduct a Pipe-to-Casing Potential Difference test to determine that pipe and casing are isolated.
11	Document repair as required by operator's procedure.	

OQ Task Name

Task 9.6 – Install Electrical Insulating Device

1.0 Task Description

This task applies to the installation of electrical insulating devices designed to isolate pipeline segments and equipment to ensure proper functioning of cathodic protection, lightning protection, and ground fault protection. Specific applications addressed include the following:

- Flange or dielectric union isolation/insulation,
- Isolation joints,
- Lightning and ground fault protection,
- Electrical isolation from electrical grounding,
- Aboveground piping isolation from other buried structures,
- Casing isolation/insulation.

The task begins when the need for the electrical insulating device is determined. The task ends when isolation has been verified and the required information has been documented per the operator's procedure.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- How the cathodic protection system functions.
- How to test for electrical isolation.
- Grounding systems.
- Various electrical isolation devices including the following:
    - Flange isolation,
    - Dielectric union,
    - Monolithic,
    - Casing isolators/spacers.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Presence of corrosion, pitting, etc.	Document as required.
	Notify appropriate personnel.
Unexpected Hazardous Liquid or Carbon Dioxide Encountered: Preparing surfaces for coating.	Eliminate ignition source.
	Notify appropriate personnel.
Pipeline Damage: Dents, gouges, scrapes, etc.	Notify appropriate personnel.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must perform the following steps for the specific insulating device:

Flange or Dielectric Union Isolation/Insulation

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	Verify appropriate kit materials such as insulating sleeves on the studs or bolts and insulating washers under the nuts and/or the heads of the bolts; mild steel washers are placed over top of the insulating washers to prevent damage when tightened.	
3	Verify proper flange alignment prior to installation of insulation kit.	When installing insulating kits, the individual should use alignment pins in the flange. The usage of alignment pins in the flange will prevent damage or destruction of the isolating sleeves that can result from misalignment of the flange faces.
4	Install flange kit and/or dielectric unions according to the manufacturer’s specifications.	The step emphasizes precautions to prevent any moisture, soil, or other foreign matter from contacting any portion of the insulating joint prior to its being sealed. NOTE: If moisture, soil, or other foreign matter contacts any portion of the insulating joint, the entire joint shall be disassembled, cleaned with a suitable solvent, and dried prior to re-assembly.
5	Verify isolation with the appropriate insulation tester.	The use of a digital multimeter can give a false indication of isolation.
6	Record all required information per the operator's procedures.	Up-to-date records are essential.

Isolation Joints

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	Verify the type of isolation device required; such as monolithic style insulating fittings that are typically welded in place. NOTE: Assembling isolating joints and testing them both hydrostatically and electrically before installation in the pipeline is preferred.	This step requires certain types of isolation devices where the isolation point location must be buried or the fluid inside the pipe is electrically conductive such as produced water. Isolating joints for pipelines must be adequate for the maximum pressure and temperature conditions encountered on the particular installation.
3	Install bond wires/cables on both sides of the encapsulated insulating device.	This step will mitigate interference or enable electrical continuity when necessary.
4	Terminate wires in a common terminal box at the approved location.	
5	Verify isolation with the appropriate insulation tester.	The use of a digital multimeter can give a false indication of isolation.
6	Record all required information per the operator's procedures.	Up-to-date records are essential.

Lightning and Ground Fault Protection

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 with the appropriate fault and lightning protection in accordance to the manufacturer's design practice.	The equipment typically will consist of either a polarization cell replacement (PCR) or a solid state decoupling (SSD) device that is bonded sufficiently and oppositely on both sides of the insulating flange.
3	Verify isolation with the appropriate insulation tester.	
4	Record all required information per the operator's procedures.	Up-to-date records are essential.

Electrical Isolation from Electrical Grounding

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. NOTE: Facility grounding cables and electrical alternating current (AC) neutrals offer low resistance pathways that can bypass or short insulating devices.
2	Install the SSD or PCR to isolate the pipeline from electrical grounding systems.	Provision for electrical isolation through an approved electrical device (PCR or SSD) that is rated for the service must 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	Conduct testing on all utility (electrical, telephone, etc.) supply or feeder cables to identify direct current (DC) flow to the foreign structures.	
4	Verify isolation with the appropriate insulation tester.	
5	Record all required information per the operator's procedures.	Up-to-date records are essential.

Aboveground Piping Isolation from Other Buried Structures

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 the piping system so that it is not in physical contact with any foreign electrically conductive or metallic structure such as casings, valve culverts, concrete caisson steel, cable trays, supporting pipe stanchions, bridge structures, pilings, or reinforcing steel in concrete.	The cathodic protection design must include and account for such structures if electrical isolation is impracticable to achieve. This step ensures that cathodically protected pipelines installed aboveground and supported with steel supports are electrically insulated from the supports.
3	Align the predetermined-sized electrical isolation device between metallic piping and metal pipe supports through the use of non-metallic spacers or shields.	The proper installation of these materials ensures crevice corrosion does not result from ingress of dust and moisture between the insulation material/pipe interfaces.
4	Install the non-metallic spacers between the insulation material and the pipe interface.	This step ensures the material is compression/abrasion resistant in conjunction with having effective dielectric properties.
5	Verify isolation with the appropriate insulation tester.	
6	Record all required information per the operator's procedures.	Up-to-date records are essential.

Casing Isolation/Insulation

Step	Action	Explanation
1	Verify the location where the isolation device is needed.	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	Ensure the annular space is cleared of any debris and contaminants.	This step emphasizes the use of precaution to ensure the removal of all organic materials or electrolytes from the annular space between the casing and the carrier pipe and to ensure that it is completely free of contaminants prior to installation of the insulating spacers.
3	Install the non-metallic spacers or shields and seal the ends per the operator's procedure and the manufacturer's specification.	The careful selection of casing isolating spacers ensures they have the mechanical strength required.
4	Verify that the annular space is cleared of any debris and contaminants and that spacers are secured.	
5	Install the end seals. NOTE: Install the casing end seals according to the manufacturer’s instructions and in the quantity recommended by the manufacturer or design engineer.	The correct installation of end-seals ensures that water/debris penetration is effectively prevented.
6	Verify isolation with the appropriate insulation tester.	
7	Record all required information per the operator's procedures.	Up-to-date records are essential.

OQ Task Name

Task 10.1 – Insert and Remove Coupons

1.0 Task Description

This task is performed on a scheduled basis. The task begins with the verification that the isolation valve has been closed and ends when the coupon has been submitted for testing and the new coupon has been installed.

Remotely Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 43.4). Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of:

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.

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

Localized Corrosion
Types of corrosion in which there is 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.

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).

Retrieval Tool/ Extractor Tool
Device used to remove and replace coupon.

Isolation or Service Valve
Device utilized to isolate the coupon and plug assembly from pipeline contents.

Coupon Holder Assembly
Device utilized to hold and isolate coupon from surrounding metals.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

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.
Malfunction of isolation/service valve.	Stop process and make notification.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify the isolation valve is closed and secure.	This isolates coupon and plug assembly from pipeline contents.
2	Remove fitting cap slowly, if equipped.	This provides access to 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 manufacturer's and company procedures. NOTE: Do not touch the coupon with bare hands or allow it to come in contact with external contaminants.	Coupon holders and retrieval tools vary with manufacturer. 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 company 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 coupon directly in original 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	Properly document the new coupon's serial number or identification, its associated protective packaging, date of installation, location of installation, installer's name.	Each coupon comes with its own protective package. It must be returned with its package and the required documentation to ensure accurate results.
7	Clean and prepare coupon holder and ancillary equipment for coupon installation. Follow manufacturer's or company procedures to prevent contamination of the coupon.	Proper preparation ensures coupon can accurately measure future corrosion.
8	Install coupon into coupon holder. Follow manufacturer's or company procedures to prevent contamination of the coupon.	Proper installation of coupon ensures that coupon is secure when inserted into pipeline stream and is electrically isolated from holder.

Step	Action	Explanation
9	Install coupon holder and coupon according to manufacturer and company procedures. Perform this function slowly to prevent damage to the coupon and plug assembly. NOTE: Coupon holders and retrieval tools vary with manufacturer. Consult manufacture and company installation procedures.	New coupon is placed to continue measuring future corrosion.
10	Replace fitting cap according to manufacturer and company procedures.	Ensures future trouble free operations of the coupon plug assembly. 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 company procedures.	Packaging for new coupon must be stored properly so it can be used when the coupon is removed.
14	Record all required information per company procedures.	Up to date records are essential to maintaining a corrosion control system.

OQ Task Name

Task 10.2 – Monitor Probes (On-line)

1.0 Task Description

This task is performed on a scheduled basis to verify the monitoring probe data measurements are functioning according to the manufacturer's specifications. The task begins when the secondary containment cover is opened and ends when the reading has been obtained, verified and documented.

2.0 Knowledge Component

An individual performing this task must have knowledge of:

Electrical Resistance (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.

Linear Polarization Resistance (LPR) Probe
LPR Probes work on the principle of voltage change over time as one element is polarized positively and the time it takes to return to its normal state is taken with reference to the second element. The element is then polarized negatively and the time it takes to return to its normal state is taken. The two curves are generated, one positive and one negative, the point at which the curves cross is the imbalance which is interpreted as the tendency to pit.

Galvanic Probe (GP)
GP measures the change in current generated between the 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 current output of the probes and recorded by a data acquisition system.

Hydrogen Probe (HP)
HP monitors hydrogen permeation in steels.

Bio Probes
Bio probes are used to suspend sample elements in the area to be monitored for sessile bacteria growth.

3.0 Skill Component

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

Steps for Performing Task #10.2 – Monitor Probes (On-line)

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.	Ensure that probes are not damaged or corroded which may result in inaccurate monitoring results.

Step	Action	Explanation
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. NOTE: Data recorders and monitor probes vary by manufacturer. Follow manufacturer's operating procedures.	Necessary for accurate corrosion measurement.
4	Document the reading. NOTE: Data recorders and monitor probes vary by manufacturer. Follow manufacturer's operating procedures for documentation.	Documentation of measurements is necessary for corrosion monitoring and mitigation.
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	Confirm Data Logger readings are appropriate. Make proper documentation and notifications as required.	If the Data Logger readings are not consistent with the probe manufacturer's readings, and all external components are in good working order, confirm the Data Logger is functioning properly. Otherwise, there may be a problem with the probe itself.

OQ Task Name

Task 11.0 – Monitoring and Controlling the Injection Rate of the Corrosion Inhibitor

1.0 Task Description

When corrosion inhibitors are used to mitigate internal corrosion, the operator must inject the inhibitor in sufficient quantities to ensure design coverage of the inhibitor. This task includes monitoring inhibitor injection rates and adjusting these rates to ensure the proper amount of inhibitor is being injected. This task begins with a visual observation of the injection system and ends when proper documentation and notification is completed.

2.0 Knowledge Component

An individual performing this task must have knowledge of:

Definitions applicable to this task are as follows:

Mils Per Year (MPY)
The rate of corrosion measured in 1/1000 of an inch/year.

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.

Abnormal Operating Conditions (AOCs)
The following AOCs could be encountered while performing this task:

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 must perform the following steps:

Step	Action	Explanation
1	Visually inspect tank and injection system to ensure the injection system is operating and inspect for signs of leakage.	Ensure operation and integrity of the system.
2	Verify the volume of inhibitor is sufficient to last until next inspection.	Ensure that you do not run out of the inhibitor before next inspection.

Step	Action	Explanation
3	Monitor flow rate of inhibitor to determine if the flow rate is correct to the established flow rate. This may include measuring the change in volume of inhibitor using a sight glass.	Follow company policies and procedures to determine the flow of the inhibitor.
4	Adjust injection rate as necessary to meet established flow rate.	Follow company policies and procedures when adjusting the flow rate of the inhibitor.
5	Document measurements and/or changes and make proper notification per company procedures.	Follow company policies and procedures for proper documentation and notification.

OQ Task Name

Task 12.0 – Visually Inspect Internal Pipe Surface

1.0 Task Description

The operator must inspect the internal surface for evidence of corrosion whenever the pipe has been opened to the atmosphere. This task begins after the pipe has been opened and prepared for inspection and ends with proper documentation of observations.

If evidence of wall loss is discovered, the loss needs to be assessed by an individual(s) who is qualified to perform:

- Measure Pit Depth with Pit Gauge is a separate covered task (Reference task 8.1)
- Measure Wall Thickness with Ultrasonic Meter is a separate covered task (Reference task 8.2)

2.0 Knowledge Component

An individual performing this task must have knowledge of:

Definitions applicable to this task are as follows:

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.

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

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

Gouge
A groove in which metal has been removed from the surface.

Scratch
A thin, shallow cut or mark on the surface.

General Corrosion
An electrochemical reaction that takes place uniformly over the surface of the steel, thereby causing a general thinning of the component which 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 which have the potential to cause rapid wall loss.

Scale
Deposit of a solid on the pipe wall.

3.0 Skill Component

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

Step	Action	Explanation
1	Confirm that pipe is in a condition to allow an internal inspection and if removed that orientation has been properly marked. Removed and upstream/ downstream pipe should be marked according to operator's procedures.	Correctly orienting the pipe will provide key information to corrosion patterns observed on the internal diameter of the pipe. Hydrocarbon must be removed to accurately view the internal surface of the pipe.
2	Visual inspection of internal surfaces is required on all pipe for which visual inspection is possible. This includes: 1) the removed component section. 2) the observable portion of pipe upstream and downstream of the removed component or access point.	Required by company policy and procedure.
3	Record all required information per company procedures.	Up to date records are essential to 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.

OQ Task Name

Task 14.1 – Locate Line

1.0 Task Description

This task includes establishing the location of a pipeline. This task requires the use of maps, 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 and ends when the correct line segment has been located.

Install, Inspect, and Maintain Permanent Marker is a separate covered task (Reference Task 14.2).

Install, Inspect, and Maintain Temporary Marker is a separate covered task (Reference Task 14.5).

NOTE: If this qualification is performed on a pipeline subject to regulation by 49 *CFR* Part 192 or 195 and potholing is used for verification, an individual qualified for Task 32 “Observation of Excavation Activities” must observe or perform the potholing activity.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

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
This is usual for documentation of a One-Call request. It includes an assigned number for tracking the ticket and all associated documentation. One-Call laws vary from state to state.

Potholing
The practice of digging a hole to uncover a pipeline to verify its location. Daylighting and bell-holing are alternate terms for potholing.

Probing
The practice of contacting the pipeline with a bar or rod to verify its location. When probing, care must be taken to avoid damaging pipeline coating.

Locator readings may be impacted by pipeline depth, type of soil, and soil density.

When using handheld electronic line locators, interference (stray signals from surrounding pipelines, underground or overhead power lines, metal fencing, railroad, etc.) may be encountered. When locating a pipeline in a multiple pipeline corridor, it may be advantageous to directly connect the locating signal to the pipeline and/or use a multi-frequency pipeline locator, initially setting the frequency range to its lowest setting. Using the low setting prevents the signal from jumping to (identifying) other pipeline facilities. Drastic changes in voltage and/or depth readings may indicate that an adjacent pipeline has been located.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Unplanned or pre-existing release of hazardous liquid or gas which could lead to unintentional ignition or other adverse events. Evidence of a release may include, and not be limited to, the following: • Odor of hazardous gas or liquids • Dead vegetation • Audible cues • Sheen on water • Bubbles	Stop task activities, move to a safe distance, and notify appropriate pipeline personnel. Appropriate notifications may include the following: • Contacting pipeline personnel • Activating the 911 Emergency System

3.0 Skill Component

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

Step	Action	Explanation
1	Receive a One-Call Ticket and describe the content and requirements of the ticket.	The individual must be able to use the One-Call Ticket to determine at a minimum: • The date the locate must be completed by • The area to be marked
2	Receive the most current drawings and/or maps and identify the pipeline to be located.	Drawings and/or pipeline maps are used to assist in locating the pipeline.
3	Check to ensure 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 the locating equipment is properly charged and calibrated.
4	Conduct a visual assessment to determine site conditions that could affect task performance.	Some rights-of-way are restricted or site conditions may impede access. Examples may include physical obstructions, traffic, soil conditions, hazards, standing water, trenches, etc.
5	Use line locating equipment to determine the approximate location of the line.	Line locating equipment will only identify the approximate location. Exact location will be verified in Step 6.
6	Verify the location by potholing and/or probing.	Verification must be performed by the evaluator or other qualified individual.

OQ Task Name

Task 14.2 – Install, Inspect, and Maintain Permanent Marker

1.0 Task Description

The task begins with verification that the line has been located. This task consists of installing, inspecting, and maintaining permanent pipeline markers in required locations. Permanent markers visually communicate the location of the pipeline. Line markers must meet the specifications outlined in applicable regulations. The task ends when the line is accurately marked with permanent marker(s).

Locate Line is a separate covered task (Reference Task 14.1).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Signs should be located directly over the pipeline if possible, but offset orientation is permissible.

Markers should be installed as follows:

- At public road crossings
- At railroad crossings
- At above ground locations in areas that are accessible to the public
- In sufficient number along the remainder of each buried line so that its location is accurately known

Markers are not required for buried pipelines located:

- Offshore or at crossings of or under waterways and other bodies of water
- In heavily developed urban areas such as downtown business centers where:
    - The placement of markers is impractical and would not serve the purpose for which the markers are intended
    - The local government maintains current substructure records

At a minimum, markers should contain the following information on a background of sharply contrasting color:

- The word “Warning,” “Caution,” or “Danger,” followed by the words “Petroleum (or the name of the hazardous liquid transported) Pipeline” or “Carbon Dioxide Pipeline,” all of which, except for markers in heavily developed urban areas, must be in letters at least 1″ high with an approximate stroke of ¼″.
- The name of the operator and a telephone number at which the operator can be reached at all times.

If applicable, ensure that a One Call has been placed prior to installing a marker. A One-Call notification system means a communication system in which an operational 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 laws vary from state to state.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Unplanned or pre-existing release of hazardous liquid or gas, which could lead to unintentional ignition or other adverse events. Evidence of a release may include and not be limited to the following: • Odor of hazardous gas or liquids • Dead vegetation • Audible cues • Sheen on water • Bubbles	Stop line-marking activities, move to a safe distance and notify appropriate pipeline personnel. Appropriate notifications may include the following: • Contacting pipeline personnel • Activating the 911 Emergency System

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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).	Markers warn the public and prevent damage to the pipeline.
3	Verify the appropriate marker for the location and product.	Markers need to have the correct product identification and information required by the regulation.
4	Securely install the mounting apparatus and marker. **Caution: When applicable, probe or pothole prior to installing a post to help ensure that the pipeline is not damaged.**	Ensure markers have a good solid foundation.
5	Inspect the signs for correct information, visibility, and orientation. Replace the sign if a marker is missing, damaged, or the incorrect information is shown.	Ensures information on marker is in good condition, visible, legible, and in accordance with regulatory requirements.

OQ Task Name

Task 14.5 – Install, Inspect, and Maintain Temporary Marker

1.0 Task Description

The task begins with a location request which may include a One Call. This task consists of installing, inspecting, and maintaining temporary pipeline markers. Temporary markers visually communicate the location of the pipeline on the surface of the right-of-way (ROW). Operators must provide for temporary marking of buried pipelines in the area of excavation activity before, as far as practical, the activity begins.

Installation is the placement of new markers or replacement of existing temporary markers. The task ends when the line is accurately marked.

NOTE:

1) State laws regarding marking requirements may vary.

2) Locate Line is a separate covered task (Reference Task 14.1).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

One Call
A system through which anyone can notify owners/operators of lines or facilities of proposed excavation so that the owners/operators can mark the lines and undertake other damage prevention measures.

One-Call Ticket
Documentation of the One-Call request. It includes assigned number identification for tracking the ticket and all associated documentation. One-Call laws vary from state to state.

White Lining
Under certain state laws and/or best practices recommended by organizations such as the Common Ground Alliance, excavators designate the ground of an area to be excavated using white paint, white flags, white stakes, or any combination of these.

Some state laws require that the operator make a “positive response.” Positive response is communication with the excavator prior to excavation to ensure that all contacted owners/operators have located their underground facilities and have appropriately marked any potential conflicts within the areas of planned excavation. Positive response may be accomplished by fax, phone, pager, written correspondence, email, or other electronic means that allows an excavator to know, prior to the beginning of the excavation, that underground pipelines have been located and marked or that there are no underground pipelines in the vicinity of the excavation.

Temporary markers must be replaced if they are damaged or missing as long as the One-Call Ticket is active.

Types of markers include flags, painting, chalk, stake chasers (“whiskers”), stakes, etc. Marker selection may depend on existing and expected conditions such as weather, traffic, construction, and local requirements.

The ANSI uniform color code for marking underground hazardous liquid and gas pipeline facilities is yellow.

Markers should be placed as close as practicable over the pipeline. Markers should be installed in sufficient number along the buried line so that its location is accurately known.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Unplanned or pre-existing release of hazardous liquid or gas, which could lead to unintentional ignition or other adverse events. Evidence of a release may include and not be limited to the following: • Odor of hazardous gas or liquids • Dead vegetation • Audible cues • Sheen on water • Bubbles	Stop line-marking activities, move to a safe distance and notify appropriate pipeline personnel. Appropriate notifications may include the following: • Contacting pipeline personnel • Activating the 911 Emergency System

3.0 Skill Component

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

Step	Action	Explanation
1	Receive a One-Call Ticket and describe the content and requirements of the ticket.	The individual must be able to use the One-Call Ticket to determine at a minimum: • The date the locate must 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 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 operator and state requirements.

OQ Task Name

Task 15.1 – Visually Inspect Surface Conditions of Right-of-Way

1.0 Task Description

The task begins with accurately identifying the right-of-way to be inspected. This task consists of performing an inspection of surface conditions on, or adjacent to, the pipeline right-of-way. The purpose of the inspection is to identify and observe for indications of leaks, construction activity, and other factors affecting safety and operation. Methods of inspection may include walking, driving, flying, or other appropriate means of traversing the right-of-way. The task ends with completion of the required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

The following conditions that could pose an immediate threat to persons, property, or the environment, resulting in a typical reaction that would include stopping right-of-way surveillance activities, moving to a safe distance, and notifying appropriate pipeline personnel.

- Indications of a release:
  - Vapor cloud or frost ball on or near a right-of-way
  - Sheen on or bubbles in the water on a right-of-way
  - Dead vegetation or wet spot
  - Odor of hazardous gas or liquids
  - Audible cues (hissing, roaring, etc.)
- Flooding, washouts, erosion, or exposure that could immediately damage or affect the stability of a pipeline
- Fire or explosion near the right-of-way

The conditions that could impact the safety or integrity of the pipeline, resulting in a typical reaction that would mandate prompt notification and reporting include the following:

- Construction or excavation equipment or other signs of construction activity on or near a right-of-way
- Soil movement such as a landslide, mudslide, or sinkhole
- Sagging aboveground pipe at a span
- Damaged, leaning, or failing pipe support system
- Unusual materials, equipment, and/or foreign objects on or near the right-of-way
- Damage to pipeline facilities or suspicious activity that might indicate vandalism or terrorist actions

The conditions that could impact the pipeline, resulting in a typical response that would include reporting:

- Vegetation overgrowth/excessive canopy that may obstruct view of right-of-way
- Damaged or missing line marker(s)
- Soil movement such as subsidence or settling
- Tripped anchors on aboveground pipe
- Damage to coatings or insulation on aboveground pipe or components

3.0 Skill Component

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

Step	Action	Explanation
1	Accurately identify the right-of-way to be inspected from alignment sheets and/or pipeline maps.	Ensures 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.	
3	Make proper notifications.	Appropriate reaction to observations may help prevent damage and/or release.
4	Complete required documentation.	All regulatory-required inspections must be documented.

OQ Task Name

Task 16.1 – Inspect Navigable Waterway Crossing

1.0 Task Description

The purpose of navigable waterway crossing inspection is to detect areas of potential pipe exposure and/or damage and to collect and record information to document the location of the pipeline.

This task starts with notification of the line to be inspected and ends with the completed documentation.

Locate Line is a separate covered task (Reference Task 14.1).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

Navigable Waterway
A waterway that is used or could be used for commerce.

Depth of Cover
The vertical distance from the top of the pipe to the soil/water interface.

Operation of specialized locating equipment to determine depth of cover.

Except for offshore pipelines, each operator shall, at intervals not exceeding 5 years, inspect each crossing under a navigable waterway to determine the condition of the crossing.

Abnormal Operating Conditions (AOCs)
The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Response
Vessel anchored over the pipeline	Make proper operator notifications.
Visible sheen or other indications of product release	Immediately make proper operator notifications.
Waterway bank erosion	Immediately make proper operator notifications.
Debris lodge against pipeline	Immediately make proper operator notifications.
Pipe movement or suspension pipeline	Immediately make proper operator notifications.

3.0 Skill Component

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

Step	Action	Explanation
1	Locate pipeline adjacent to navigable water way crossing.	Establishes a reference point

Step	Action	Explanation
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	Document findings: • Location of exposed or unsupported pipe • Depth of cover	Required by regulation 49 *CFR* 195.404

OQ Task Name

Task 19.1 – 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 initial notification and ends with the completion of the required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Body or Body Cavity
The principle pressure-containing part of a valve where the closure element and seals are located.

Body Bleed (Blowdown)
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.

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. (NOTE: For single-seated valves, see leak-through below.)

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.

3.0 Skills Component

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

Step	Action	Explanation
1	Ensure that the proper notifications have been made.	This step ensures that the task has been scheduled and communicated and that the operational status has been confirmed.
2	Verify the valve number and nameplate data.	If the nameplate is missing, it is to be replaced per operator's specifications. Ensure that the proper valve is located, especially before operating the valve to preclude any upsets. Ensure that obstructions are not blocking accessibility to the valve. Verifies that the documentation to ensure proper maintenance procedures for the particular valve is maintained.
3	Verify proper isolation of the valve.	

Step	Action	Explanation
4	Position the valve for blowdown (depressurizing), isolating the valve body from the line pressure.	The individual must follow the manufacturer's recommendations and/or the operator's procedures.
5	Blowdown (depressurize) the valve body; drain non-petroleum material (such as water or sediment) from the valve body.	Flush until clean product is observed. AOC: Unexpected release or discharge of contaminated liquid. AOC: Sediment obstructs proper drain valve seating.
6	Check for leak-by and leak-through sealing of valve.	The individual must follow the manufacturer's recommendations and/or the operator's procedures. NOTE: In the event that the valve fails to seal, proper notification must be communicated as per the operator's procedure.
7	Connect the injection equipment.	AOC: Unexpected release or discharge of hazardous liquid resulting from faulty connection. AOC: Failure of injection hose (burst or leak). Check valve will prevent back-flow or exposure to hydrocarbon.
8	Operate the injection equipment, and inject appropriate antifreeze and/or corrosion inhibitor.	
9	Perform necessary notifications upon completion of the task.	
10	Document task results as per the operator's procedures.	

OQ Task Name

Task 19.2 – Valve Lubrication

1.0 Task Description

This task involves the activities required to lubricate the components of a valve. This task begins with the initial notification and ends with the completion of the required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Valve Operator
A mechanical valve component that utilizes motion to open and close a valve.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Unexpected release of hazardous liquid	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Ensure that the proper notifications have been made.	This step ensures that the repair has been scheduled and communicated and that the operational status has been confirmed.
2	Verify the valve number and nameplate data.	If the nameplate is missing, it is to be replaced per operator's specifications. Ensure that the proper valve is located, especially before operating the valve to preclude any upsets. Ensure that obstructions are not blocking accessibility to the valve. Verifies that the documentation to ensure proper maintenance procedures for the particular valve is being maintained.
3	Lubricate the valve stem, bearings, and associated components with the appropriate lubricant.	The individual must follow the manufacturer's recommendations and/or the operator's procedures. AOC: Improper use of grease gun could result in lubrication fitting failure and potential product release.
4	Perform the necessary notifications upon completion of the task.	
5	Document task results as per the operator's procedures.	

OQ Task Name

Task 19.3 – Valve Seat Sealing

1.0 Task Description

This task involves verification of valve sealing and the injection of seat sealing products into a valve to control leak-by and leak-through as needed to maintain proper valve function. This task begins upon closure of the valve according to the manufacturer's instructions and concludes upon opening the valve following verification and injection, as needed, of sealing compound.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

The definition applicable to this task is as follows:

Sealant
Material injected into the valve seats to provide a temporary seal.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Release of product in the event a drain valve is left open	Close the drain valve.
A stem leak, body/bonnet leak, or piping connection leak may be encountered upon arriving at the valve	If the leak cannot be isolated safely at the site, the control center should be contacted to isolate or shut down the line.
The valve does not fully seat upon closure and allows leak-through	Notify the operator according to operator's procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify the nameplate and manufacturer data.	
2	Verify the valve is closed according to the manufacturer's instructions. NOTE: Manual control of the valve must be established to prevent inadvertent actuation of the valve during the performance of this task.	This step ensures that the valve is in the proper position to accept the sealant.
3	Depressurize the valve body.	Release of product in the event a drain valve is left open.

Step	Action	Explanation
4	Identify the appropriate type and amount of injection sealant.	Sealants vary by manufacturer and application. This step ensures that the proper amount of sealant is used without damaging the valve.
5	Inject appropriate sealant into seats.	This step ensures that the sealant is compatible with the valve.
6	Check for leak-by and leak-through sealing of valve.	Inspects as per the manufacturer's or operator's procedures. NOTE: In the event the valve fails to seal, proper notification must be communicated as per the operator's procedure.
7	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.

OQ Task Name

Task 19.4 – 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 to control leak-out as needed to maintain proper valve function and integrity. This task begins with identifying the type of valve stem seal and ends with verification that there is no visible leakage.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

Energized
Maintain pressure of the injectable packing.

Injectable Packing
Bulk material injected into the stem seal gland to provide a temporary or permanent seal, depending on the type of stem seal.

Stem Seal
Seal surrounding the valve stem that prevents leakage.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Stem leak, body/bonnet leak, or piping connection leak may be encountered upon arriving at the valve.	If the leak cannot be isolated safely at the site, the control center should be contacted to isolate or shut down the line.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify the nameplate and manufacturer data.	
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	Inject the appropriate injectable packing into valve stem packing gland.	Ensure that the injection pressure does not exceed the manufacturer's instructions.

Step	Action	Explanation
5	Operate the valve to observe stem movement.	This step ensures that the valve operates properly with no visible leakage and that the packing remains energized. NOTE: Performance of this step requires a person to be qualified to operate the valve.

OQ Task Name

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 an initial notification and ends with completion of the required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Block and Bleed
The capability of obtaining a seal across the upstream and downstream seat seals of a valve when the body pressure is bled off to atmosphere through blowdown valves or vent plugs. This feature is useful when testing for integrity of seat seals and in accomplishing minor repairs under pressure.

Double Block and Bleed
A valving arrangement or valve type (e.g., General Twin Seal or Grove Tru-seal) that ensures no flow in a line even though the valve may leak. It consists of two block valves in the main line with a small bleeder valve draining the line between the block valves.

Function Test
Operate the valve to assure 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.

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. (NOTE: For single-seated valves, see leak-through below.)

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.

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. 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)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Unexpected valve movement	Return the valve to the proper position, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.
A stem leak, body/bonnet leak, or piping connection leak may be encountered	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.
Unexpected release of hazardous liquid	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.

3.0 Skills Component

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

Step	Action	Explanation
1	Ensure that the proper notifications have been made.	This step ensures that the repair has been scheduled and communicated and that the operational status has been confirmed.
2	Verify the valve number and nameplate data.	If the nameplate is missing, it is to be replaced per operator's specifications. Ensure that the proper valve is located, especially before operating the valve to preclude any upsets. Ensure that obstructions are not blocking accessibility to the valve. Verifies that the documentation to ensure proper maintenance procedures for the particular valve is being maintained.
3	Verify the proper isolation of the valve and actuator prior to performing an adjustment.	
4	Verify the proper valve position, i.e., open or closed.	
5	Properly set the limit switches.	The individual must follow the manufacturer's recommendations and/or the operator's procedures. AOC: Improper setting of the limit switches could damage the actuator or valve.

Step	Action	Explanation
6	Properly set the torque switches.	The individual must follow the manufacturer's recommendations and/or the operator's procedures. AOC: Improper setting of the torque switches could damage the actuator or valve.
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 status are in proper working order. NOTE: This is a separate covered task.
8	Perform necessary notifications upon completion of the inspection.	
9	Document inspection results as per the operator's procedures.	

OQ Task Name

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 the initial notification and ends with the completion of the required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Block and Bleed
The capability of obtaining a seal across the upstream and downstream seat seals of a valve when the body pressure is bled off to atmosphere through blowdown valves or vent plugs. This feature is useful when testing for integrity of seat seals and in accomplishing minor repairs under pressure.

Double Block and Bleed
A valving arrangement or valve type (e.g., General Twin Seal or Grove Tru-seal) that ensures no flow in a line even though the valve may leak. It consists of two block valves in the main line with a small bleeder valve draining the line between the block valves.

Function Test
Operate the valve to assure 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.

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. (NOTE: For single-seated valves, see leak-through below.)

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.

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).

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)

The following AOCs could be encountered while performing this task::

AOC Recognition	AOC Reaction
Unexpected valve movement	Return the valve to the proper position, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.
A stem leak, body/bonnet leak, or piping connection leak may be encountered	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.
Unexpected release of hazardous liquid	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Ensure that the proper notifications have been made.	This step ensures that the repair has been scheduled and communicated and that the operational status has been confirmed.
2	Verify the valve number and nameplate data.	If the nameplate is missing, it is to be replaced per operator's specifications. Ensure that the proper valve is located, especially before operating the valve to preclude any upsets. Ensure that obstructions are not blocking accessibility to the valve. Verifies that the documentation to ensure proper maintenance procedures for the particular valve is being maintained.
3	Verify the proper isolation of the valve and actuator prior to performing adjustment.	
4	Verify the proper valve position, i.e., open or closed.	
5	Properly set the adjustment mechanisms for full open and closed positions.	The individual must follow the manufacturer's recommendations and/or the operator's procedures. AOC: Improper setting of the adjustment mechanisms could damage the actuator or valve.
6	Verify that the position status indication matches the valve position.	The individual must follow the manufacturer's recommendations and/or the operator's procedures. AOC: Improper setting of the position indication could damage the actuator, valve, or piping.

Step	Action	Explanation
7	Perform functional 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. NOTE: This is a separate covered task.
8	Perform the necessary notifications upon completion of the inspection.	
9	Document the inspection results as per the operator's procedures.	

OQ Task Name

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 the initial notification and ends with the completion of the required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Block and Bleed
The capability of obtaining a seal across the upstream and downstream seat seals of a valve when the body pressure is bled off to atmosphere through blowdown valves or vent plugs. This feature is useful when testing for integrity of seat seals and in accomplishing minor repairs under pressure.

Double Block and Bleed
A valving arrangement or valve type (e.g., General Twin Seal or Grove Tru-seal) that ensures no flow in a line even though the valve may leak. It consists of two block valves in the main line with a small bleeder valve draining the line between the block valves.

Function Test
Operate the valve to assure 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.

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. (NOTE: For single-seated valves, see leak-through below.)

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.

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).

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)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Unexpected valve movement	Return the valve to the proper position, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.
A stem leak, body/bonnet leak, or piping connection leak may be encountered	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.
Unexpected release of hazardous liquid	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Ensure that the proper notifications have been made.	This step ensures that the repair has been scheduled and communicated and that the operational status has been confirmed.
2	Verify the valve number and nameplate data.	If the nameplate is missing, it is to be replaced per operator's specifications. Ensure that the proper valve is located, especially before operating the valve to preclude any upsets. Ensure that obstructions are not blocking accessibility to the valve. Verifies that the documentation to ensure proper maintenance procedures for the particular valve is being maintained.
3	Verify the proper isolation of the valve and actuator prior to performing adjustment.	
4	Verify the proper valve position, i.e., open or closed.	
5	Properly set the adjustment mechanisms for full open and closed positions.	The individual must follow the manufacturer's recommendations and/or the operator's procedures. AOC: Improper setting of the adjustment mechanisms could damage the actuator or valve.

Step	Action	Explanation
6	Verify that the position status indication matches the valve position.	The individual must follow the manufacturer's recommendations and/or the operator's procedures. AOC: Improper setting of the position indication could damage the actuator, valve, or piping.
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. NOTE: This is a separate covered task.
8	Perform the necessary notifications upon completion of the inspection.	
9	Document the inspection results as per the operator's procedures.	

OQ Task Name

Task 20.0 – Inspect Mainline Valves

1.0 Task Description

This task involves performing an inspection to ensure a valve is in good working order, which means the valve's performance meets all the necessary functions. The task also includes verification the proper security controls are in place. This task begins with initial notification and ends with completion of required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

The type and operating features of the valve, e.g., ball valve, gate valve, manual, or motor actuation.

Local Functionality Test
This test consists of a partial or full opening or closing of the valve within operational parameters. The inspection is performed at the valve site and may be completed manually and/or with the motor actuator.

Remote Functionality Test
This test is performed remotely, i.e., from the control center, and consists of a full opening or closing of the valve within operational parameters.

Abnormal Operating Conditions (AOCs)
The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
A stem leak, body/bonnet leak, or piping connection leak may be encountered upon arriving at valve	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.
Unintended closure or opening of valve	Immediately return the valve to the proper position, and notify the operator.
Breach of perimeter security, valve access control, or other access control	Secure site, if safe to do so. Notify the operator of any security breaches.
Valve fails to operate properly during inspection resulting in pressure outside of normal operating limits	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator.

3.0 Skill Component

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

Step	Action	Explanation
1	Ensure that the proper notifications have been made.	This step ensures that the inspection has been scheduled and communicated and that the operational status has been confirmed.

Step	Action	Explanation
2	Ensure that the valve is correctly labeled.	This step ensures that the proper valve is inspected and labeling is consistent with the operator's documentation.
3	Inspect the valve security and access control.	This step ensures 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 ensures that there are no visible leaks, damage, or corrosion of the valve, components, or flanges.
5	Inspect the valve position indicator.	This step ensures that the position indicator is intact and operational.
6	Perform functional testing to check operation of the valve as per applicable procedures, including remote operation if capable.	This step ensures that the valve is in proper working order. NOTE: Performance of this step requires a person to be qualified to operate the valve.
7	Re-establish proper valve status and security controls.	This step ensures that the valve and/or valve site are secured against unauthorized access.
8	Perform the necessary notifications upon completion of the inspection.	
9	Document the inspection results as per the operator's procedures.	

OQ Task Name

Task 21.1 − Repair Valve Actuator/Operator, Pneumatic

1.0 Task Description

This task involves the disassembly, diagnosis of component failure, repair or replacement, and reassembly of a valve actuator. This task addresses the repair of a pneumatic actuator according to the applicable procedures and is conducted to maintain the integrity of the valve actuator, which means the actuator meets all the necessary functions. This task begins with the initial notification and ends with the completion of the required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Applicable Procedures
May include, but are not limited to, the valve manufacturer's instructions, operator's procedures, drawings, other job aids, etc.

Integrity Test
A test to ensure the actuator operates properly and does not leak after re-assembly.

Abnormal Operating Conditions (AOCs)
The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Unexpected valve movement	Return the valve to the proper position, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.
A stem leak, body/bonnet leak, or piping connection leak may be encountered	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Ensure that the proper notifications have been made.	This step ensures that the repair has been scheduled and communicated and that the operational status has been confirmed.
2	Verify the proper isolation of the valve and actuator prior to repair or disassembly.	
3	Repair or disassemble the actuator following applicable procedures.	The individual must follow the manufacturer's instructions for the applicable valve.
4	Diagnose and repair or replace worn or damaged parts per the manufacturer's specifications.	The individual must follow the manufacturer's instructions for the applicable valve.

Step	Action	Explanation
5	Reassemble the actuator per applicable procedures.	The individual must follow the manufacturer's instructions for the applicable valve.
6	Perform a test to ensure proper actuator integrity.	This step ensures that the pneumatic source does not leak and the actuator operates properly.
7	Re-establish the proper actuator status and security controls.	
8	Perform the necessary notifications upon completion of the repair.	
9	Document the repair results per the operator's procedures.	

OQ Task Name

Task 21.2 − Disassembly/Re-assembly of Valve

1.0 Task Description

This task involves the disassembly and re-assembly of valves, diagnosis of valve component failure, and repair or replacement of parts, as necessary. This task addresses the repair of a valve according to the applicable procedures, and is conducted to maintain the integrity of the valve, which means the valve performance meets all the necessary functions. This task begins with the initial notification and ends with the completion of required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Applicable Procedures
May include, but are not limited to, the valve manufacturer's instructions, operator's procedures, drawings, other job aids, etc.

Integrity Test
A test to ensure the valve operates properly and does not leak after re-assembly. The DOT valve inspection is a separate covered task.

Valves
The type, operating features and repair methods of the valve, e.g., ball valve and gate valve.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Release of product in the event that the valve body pressurizes during task performance.	Isolate the valve, if safe to do so. Immediately notify the operator.
A stem leak, body/bonnet leak, or piping connection leak may be encountered upon arriving at the valve.	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Ensure that the proper notifications have been made.	This step ensures that the repair has been scheduled and communicated and that the operational status has been confirmed.
2	Ensure that the valve has been isolated according to applicable procedures.	This step prevents release of hazardous energy and ensures worker safety.
3	Disassemble the valve following applicable procedures.	The individual must follow the manufacturer's instructions for the applicable valve.

Step	Action	Explanation
4	Diagnose and repair or replace worn or damaged parts per the manufacturer's specifications.	The individual must follow the manufacturer's instructions for the applicable valve.
5	Reassemble the valve per applicable procedures.	The individual must follow the manufacturer's instructions for the applicable valve.
6	Perform a valve integrity test.	This step ensures that the valve operates properly and does not leak.
7	Perform the necessary notifications upon completion of the valve repair.	

OQ Task Name

Task 21.3 – Internal Inspection of Valve and Components

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 nameplate and ends with completion of the required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Body or Body Cavity
The principle pressure-containing part of a valve in which the closure element and seals are located.

Body Bleed
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.

Block and Bleed
The capability of obtaining a seal across the upstream and downstream seat seals of a valve when the body pressure is bled off to atmosphere through blowdown valves or vent plugs. This feature is useful when testing for integrity of seat seals and in accomplishing minor repairs under pressure.

Double Block and Bleed
A valving arrangement or valve type (e.g., General Twin Seal or Grove Tru-seal) that ensures no flow in a line even though the valve may leak. It consists of two block valves in the main line with a small bleeder valve draining the line between the block valves.

Drain and Vent Plug
A mechanical device used to vent or bleed off internal valve body pressure.

Function Test
Operate the valve to assure 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.

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. (NOTE: For single-seated valves, see leak-through below.)

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.

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).

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)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
A stem leak, body/bonnet leak, or piping connection leak may be encountered	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.
Unexpected release of hazardous liquid	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify the valve number and nameplate data.	If the nameplate is missing, it is to be replaced per operator's specifications. Ensure that the proper valve is located, especially before operating the valve to preclude any upsets. Ensure that obstructions are not blocking accessibility to the valve. Verifies that the documentation to ensure proper tolerances and measurement procedures are used for the particular valve being inspected.
2	Verify the proper isolation of the valve prior to performing inspection.	AOC: Unexpected release of or exposure to hazardous liquid.
3	Inspect the valve and components.	The individual must follow the manufacturer's recommendations and/or the operator's procedures. Inspection may include but is not limited to 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 are tightened to specified limits and torque procedure • Condition of valve body and coatings

Step	Action	Explanation
4	Perform the necessary notifications of results of the inspection and items for repair upon completion.	Ensures arrangements for repairs and functionality test according to covered task for Disassembly/Re-assembly of Valve.
5	Document the inspection results per operator's procedures.	

OQ Task Name

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 re-assembly of valve actuator. This task addresses the repair of a hydraulic actuator according to the applicable procedures and is conducted to maintain the integrity of the valve actuator, which means the actuator meets all the necessary functions. This task begins with the initial notification and ends with the completion of the required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Applicable Procedures
May include, but are not limited to, the valve manufacturer's instructions, operator's procedures, drawings, other job aids, etc.

Integrity Test
A test to ensure the actuator operates properly and does not leak after re-assembly.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Unexpected valve movement.	Return the valve to the proper position, if safe to do so. Immediately notify the operator, and execute the applicable emergency procedures.
A stem leak, body/bonnet leak, or piping connection leak may be encountered.	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator, and execute the applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Ensure that the proper notifications have been made.	This step ensures that the repair has been scheduled and communicated and that the operational status has been confirmed.
2	Verify the proper isolation of the valve and actuator prior to repair or disassembly.	
3	Repair or disassemble the actuator following applicable procedures.	The individual must follow the manufacturer's instructions for the applicable valve.
4	Diagnose and repair or replace worn or damaged parts per the manufacturer's specifications.	The individual must follow the manufacturer's instructions for the applicable valve.

Step	Action	Explanation
5	Reassemble the actuator per applicable procedures.	The individual must follow the manufacturer's instructions for the applicable valve.
6	Perform a test to ensure proper actuator integrity.	This step ensures that the hydraulic source does not leak and the actuator operates properly.
7	Re-establish the proper actuator status and security controls.	
8	Perform the necessary notifications upon completion of the repair.	
9	Document the repair results per the operator's procedures.	

OQ Task Name

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 re-assembly of valve actuator. This task addresses the repair of an electric actuator according to the applicable procedures and is conducted to maintain the integrity of the valve actuator, which means the actuator meets all the necessary functions. This task begins with the initial notification and ends with the completion of the required documentation.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Applicable Procedures
May include, but are not limited to, the valve manufacturer's instructions, operator's procedures, drawings, other job aids, etc.

Integrity Test
A test to ensure the actuator operates properly after re-assembly.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Unexpected valve movement.	Return the valve to the proper position, if safe to do so. Immediately notify the operator, and execute the applicable emergency procedures.
A stem leak, body/bonnet leak, or piping connection leak may be encountered.	Stop operation and secure the equipment, if safe to do so. Immediately notify the operator, and execute the applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Ensure that the proper notifications have been made.	This step ensures that the repair has been scheduled and communicated and that the operational status has been confirmed.

Step	Action	Explanation
2	Verify the valve number and nameplate data.	If the nameplate is missing, it is to be replaced per operator's specifications. Ensure that the proper valve is located, especially before operating the valve to preclude any upsets. Ensure that obstructions are not blocking accessibility to the valve. Verifies that the documentation to ensure proper maintenance procedures for the particular valve is being maintained.
3	Verify the proper isolation of the valve and actuator prior to repair or disassembly.	
4	Repair or disassemble the actuator following applicable procedures.	The individual must follow the manufacturer's and/or the operator's instructions for the applicable valve.
5	Diagnose and repair or replace worn or damaged parts per manufacturer's specifications.	The individual must follow the manufacturer's instructions for the applicable valve.
6	Reassemble the actuator per the applicable procedures.	The individual must follow the manufacturer's instructions for the applicable valve.
7	Perform a test to ensure proper actuator integrity.	This step ensures that the actuator operates properly.
8	Re-establish the proper actuator status and security controls.	
9	Perform the necessary notifications upon completion of the repair.	
10	Document the repair results per the operator's procedures.	

OQ Task Name

Task 22.1– Inspect Tank Pressure/Vacuum Breakers

1.0 Task Description

This task involves activities performed on a tank pressure/vacuum breaker to verify that it is functioning properly, is in good mechanical condition, and is adequate for its intended purpose. This task begins with verification that the test equipment has been calibrated and ends with appropriate notifications that the relief valve has returned to a normal operating condition.

Elements of this task may include the following:

- Verifying the location of the device to be inspected,
- Verifying the device number and nameplate data,
- Verifying the device type and manufacturer,
- Visually inspecting the device for leaks or corrosion,
- Verifying mechanical functionality,
- Conducting repairs, as required,
- Applying a security seal to a breaker, as required,
- Documenting results.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Pallet weight tank pressure/vacuum breakers;
- Calibration equipment and tools – including digital scales and calipers;
- Tank/vessel construction types – cone roof, internal floating roof, external floating roofs;
- Device set point – ability to understand the manufacturer's specification and the operator's design criteria.

Definitions applicable to this task are as follows:

Body or Body Cavity
The principle pressure-containing part of a breaker where the closure element and seals are located.

Diaphragm
A round, thin, flexible-sealing device that is secured and sealed around its outer edge 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.

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)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
The liquid level is at an unexpected high or low level.	Notify the Control Center or appropriate personnel of the level status.
The device is found to be in an inoperable condition.	Notify/inform the appropriate operator personnel of the condition.
Observed structural damage to the roof components.	Notify/inform the appropriate operator personnel of the condition.
Debris or free standing product exists on the roof.	Notify/inform the appropriate operator personnel of the condition.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify that the test equipment has been calibrated.	Test equipment such as digital scales or pallet weights must have a valid certification of calibration and must be appropriate for the intended calibration range per the manufacturer's specifications.
2	Notify the Control Center, local operations (if applicable), and any affected personnel **prior** to performing any test per the operator's procedures.	
3	Verify the tank has been isolated from the process system, if required, as per the operator's procedure.	
4	Verify the device number and the nameplate data on the tank.	This step uses the appropriate operator drawings and documentation to verify that the correct device was identified.
5	Verify the device type and the manufacturer.	This step uses the appropriate operator's drawings and documentation to verify the device type and the manufacturer.
6	Visually inspect the device and its associated equipment to determine the following: • Appropriateness for intended service • Physical/mechanical condition • Presence of corrosion • Presence of erosion • Presence of leakage • Condition of the nozzle to gasket seal and its integrity	This inspection confirms the condition and functionality of the device. If maintenance, repair, or replacement is required, make the appropriate notifications or repairs per the operator's and manufacturer's procedures.

Step	Action	Explanation
7	Remove the device cover and examine it for signs of hydrocarbon or corrosion fouling.	Hydrocarbon or corrosion fouling can prevent the device from functioning properly. If maintenance, repair, or replacement is required, make the appropriate notifications or repairs per the operator's and manufacturer's procedures.
8	Validate the pallet weights.	This step validates that the correct pallet weights are installed per the manufacturer's specifications and the operator's design criteria.
9	Move the pressure/vacuum pallets, if applicable. Examine the pressure/vacuum pallet seating surfaces for signs of hydrocarbon fouling, cracking, diaphragm damage, or other mechanical damage.	This step verifies that the pressure/vacuum pallet moves freely. This step includes inspecting the seat to assure a tight seal. If maintenance, repair, or replacement is required, make appropriate notifications or repairs per the operator's and manufacturer's procedures.
10	Examine the outlet of the pressure/vacuum breaker for fouling.	The amount of hydrocarbon vented and the amount of air drawn in during a vacuum cycle is decreased by fouling of the outlet of the breaker.
11	Reassemble the pressure/vacuum breaker per the manufacturer's specifications.	
12	Apply a security seal to the breaker, if required by operator's procedure.	The security seal may include inspection information and results.
13	Document inspection results.	This step documents the results per the operator's procedures.
14	Notify the Control Center, local operations (if applicable), and any affected personnel, per the operator's procedures.	This communication step provides notice that the device is operable and is ready to be returned to normal operation.

OQ Task Name

Task 22.2 – Inspect, Test, and Calibrate HVL Tank Pressure Relief Valves

1.0 Task Description

This task involves the inspection, testing, and calibration activities performed on a 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 identifying and verifying the relief valve to be inspected, tested, and/or calibrated and ends with notification that the relief valve has returned to a normal operating condition.

Elements of this task may include the following:

- Verifying the location of the device to be inspected
- Verifying the device number and the nameplate data
- Verifying the device type and the manufacturer
- Testing and calibrating the device
- Visually inspecting the device for leaks or corrosion
- Applying a security seal to a device as required by procedures

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Types of tank pressure relief valves including the following:
    - Spring loaded
    - Snap acting pilot
    - Modulating pilot
- Calibration equipment and tools including the following:
    - Analog pressure gauges
    - Digital pressure gauges
    - Calipers
    - Micrometers
- The device set point including the ability to understand the manufacturer's specifications and the operator's design criteria as follows:
    - Manufacturer-specified reseating adjustments (spring loaded valves)
    - Manufacturer-specified lift setting adjustments (pilot operated valves)

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
The device does not actuate within a satisfactory range, or it is not repeatable.	Make the appropriate operator notifications in order to repair or replace the device.
The unintentional activation of a safety/control device (e.g., abnormal shutdown, unintentional valve movement, high pressure shutdown) during testing which results in a loss of control or over-pressure condition of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition.
The isolation valve does not fully close or does not isolate the process pressure.	Stop the task, return the valve to service, and make appropriate operator notifications to ensure proper repairs are made. The outputs and interactions of these devices could result in a loss of control or could adversely affect the process system.
A device isolation valve is in an improper position.	Make the appropriate operator notifications.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify that the test equipment has been calibrated prior to performing any calibrations.	This verification 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 must have a valid certification of calibration and be appropriate for the intended calibration range.
2	Notify the Control Center, local operations (if applicable), and any affected personnel **prior** to performing any test per the operator's procedures.	
3	Verify the device number and the nameplate data on the tank.	This step utilizes the appropriate operator's drawings to verify that the correct device was identified.
4	Verify the device type and the manufacturer.	This step utilizes the appropriate operator's drawings to verify the device type, manufacturer, and device set points.

Step	Action	Explanation
5	Visually inspect the device and its associated equipment to determine the following: • 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	This inspection confirms the condition and functionality of the device. If maintenance, repair, or replacement is required, make the appropriate notifications or repairs per the operator's and manufacturer's procedures.
6	Isolate the device from the process system.	This step isolates the device from the process system and relieves trapped process pressure. This step allows the correct test pressure and medium to be applied during calibration and prevents a loss of containment.
7	Connect the test equipment and inspect all connections for leakage.	Loss of test pressure results in inaccurate test results or calibration of the device.
8	Apply the test medium pressure and determine the device set point or range "as found."	Using the "as found" value of a device set point prior to calibration helps determine the proper functionality and repeatability. This step 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.
9	Document the "as found" results.	This step documents "as found" results per the operator’s procedures. This documentation provides historical data that may indicate if the device fails to maintain calibration and may need replacing.

Step	Action	Explanation
10	If the device calibration is required, re-apply the test medium (step 8) to the desired set point or range and adjust it according to the device manufacturer's specifications to the operator's documented set point. Repeat the test procedure to achieve calibration and establish repeatability to the desired set point.	
11	Document the final set point value "as left" results.	This step documents "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.
12	Remove the test equipment, return the device to normal operating condition, and verify the integrity of the system per the operator's procedures.	
13	Apply a security seal to the device, if required by the operator's procedure.	A security seal may include inspection information and results. The application of a security seal should follow the operator's procedures.
14	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.

OQ Task Name

Task 23.1 – Maintain/Repair Relief Valves

1.0 Task Description

This task involves disassembling and re-assembling 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 it is conducted to maintain the integrity of a valve, meaning the valve's performance meets all the necessary functions. This task begins with verification of the device number and the nameplate data and ends with notification to the appropriate personnel that the device is operable and the system has returned to normal operation.

Inspect, Test, and Calibrate Relief Valves is a separate covered task (Reference Task 23.2).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Types of pressure relief valves including the following:
  - Spring loaded
  - Snap acting pilot
  - Modulating pilot
- Calibration equipment and tools including the following:
  - Analog pressure gauges
  - Digital pressure gauges
  - Calipers
  - Micrometers
- The device set point including the ability to understand the manufacturer's specifications and the operator's design criteria as follows:
  - Manufacturer-specified reseating adjustments (spring-loaded valves)
  - Manufacturer-specified lift setting adjustments (pilot-operated valves)

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
The device does not actuate within a satisfactory range, or it is not repeatable.	Make appropriate operator notifications to repair or replace the device.
The unintentional activation of a safety/control device (e.g., abnormal shutdown, unintentional valve movement, high pressure shutdown) during testing which results in a loss of control or over-pressure condition of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition.

AOC Recognition	AOC Reaction
The isolation valve does not fully close or isolate the process pressure	Stop the task, return the valve to service, and make the appropriate operator notifications to ensure proper repairs are made. The outputs and interactions of these devices could result in a loss of control or could adversely affect the process system.
The improper position of a device isolation valve	Make the appropriate operator notifications.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify the relief valve number and the nameplate data.	This step uses the appropriate operator's drawings and documentation to verify that the correct device was identified.
2	Verify the relief valve type and the manufacturer.	This step uses the appropriate operator's drawings and documentation to verify the device type and the manufacturer.
3	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) must be notified that work is to be performed on a relief valve.
4	Isolate the relief valve from the process system.	This step isolates the relief valve from the process system and relieves trapped process pressure.
5	Disassemble the relief valve following applicable operator's procedures.	Disassembly follows the manufacturer's instructions and specifications for the applicable relief valve.
6	Diagnose and repair or replace worn or damaged parts.	Disassembly follows the manufacturer's instructions and specifications for the applicable relief valve.
7	Assemble the relief valve per the manufacturer's procedures.	Assembly follows the manufacturer's instructions and specifications for the applicable relief valve.
8	Inspect, test, and calibrate the relief valve.	Testing and calibrating the relief valve must be completed prior to returning the relief valve to service. Inspection should verify the integrity of the device and ensure no leakage exists.
9	Return the relief valve to normal operating condition and verify the integrity of the system per the operator's procedures.	This step verifies that the relief valve operates properly and does not leak.
10	Apply a security seal to the breaker, if required by the operator's procedure.	The security seal may include inspection information and results. The operator's procedures are used to apply the seal.
11	Notify the Control Center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notice that the relief valve is operable and that the system is ready or has returned to normal operation.

OQ Task Name

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 identifying and verifying the relief valve to be inspected, tested, and/or calibrated and ends with notification that the relief valve has returned to a normal operating condition.

Elements of this task may include the following:

- Verifying the location of the device to be inspected;
- Verifying the device number and the nameplate data;
- Verifying the device type and the manufacturer;
- Testing and calibrating the device;
- Visually inspecting the device for leaks or corrosion;
- Applying a security seal to a breaker, as required.

Maintain/Repair Relief Valves is a separate covered task (Reference Task 23.1).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Types of relief valves including, but are not limited to, the following:
  - Spring loaded
  - Snap acting pilot
  - Modulating pilot
  - Nitrogen loaded
  - Piston
- Calibration equipment and tools including the following:
  - Analog pressure gauges
  - Digital pressure gauges
  - Calipers
  - Micrometers
- The device set point including the ability to understand the manufacturer’s specifications and the operator’s design criteria as follows:
  - Manufacturer-specified reseating adjustments (spring loaded valves)
  - Manufacturer-specified lift setting adjustments (pilot operated valves)

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
The device does not actuate within a satisfactory range, or it is not repeatable.	Make the appropriate operator notifications to repair or replace the device.
The unintentional activation of a safety/control device (e.g., abnormal shutdown, unintentional valve movement, high pressure shutdown) during testing which results in a loss of control or an over-pressure condition of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition.
The isolation valve does not fully close or does not isolate the process pressure.	Stop the task, return the valve to service, and make the appropriate operator notifications to ensure proper repairs are made. The outputs and interactions of these devices could result in a loss of control or could adversely affect the process system.
The improper position of a device isolation valve.	Make the appropriate operator notifications.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify that test equipment has been calibrated prior to performing any calibrations.	This verification 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 must have a valid certification of calibration and be appropriate for the intended calibration range.
2	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) must be notified that work is to be performed on the relief valve.
3	Verify the device number and the nameplate data.	This step uses the appropriate operator's drawings and documentation to verify that the correct device was identified.
4	Verify the device type and the manufacturer.	This step uses the appropriate operator's drawings and documentation to verify the device type and the manufacturer.

Step	Action	Explanation
5	Visually inspect the device and its associated equipment to determine the following: • 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	This inspection confirms the condition and the functionality of the device. If maintenance, repair, or replacement is required, make the appropriate notifications or repairs per the operator's and manufacturer's procedures.
6	Isolate the device from the process system.	This step isolates the device from the process system and relieves trapped process pressure. This action allows the correct test pressure and medium to be applied during calibration and prevents a loss of containment.
7	Connect the test equipment and inspect all connections for leakage.	The loss of test pressure results in inaccurate test results or calibration of the device.
8	Apply the test medium pressure and determine the device set point or range "as found."	Using the "as found" value of a device set point prior to calibration helps determine the proper functionality and repeatability. This step 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.
9	Document "as found" results.	This step documents "as found" results per the operator’s procedures. This documentation provides historical data that may indicate if the device fails to maintain calibration and may need to be replaced.
10	If device calibration is required, re-apply the test medium (step 8) to the desired set point or range and adjust it according to the device manufacturer’s specifications. Repeat the test procedure to achieve calibration and establish repeatability to the desired set point.	

Step	Action	Explanation
11	Document the final set point value "as left" results.	This step documents "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.
12	Remove test equipment, return the device to normal operating condition, and verify the integrity of the system per the operator’s procedures.	
13	Apply a security seal to the device, if required by the operator’s procedure.	A security seal can include inspection information and results; it is applied using the operator's procedures.
14	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.

OQ Task Name

Task 24.1 – Maintain/Repair Pressure Limiting Devices

1.0 Task Description

This task consists of the repair and maintenance activities performed on a pressure limiting device and associated equipment on an existing pipeline system. This task applies to maintaining or restoring the design function. This task begins with verification of the device number/nameplate data and ends with the notification to the appropriate personnel that the device is operable and that the system has returned to normal operation.

Elements of this task may include the following:

- Disassembling a pressure limiting device and its associated equipment;
- Cleaning and inspecting a pressure limiting device and its associated equipment's internal components;
- Repairing and replacing the failed or worn components;
- Re-assembling a pressure limiting device and its associated equipment components and returning it to operable condition.

Inspect, Test, and Calibrate Pressure Limiting Devices is a separate covered task (Reference Task 24.2).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Types of sliding stem style pressure limiting devices including the following:
  - Globe control valve and its associated components
  - Cage control valve and its associated components
- Types of rotary style pressure limiting devices including the following:
  - Butterfly-style control valve its and associated components
  - Ball valves
  - V-Notch valves
- Associated equipment of pressure limiting devices including the following:
  - Controllers
  - Positioners
  - Solenoid valves
  - Limit switches
  - Regulators
  - Transducers
- Calibration equipment and tools including the following:
  - Analog pressure gauges
  - Digital pressure gauges
  - Calipers
  - Micrometers

  - VOM multimeters
  - Manufacturer-specific multifunction calibrators
- The operation and the proper use of test equipment required for performing the functions required in this task, such as multimeters, multifunction calibrators, and gauges (analog, digital, and digital pressure modules).
- The operation and safe handling of test media, such as pressure regulators, nitrogen sources, and process connections.
- The operation and safe handling of electrical systems, such as voltages applied to the device, electrical requirements, and connections of test equipment to the device.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
The control valve and its associated components do not actuate within a satisfactory range, are not repeatable, or not repairable	Make appropriate operator notifications to repair or replace the device and its associated components.
The unintentional activation of a safety / control device (e.g., abnormal shutdown, unintentional valve movement, high pressure shutdown) during testing which results in a loss of control or an over-pressure condition of the pipeline	Take appropriate action to mitigate the situation and to return the pipeline to normal condition.
The isolation valve does not fully close or isolate the process pressure	Stop the task, return the valve to service, and make the appropriate operator notifications to ensure proper repairs are made. The outputs and interactions of these devices could result in a loss of control or could adversely affect the process system.
The improper position of a device isolation valve	Make the appropriate operator notifications.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify the control valve number and location.	This step uses the appropriate operator's drawings and documentation to verify that the correct device was identified.
2	Verify the control valve and associated components type and the manufacturer nameplate data.	This step uses the appropriate operator’s drawings and documentation to verify the device type and the manufacturer.
3	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) must be notified that work is to be performed on a control valve.

Step	Action	Explanation
4	Isolate the control valve from the process system.	This step isolates the control valve from the process system and relieves the trapped process pressure.
5	Disassemble the control valve following the applicable operator's procedures.	Disassembly follows the manufacturer's instructions and specifications for the applicable control valve.
6	Diagnose and repair or replace the worn or damaged parts.	Disassembly follows the manufacturer's instructions and specifications for the applicable control valve.
7	Assemble the control valve per the manufacturer's procedures.	Assembly follows the manufacturer's instructions and specifications for the applicable control valve.
8	Test and calibrate the control valve and associated components.	Testing and calibrating the control valve must be completed prior to returning the control valve to service.
9	Return the control valve 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 control valve operates properly and does not leak.
10	Notify the Control Center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notice that the control valve is operable and that the system is ready or has returned to normal operation.

OQ Task Name

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 an over-pressure safety 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 ensuring calibration of test equipment and ends with returning the pressure limiting device to an operable condition.

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

Maintain/Repair Pressure Limiting Devices is a separate covered task (Reference Task 24.1).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Types of sliding stem style pressure limiting devices including the following:
  - Globe control valve and its associated components
  - Cage control valve and its associated components
- Types of rotary style pressure limiting devices including the following:
  - Butterfly-style control valve its and associated components
  - Ball valves
  - V-Notch valves
- Associated equipment of pressure limiting devices including the following:
  - Controllers
  - Positioners
  - Solenoid valves
  - Limit switches
  - Regulators
  - Transducers
- Calibration equipment and tools including the following:
  - Analog pressure gauges
  - Digital pressure gauges
  - Calipers
  - Micrometers
  - VOM multimeters
  - Manufacturer-specific multifunction calibrators
- The operation and the proper use of test equipment for performing the functions required in this task, such as multimeters, multifunction calibrators, and gauges (analog, digital, and digital pressure modules).
- The operation and safe handling of test media, such as pressure regulators, nitrogen sources, and process connections.
- The operation and safe handling of electrical systems, such as voltages applied to the device, electrical requirements, and connections of test equipment to the device.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
The control valve and its associated components do not actuate within a satisfactory range, are not repeatable, or not repairable.	Make appropriate operator notifications to repair or replace the equipment.
The unintentional activation of a safety/control device (e.g., abnormal shutdown, unintentional valve movement, high pressure shutdown.) during testing which results in a loss of control or an over-pressure condition of the pipeline.	Take appropriate action to mitigate the situation and to return the pipeline to normal condition.
The isolation valve does not fully close or does not isolate the process pressure.	Stop the task, return the valve to service, and make the appropriate operator notifications to ensure proper repairs are made. The outputs and interactions of these devices could result in a loss of control or could adversely affect the process system.
The improper position of a device isolation valve.	Make the appropriate operator notifications.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify that the test equipment has been calibrated.	This verification 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 must have a valid certification of calibration and be appropriate for the intended calibration range.
2	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) must be notified that work is to be performed on a control valve.
3	Verify the control valve number and location.	This step uses the appropriate operator's drawings and documentation to verify that the correct device was identified.
4	Verify the control valve, its associated components type, and the manufacturer's nameplate data.	This step uses the appropriate operator's drawings and documentation to verify the device type, the manufacturer, and to verify the device is within the proper maximum allowable working pressure (MAWP).

Step	Action	Explanation
5	Visually inspect the device and its associated equipment to determine the following: • 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 control valve and its associated equipment	This inspection confirms the condition and functionality of the device. If maintenance, repair, or replacement is required, make the appropriate notifications or repairs per the operator's and manufacturer's procedures.
6	For static (out-of-service) testing and calibration, isolate the pressure limiting device from the process system.	Isolation of the control valve and associated equipment from the process system provides for the correct test pressure and medium to be applied during calibration.
7	For dynamic (in-service) testing and calibration, use the operator's procedures and notification protocols.	Dynamic testing yields the most accurate results and must be performed in coordination with Operations to establish operational testing limits and to avoid operational upsets.
8	Connect the test equipment, and inspect all connections for leakage.	The loss of the test pressure results in inaccurate test results or calibration of the device.
9	Apply the test medium pressure and determine the control valve upper and lower operating limits and range.	If the control valve is improperly adjusted, it may have a problem maintaining its calibration within acceptable limits and tolerance. This step verifies the current settings for the control valve and its associated components and determines if a calibration and adjustment are required.
10	If calibration or adjustment of the control valve and/or its associated components is required, re-apply the test medium (step 9) to the required values and range. Adjust the control valve and its associated components per the manufacturer's and the operator's specifications. Repeat the test procedure to achieve calibration and establish repeatability to the desired upper and lower operating limits and range.	
11	Document the inspection and calibration results.	Documentation of the results follows the operator's procedures.
12	Remove the test equipment, return the control valve and its associated equipment to normal operating condition, and verify the integrity of the system per the operator's procedures.	
13	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.

OQ Task Name

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 ensure that the equipment and associated output signals are functioning properly and are adequate for the intended purpose.

This task begins with identifying and verifying the pressure switch to be inspected, tested and/or calibrated. The task ends with notification that the pressure switch is returned to a normal operating condition.

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

The primary purpose of this task is to insure that the pressure switch operates correctly to detect or prevent a possible overpressure of the pipeline system. The pressure switch typically initiates an alarm to the Control Center and may initiate automatic operation of system equipment when designed to do so by the company. After receipt of an alarm, the Control Center will take appropriate and immediate actions to prevent an actual overpressure beyond operational limits.

An individual performing this task must have knowledge of:

- Operation and proper use of test equipment to be used to perform the functions required in this task (i.e., multi-meters, multi-function calibrators, pressure gauges analog or digital and digital pressure modules).
- Operation of test media and equipment (i.e., pressure regulators, hand pumps, air, nitrogen, glycol mediums and equipment process connections).
- 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).
- Knowledge of the control instrumentation for the process system (i.e., knowing the alarm, control, indication and recording function of the device in the process system).

Definitions applicable to this task are as follows:

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.

Shutdown Device
A device that must operate to provide protection for a pipeline. Ex: A pressure switch activates and through the control sequence prevents the pipeline from over pressuring.

Pressure Switch Deadband (Zero Pressure)
The pressure value required to reset a pressure switch after it has been actuated.

Pressure Switch Range
Adjustable span of pressure switch.

Pressure Switch Set Point
Trip threshold at which switch activates.

Test Equipment Operation
Operation and proper use of test equipment to be used to perform the functions required in this task (i.e., multi-meters, multi-function calibrators, gauges (analog, digital, and digital pressure modules).

Test Equipment Calibration
Able to determine that the test equipment is within its calibration period and accuracy.

Abnormal Operating Conditions (AOCs)
The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Device does not actuate within satisfactory range or is not repeatable	Make appropriate company notifications to repair or replace.
Unintentional Activation of a Safety/Control Device: Abnormal shutdown, unintentional valve movement, high pressure shutdown, etc. during testing which results in loss of control or over-pressure condition of the pipeline.	Take appropriate action to mitigate the situation to return the pipeline to normal condition. Make required notifications per company procedure.
Isolation valve does not fully close or isolate process pressure.	Stop task, return valve to service, and make appropriate company notifications. The outputs and interactions of these devices could result in loss of control or could adversely affect the process system.
Unexpected release of hazardous liquid or gas.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.

3.0 Skill Component

To demonstrate proficiency in this task an individual must perform the following steps:

Step	Action	Explanation
1	Verify the device number/nameplate data.	Utilize appropriate company drawings to verify correct device. This step verifies the pressure switch to the correct alarm tag that will be activated.
2	Verify that test equipment has been calibrated prior to performing calibrations.	Test equipment (i.e., multi-meters, multi-function calibrators, pressure gauges analog or digital, and digital pressure modules), that is used to calibrate pressure switches that are providing overpressure protection must have valid certification of calibration and is appropriate for the intended calibration range.

Step	Action	Explanation
3	Verify device set point for switches 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 must 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 Control Center, local operations (if applicable), and any affected personnel, **prior** to performing any test per company procedures.	The Control Center and local operations (If applicable) must 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: 1. Receipt/Initiation of the alarm 2. Proper pressure switch device number to alarm tag. If the pressure 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. Consult company procedures. Notification is crucial to avoid a “false alarm” that could affect the operation of the pipeline.
6	Visually inspect pressure switch (per company procedure).	Visually inspect switch and associated equipment: • Appropriate for intended service • Physical/Mechanical condition • Corrosion • Leakage • Electrical connections (if applicable)
7	Isolate the pressure switch from the process system (per company procedure).	Isolate the device from the process system and relieve trapped process pressure. This will allow correct test pressure and 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.

Step	Action	Explanation
9	Apply test medium pressure and determine device set point or range “as found”.	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 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	Document “as found” results.	Document “as found” results per company procedure. This documentation provides historical data that may indicate the device fails to maintain calibration and may need to be replaced.
11	If device calibration is required, re-apply test medium to desired set point or range and adjust according to device manufacturer’s specifications. Repeat test procedure to achieve calibration and establish repeatability to desired set point.	Calibration according to device manufacturer’s instructions will assure proper calibration is achieved. Repeat steps 5-10.
12	Document final set point value, “as left” results.	Document “as left” results per company procedure. Documentation of the final calibration will provide an opportunity for review to ensure that the correct set point(s) were established and will provide historical data for future testing of the device.
13	Remove test equipment, return device to normal operating condition and verify integrity of system as per company procedure.	
14	Notify Control Center, local operations (if applicable), and any affected personnel, per company procedures. Notify Operations Center and/or affected personnel.	To notify appropriate personnel that the device is operable and the system is ready or has returned to normal operation.

OQ Task Name

Task 25.2 – Inspect, Test and Calibrate Pressure Transmitters

1.0 Task Description

This task consists of the inspection, testing, and calibration activities performed on a pressure transmitter to ensure that the equipment and associated output signals are functioning properly and are adequate for the intended purpose.

This task begins with identifying and verifying the pressure transmitter to be inspected, tested and/or calibrated. The task ends with notification that the pressure transmitter is returned to a normal operating condition.

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

The primary purpose of this task is to insure that the pressure transmitter operates correctly to detect or prevent a possible overpressure of the pipeline system. The pressure transmitter is designed to accurately determine dynamic pipeline pressure and typically initiates an alarm to the Control Center if engineered pressure threshold(s) are reached. After receipt of an alarm, the Control Center will take appropriate and immediate actions to prevent an actual overpressure beyond operational limits. A pressure alarm may also initiate automatic operation of system equipment when designed to do so by the company.

An individual performing this task must have knowledge of:

- Operation and proper use of test equipment to be used to perform the functions required in this task (i.e., multi-meters, multi-function calibrators, pressure gauges analog or digital, and digital pressure modules).
- Operation of test media and equipment (i.e., pressure regulators, hand pumps, air, nitrogen, glycol mediums and equipment process connections).
- 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).
- Knowledge of the control instrumentation for the process system (i.e., knowing the alarm, control, indication and recording function of the device in the process system).

Definitions 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.

Pressure Transmitter Range
Device output signal which can be adjusted by the operator to a different span of pressure.

Test Equipment Operation
Operation and proper use of test equipment to be used to perform the functions required in this task (i.e., multi-meters, multi-function calibrators, pressure gauges analog or digital, and digital pressure modules).

Abnormal Operating Conditions (AOC)

The following AOCs could be encountered while performing this task:

AOC RECOGNITION	AOC REACTION
Device does not function within satisfactory range or is not repeatable	Make appropriate company notifications to repair or replace.
Isolation valve does not fully close or isolate process pressure	Stop task, return valve to service, and make appropriate company notifications
Unintentional Activation of a Safety/Control Device: Abnormal shutdown, unintentional valve movement, high pressure shutdown, etc. during testing which results in loss of control or over-pressure condition of the pipeline.	Take appropriate action to mitigate the situation to return the pipeline to normal condition. Make required notifications per company procedure.

3.0 Skill Component

To demonstrate proficiency in this task an individual must perform the following steps:

Step	Action	Explanation
1	Verify the device number / nameplate data.	Utilize appropriate company drawings to verify correct device. This step is crucial in that it verifies the pressure transmitter output display and/or the correct alarm tag that will be activated.
2	Verify that test equipment has been calibrated prior to performing calibrations.	Test equipment (i.e., multi-meters, multi-function calibrators, gauges analog or digital, and digital pressure modules), that is used to calibrate pressure transmitters that are providing overpressure protection must have valid certification of calibration and is 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 company 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 company documentation to determine proper test medium.
5	Notify Control Center, local operations (if applicable), and any affected personnel, **prior** to performing any test per company procedures. .	The Control Center and local operations (If applicable) must be notified that the Pressure transmitter will be tested. Control Center may be required to validate: 1. Receipt/Initiation of an alarm 2. SCADA/HMI display values 3. Transmitter device number corresponds to SCADA/HMI display ID.

Step	Action	Explanation
		If the pressure 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. Consult company procedures. Notification is crucial to avoid a “false alarm” that could affect the operation of the pipeline.
6	Visually inspect pressure transmitter (per company procedure)	Visually inspect transmitter and associated equipment: • Physical/Mechanical condition • Corrosion • Leakage • Electrical connections (if applicable)
7	Isolate the pressure transmitter from the process system (per company procedure).	Isolate the device from the process system and relieve trapped process pressure. This will allow correct test pressure and 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”.	This test determines proper functionality and repeatability and shall be repeated multiple times per company procedure. Determines if a calibration is required
10	Document “as found” results.	Document “as found” results per company procedure.
11	If device calibration is required, reapply test medium pressure through the desired test range and adjust device settings using 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.
12	Document “as left” results.	Document “as left” results per company procedure.
13	Remove test equipment, return device to normal operating condition and verify integrity of system as per company procedure.	
14	Notify Control Center, local operations (if applicable), and any affected personnel, per company procedures.	To notify appropriate personnel that the device is ready for normal operation.

OQ Task Name

27.1 – 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 latest DOT-approved edition of API 653. The interval of the inspection shall not exceed 1 month.

API 653 Inspection of In-Service Breakout Tanks is a separate covered task (Reference Task 27.2).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

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.

There are three primary types of atmospheric steel aboveground breakout tanks:

1. **External/opentop 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 either 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 with a floating roof inside that travels up and down along with the liquid level.

Definitions applicable to this task are as follows:

Chime Ring
The outside edge of the tank bottom that extends past the weld of the tank shell. The chime ring should be visually inspected for signs of settlement, corrosion, and evidence of leaks.

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. Dikes should not be compromised by erosion, excavations, or excessive vegetation.

Reinforcing Plate/Pad/Repad
Steel reinforcement plates installed around shell openings to provide the shell with added strength required for the installation of a shell appurtenance. Repads should be visually inspected for corrosion and coating condition.

Shell
The vertical, cylindrical walls of a tank. The shell shall be visually inspected for distortions, signs of settlement, corrosion and condition of coating, and insulation systems, if applicable.

Shell Appurtenances
Manways, reinforcement plates, nozzles, sampling ports, temperature probes, mixers, and auto-gauge systems. Shell appurtenances shall be visually inspected for corrosion, coating condition, and evidence of leaks.

Tank Foundation/Ring Wall
Perimeter concrete ring providing support for the tank shell. Foundations shall be inspected for signs of settlement and foundation condition.

Roof
The top external surface of the tank. The roof shall be visually inspected for evidence of leaks and coating condition. External floating roof tanks should be inspected for excessive water or other material that may cause a condition that could affect the integrity of the tank.

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. Weep holes should be inspected for evidence of leaks.

3.0 Skill Component

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

Step	Action	Explanation
1	Visually inspect the following for evidence of leaks: • Mixer seals • Flanges • Manways/nozzles • Chime • Roof/pontoons • Welds/rivets • Telltales/weep holes on reinforcing pads • Sheen on water in containment area	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.
2	Visually inspect the shell for the following defects: • External visual inspection for paint and corrosion defects • Inspect the chime area for corrosion • Reinforcement plate/padding around manways and/or valves • Inspect for shell distortions—look for deflection or deformation of the shell • Insulation condition, if applicable	Visual inspection of the shell is performed to identify coating condition, areas of pitting, or corrosion and distortions.

Step	Action	Explanation
3	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.	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.
4	Visually inspect the secondary containment system for impoundment integrity.	The tank dike wall must be maintained so that the containment area capacity remains as designed.
5	Visually inspect the tank roof for the following: • Coating condition, holes, pitting, and corrosion • Standing or pooling water or product • Floating roof out of level	Large standing water areas on a floating roof indicate inadequate drainage design or, if to one side, a non-level roof with 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.
6	Document the findings of the inspection	Submit a completed inspection form according to operator's procedures

OQ Task Name

Task 27.2 – API 653 Inspection of In-Service Breakout Tanks

1.0 Task Description

This task involves performing an internal or external inspection of an in-service breakout tank in accordance with the latest DOT-approved edition of API 653. This inspection shall be performed by an *authorized inspector* as defined by API 653.

An in-service breakout tank is one that has been commissioned.

Routine Inspection of Breakout Tanks (API 653 Monthly or DOT Annual) is a separate covered task (Reference Task 27.1).

2.0 Knowledge Component

An individual performing this task must provide documentation of the American Petroleum Institute (API) Authorized Inspector Certification for API 653. For atmospheric and low-pressure steel aboveground tanks, the inspector shall have certification as an authorized inspector for those tanks under API 653.

3.0 Skill Component

The certificate demonstrates task performance proficiency. No other steps are required for OQ qualification.

Step	Action	Explanation
1	Inspect the physical integrity of aboveground steel breakout tanks in accordance with the latest DOT-approved edition of API 653.	Authorized Inspector Certification required in accordance with the latest DOT-approved edition of API 653. Conditions that are found to be unacceptable according to the latest DOT-approved edition of API 653 shall be documented and provided to the operator.

OQ Task Name

Task 27.3 – API 510 Inspection of In-Service Breakout Tanks

1.0 Task Description

This task involves performing an internal or external inspection of an in-service breakout tank in accordance with the latest DOT-approved edition of API 510. This inspection shall be performed by an *authorized inspector* as defined by API 510.

An in-service breakout tank is one that has been commissioned.

Routine Inspection of Breakout Tanks (API 653 Monthly or DOT Annual) is a separate covered task (Reference Task 27.1).

2.0 Knowledge Component

An individual performing this task must provide documentation of the American Petroleum Institute (API) Authorized Inspector Certification for API 510. For steel aboveground breakout tanks built to API Standard 2510, the inspector shall have certification as an authorized pressure vessel inspector for API 510.

3.0 Skill Component

The certificate demonstrates task performance proficiency. No other steps are required for OQ qualification.

Step	Action	Explanation
1	Inspect the physical integrity of aboveground steel breakout tanks in accordance with the latest DOT approved edition of API 510.	Authorized Inspector Certification required in accordance with the latest DOT-approved edition of API 510. Conditions that are found to be unacceptable according to the latest DOT-approved edition of API 510 shall be documented and provided to the operator.

OQ Task Name

Task 30.0 – Test Overfill Protective Devices

1.0 Task Description

This task consists of the testing activities performed on an Overfill Protective Device (OPD) to ensure that the equipment and associated Control Center alarms are functioning properly and are adequate for the intended purpose. CFR 49 195.428 (c) gives direction on overfill protection devices and requires API RP 2350 be followed.

This task begins with notification to the Company Control Center, local operations (if applicable) and/or affected personnel that OPD testing activities are to commence and ends with the completion of the appropriate documentation per company procedure.

Inspect and Calibrate Overfill Protective Devices is a separate covered task (Reference Task 31.0).

2.0 Knowledge Component

The primary purpose of an Overfill Protective Device (OPD) is 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 must have knowledge of the various types of overfill protection devices, systems, and equipment.

In some instances, when designed to do so by the company, the OPD can be part of an automated overfill protection control scheme.

Additionally the individual shall have general knowledge of:

- Tank/vessel construction types:
  - Fixed roof, internal floating, external floating, and underground.
- Tank/vessel fill/drain operations.
- Control Center communication methods:
  - Radio, phone, intercom.
- Company testing and operating procedures related to the testing of OPDs.
- Alarms:
  - Location, activation and shutdown sequence of activated alarms.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC RECOGNITION	AOC REACTION
Liquid level is found to be at an unexpected high or low level.	Notify Control Center or appropriate personnel of level status.
Unintentional activation or shutdown of system devices.	Notify Control Center or appropriate personnel to take appropriate actions. Notify/inform appropriate company personnel of the condition of the OPD.
OPD is found to be in an inoperable condition.	Notify Control Center or appropriate personnel to take appropriate actions. Notify/inform appropriate company personnel of the condition of the OPD.

3.0 Skill Component

To demonstrate proficiency in this task an individual must perform the following steps:

Step	Action	Explanation
1	Notify Control Center, local operations (if applicable), and any affected personnel, **prior** to performing any test per company procedures.	The Control Center and local operations (If applicable) must be notified that the OPD will be tested and that an alarm tag will be activated. The Control Center will be required to validate: 1. Receipt/Initiation of the alarm 2. Proper OPD device number to alarm tag. 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 company procedure. An OPD alarm is considered a very high priority alarm and could initiate response activities. Notification is crucial to avoid a “false alarm” that could affect the operation of the pipeline.
2	Verify the device number/nameplate data.	Utilize appropriate company drawings to verify correct device. This step verifies the OPD to the correct alarm tag that will be activated.

Step	Action	Explanation
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. If the OPD is part of an automated shutdown or flow relief system, notify the Control Center of any unexpected changes in operation (i.e. valve movements, pump run status, etc.).
4	Manually activate the OPD.	Confirm the Control Center and / or local operations are ready for the test, prior to manually activating the OPD. Confirm operability of OPD
5	Verify the alarm has been received by the Control Center and/or local operations.	Confirm the correct alarm tag is received.
6	Verify the operation of any devices such as valves that might operate as part of a shutdown or relief flow system per company procedure (if applicable).	Confirm operation of overfill protection control scheme. If the OPD is part of an automated shutdown or flow relief system, notify the Control Center 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.	Verify that alarm(s) 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).	
9	Notify Control Center, local operations, and any affected personnel the test has ended.	Verify integrity of system and return system to normal operation.
10	Document test results as required by company procedures.	Documentation of OPD test.

OQ Task Name

Task 31.0 – 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) to ensure that the equipment is functioning properly and are adequate for the intended purpose. CFR 49 195.428 (c) gives direction on overfill protection devices and requires API RP 2350 be followed.

This task begins with notification to the Company Control Center, local operations (if applicable) and/or affected personnel that OPD inspection and calibration activities are to commence and ends with the completion of the appropriate documentation per company procedure.

Test Overfill Protective Devices is a separate covered task (Reference Task 30.0).

2.0 Knowledge Component

The primary purpose of an Overfill Protective Device (OPD) is 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 must have knowledge of:

- Types of overfill protection devices:
  - Mechanical displacement, SONAR, Laser.
- Calibration equipment and tools:
  - Multimeter, measurement equipment, and displacement test mediums.
- Tank / vessel construction types:
  - Fixed roof, internal floating, external floating, and underground.
- Alarms:
  - Location, activation and shutdown sequence of activated alarms.
- Device set point:
  - Threshold at which switch activates.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Liquid level is found to be at an unexpected high or low level.	Notify Control Center or appropriate personnel of level status.
OPD is found to be in an inoperable condition.	Notify/inform appropriate company personnel of the condition of the OPD.

AOC Recognition	AOC Reaction
Unintentional activation or shutdown of system devices.	Notify Control Center or appropriate personnel to take appropriate actions. Notify/inform appropriate company personnel of the condition of the OPD.
Observed structural damage to roof components	Notify/inform appropriate company personnel of the condition.
Debris or free standing product on roof	Notify/inform appropriate company personnel of the condition.

3.0 Skill Component

To demonstrate proficiency in this task an individual must 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 company procedures.	The Control Center and local operations (If applicable) must 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 company documentation to determine proper set point value.
3	Determine required calibration equipment.	Consult device manufacturer manual and company procedures to determine type of calibration equipment needed.
4	Identify the device number/nameplate data.	Utilize appropriate company drawings to verify correct device.
5	Inspect internal and external components of the OPD and associated equipment per manufacturer recommendations and company specific procedures: • Physical/Mechanical condition • Corrosion • Electrical connections	Confirms condition and functionality. If maintenance, repair, or replacement is required, make appropriate notifications per company procedure.
6	Verify device set point	The set point is the point that an alarm will be activated based on the liquid level in the tank.
7	If device calibration is required, adjust device according to manufacturer's recommendations. Repeat procedure to achieve calibration and establish repeatability.	Refer to company documentation to determine proper set point value and calibration procedures.

Step	Action	Explanation
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 OQ task. Refer to task 30.0 – Test Overfill Protective Device.
9	Reset and confirm that OPD has returned to a normal operating condition.	Verify the alarms have been cleared appropriately.
10	Notify Control Center, local operations, and any affected personnel, that the inspection/calibration is complete and has ended. 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).	Verify integrity of system and return system to normal operation.
11	Document inspection and calibration results.	Per company procedures. Documentation of OPD test.

OQ Task Name

Task 32.0 – Observation of Excavation Activities

1.0 Task Description

This task consists of observing excavation activities to help prevent damage to buried pipelines. Excavation refers to the removal of earth by any means when that removal could expose or damage a buried or submerged pipeline. This task **does not** apply to horizontal/directional drilling, but **does** apply to vertical drilling (including drilling to collect soil samples) whenever pipelines are present.

This task begins after the pipeline(s) has been properly located and marked and when the removal of earth first begins. The task ends when all intended earth removal has been accomplished. This task is intended for individual(s) at the site responsible for the observation of the excavation.

Backfilling a Trench Following Maintenance is a separate covered task (Reference Task 39.0).

NOTE: This task is NOT intended to satisfy OSHA requirements for Competent Persons for Excavation Activities.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

The pipeline operator's control center or local operations personnel must be notified so that operations personnel are aware of the excavation and can take appropriate actions.

A current One-Call Ticket must be on record, if required by operator's Damage Prevention Program. One Call is a system to notify owners/operators of lines or facilities of proposed excavation so that the owners/operators can mark the lines and undertake other damage prevention measures. The excavation activities should not continue if there is not a current One-Call Ticket, when required.

The pipeline and all other buried structures must be located and marked by stakes, paint, or some other customary manner (line locating is a separate covered task). The excavation activities should not continue if any known structures are not marked. The positioning of equipment (profile) at the excavation site must not produce any undue stress on a buried structure.

The individual performing this task must be aware of the marked area to be excavated and digging criteria including tolerance zone and hand digging or other noninvasive excavation requirements. The tolerance zone is an area equal to half the nominal diameter of the underground pipeline plus a distance defined by the operator or state on either side of the outside edge of the underground pipeline facility on a horizontal plane (sometimes referred to as "clearance"). Tools must be appropriate for the excavation, including but not limited to, the following:

- Backhoe (if required by operator's procedures, teeth on the backhoe bucket may need to be covered with a flat bar to prevent accidentally piercing the pipeline; the bucket must be of an appropriate size)
- Jackhammer
- Hydro-vac
- Vacuum excavator
- Shovels and hand tools

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Pipeline is unintentionally hit during the excavation with no release of product.	Stop excavation activities. Notify appropriate local operations personnel. If damage could result in an emergency situation, notify proper authorities, and request a line shut down, if necessary.
Pipeline is unintentionally hit during the excavation, resulting in a release of product.	Stop excavation activities. Follow operator's emergency response procedures for notification. If damage could result in an emergency situation, notify proper authorities, and request line shut down, if necessary.
Unplanned or pre-existing release of hazardous liquid or gas, which could lead to unintentional ignition or other adverse events.	Stop excavation activities and assess the extent of the release. Depending on the situation, take action according to the operator's emergency response plan.
Discovery of unexpected physical damage to the pipeline system, including scraping, displacement, nicks, leaks, dents, gouges, grooves, destruction, or partial or complete breaks of an underground pipeline or of any protective coating, casing, conduits, cathodic protection, or any other protective or communications device of a pipeline.	Stop excavation activities. Report damage to appropriate operations personnel for further assessment, if necessary.
Discovery of an undocumented pipeline in the area of excavation.	Stop excavation activities. Ensure proper notifications are made to the appropriate One-Call Center, local operations personnel, and/or other appropriate agency. Notation or notification should be made so that the operator can update alignment sheets and/or pipeline maps.
Improper support for the pipeline during excavation could lead to pipeline damage.	Stop excavation activities if necessary, and ensure proper support.

If an area is left unattended, the area should be secured in accordance with an operator's procedures. Methods of securing an excavation may include temporary fences, metal plate, markers, or other appropriate methods.

3.0 Skill Component

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

Step	Action	Explanation
1	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.
2	Identify an appropriate location for excavated material (soil) to ensure that it is placed in a location that could not affect the integrity of the pipeline.	Provide adequate distance from the excavation to ensure the stability of the excavation, prevent excessive stress on the pipeline, and prevent pipeline damage because of cave-in.

Step	Action	Explanation
3	Identify the marked and potentially unmarked hazards surrounding the excavation site (including underground hazards).	Observes for irregularities. Ensures hazards are avoided and prevents damage to the line or any appurtenances.
4	Determine and communicate to excavator the required tolerance zone.	Adherence to tolerance zones provides assurance that the pipeline will not be hit.
5	Ensure that the tolerance zone is maintained during excavation. Require hand digging or other non-invasive excavation methods of the remaining soil within the tolerance zone.	Use of hand tools, vacuum excavation or other non-invasive methods minimizes damage when excavating near the pipe.
7	Notify control center or local operations at the completion of work.	Ensure the line is monitored during and after excavation activities.
8	Document the excavation per operator 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

OQ Task Name

Task 38.1 – Visually Inspect Pipe and Pipe Components Prior to Installation

1.0 Task Description

This task involves the on site visual inspection of pipe and components that are to be installed in the pipeline system. The purpose of the inspection is to ensure that the pipe and components are not 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.

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.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

Component
Any part of a pipeline which may be subjected to pump pressure including, but not limited to, pipe, valves, elbows, tees, flanges, and closures.

Maximum Operating Pressure (MOP)
The maximum pressure at which a pipeline or segment of a pipeline or a component may be normally operated. Inspection shall include assurance that the pipe and/or component is compatible with MOP for the system in which it is to be installed.

Corrosion
Surface rust or pitting are examples of conditions that may be identified during a visual inspection.

Mechanical Defects
Buckles, dents, cracks, gouges, out of round pipe, or other defects that might reduce the strength of the pipe or pipe component. A crack is a surface flaw or defect characterized by break without complete separation; fissure. A gouge is a surface flaw characterized by the removal of steel from the pipe or component.

Buckled or Wrinkled Bends
Bends must have a smooth contour. Buckles and wrinkles are physical defects that are characterized by bulging or warping of the pipe.

Coating defects that can be visually identified such as cuts, scratches, or other defects characterized by a visually determined loss of coating (holiday).

Each length of pipe with a nominal outside diameter of 4½ in. (114.3 mm) or more must 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 must be applied in a manner that does not damage the pipe or pipe coating and must remain visible until the pipe is installed.

Each valve must 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

Butt-welding type fittings must meet the marking and end preparation required by the operator's specification.

3.0 Skill Component

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

Step	Action	Explanation
1	Inspect pipe and components for: • Corrosion • Defects such as cracks, grooves, gouges, dents, or out of round pipe • Coating damage • Bends inspect for buckles and/or wrinkles	The inspection of pipe and components prior to installation does not include an assessment of the damage and a determination of the measures necessary to mitigate the damage.
2	Ensure component is rated for intended service.	Inspector must know the design MOP for the system and ensure through visual verification of the markings on the pipe and components that the pipe or component is compatible.
3	Communicate the inspection results.	A satisfactory outcome of the inspection must be achieved. If not, the condition must be noted and resolved.

OQ Task Name

Task 38.3 – Visually Inspect that Welds Meet DOT Requirements

1.0 Task Description

This task involves visually inspecting welds to ensure they are in accordance with the latest DOT-approved edition of API 1104 and the applicable qualified welding procedure and to identify any defects that may affect the integrity of a pipeline tie-in or component replacement.

NDT – Magnetic Particle Testing is a separate covered task (Reference Task 38.6).

NDT – Radiographic Testing is a separate covered task (Reference Task 38.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

This inspection of welds and identification of conditions as defined by the latest DOT edition of API 1104 and the operator's applicable written welding procedure are limited to conditions that can be identified visually and include the following:

- Arc Burn – The gouging effect imparted to the surface of the pipe whenever an electric arc is inadvertently struck, typically adjacent to a weld, when starting to weld.
- External Undercut (EU) – A groove melted in parent material adjacent to the cover pass and left unfilled by weld material.
- Pin Hole or Porosity (POR) – A condition when the surface of the weld is in a semi-molten stage and gas produced by the welding process rises to the surface of the molten puddle and escapes. This condition leaves the appearance of pin holes on the surface of the weld. Acceptable porosity limits are determined by radiography.
- Slag – Slag is the residue left on a weld bead from the flux. It shields the hot metal from atmospheric contaminants that may weaken the weld point. Slag can also be globules of molten metal that are expelled from the joint and then re-solidify on the metal surface.
- 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.

The Qualified Welding Procedure is 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 must be knowledgeable of the operator's applicable written welding procedure.

3.0 Skill Component

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

	Action	Explanation
1	Identify any conditions that do not meet the qualified welding procedure or the latest DOT-approved edition of API Standard 1104. Conditions may include the following: • Arc burn • External undercut (EU) • Pin hole/porosity • Slag • Weld (cap) height – inadequate or excessive	• Arc burns are not acceptable and must be repaired • The depth of EU adjacent to the final bead on the outside of the pipe shall not be more than $^{1}/_{32}$ of an inch or 12.5% of the pipe wall thickness (whichever is smaller). There shall not be more than 2 inches of EU in any continuous 12 inch length of weld. • 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 must be achieved. If not, the condition must be noted and resolved.

OQ Task Name

Task 38.4 – NDT – Radiographic Testing

1.0 Task Description

This task involves verifying that welds meet the specifications of the latest DOT approved edition of API Standard 1104 utilizing radiography and to identify any indications and imperfections that may affect the integrity of a pipeline tie-in, component installation/replacement, or pipeline repair.

Visually Inspect that Welds Meet DOT Requirements is a separate covered task (Reference Task 38.3).

2.0 Knowledge Component

An individual performing this task must provide documentation of certification through the American Society for Nondestructive Testing, Recommended Practice No. SNT-TC-1A, ACCP certification for radiography (RT) or any other recognized national certification program that shall be acceptable to the operator for the test method used.

3.0 Skill Component

The certificate demonstrates task performance proficiency. No other steps are required for OQ qualification.

Step	Action	Explanation
1	Evaluate completed welds utilizing radiography to ensure they meet the requirements of the latest DOT-approved edition of API 1104.	Certification required to Level II or III in accordance with the recommendations of American Society for Nondestructive Testing (ASNT), Recommended Practice No. SNT-TC-1A, ACCP for RT or any other recognized national certification program that shall be acceptable to the operator for the test method used.

OQ Task Name

Task 38.5 NDT – Liquid Penetrant Testing

1.0 Task Description

This task involves verifying that welds meet the specifications of the latest DOT-approved edition of API Standard 1104 utilizing liquid penetrant testing and to identify indications and imperfections that may affect the integrity of a pipeline tie-in, component installation/replacement, or pipeline repair.

Visually Inspect that Welds Meet DOT Requirements is a separate covered task (Reference Task 38.3).

2.0 Knowledge Component

An individual performing this task must provide documentation of certification through the American Society for Nondestructive Testing, Recommended Practice No. SNT-TC-1A, ACCP certification for Liquid Penetrant Testing (PT) or any other recognized national certification program that shall be acceptable to the operators for the test method used.

3.0 Skill Component

The certificate demonstrates task performance proficiency. No other steps are required for OQ qualification.

Step	Action	Explanation
1	Evaluate completed welds utilizing liquid penetrant testing to ensure they meet the standards of the latest DOT-approved edition of API 1104.	Certification required to Level II or III in accordance with the recommendations of American Society for Nondestructive Testing (ASNT), Recommended Practice No. SNT-TC-1A, ACCP for PT or any other recognized national certification program that shall be acceptable to the operators for the test method used.

OQ Task Name

Task 38.6 – NDT – Magnetic Particle Testing

1.0 Task Description

This task involves verifying that welds meet the specifications of the latest DOT-approved edition of API Standard 1104 utilizing magnetic particle testing and to identify any indications or perfections that may affect the integrity of a pipeline tie-in, component installation/replacement, or pipeline repair.

Visually Inspect that Welds Meet DOT Requirements is a separate covered task (Reference Task 38.3).

2.0 Knowledge Component

An individual performing this task must provide documentation of certification through the American Society for Nondestructive Testing, Recommended Practice No. SNT-TC-1A, ACCP certification for magnetic particle testing (MP) or any other recognized national certification program that shall be acceptable to the operator for the test method used.

3.0 Skill Component

The certificate demonstrates task performance proficiency. No other steps are required for OQ qualification.

Step	Action	Explanation
1	Evaluate completed welds through magnetic particle testing to ensure they meet the requirements of the latest DOT-approved edition of API 1104.	Certification required to Level II or III in accordance with the recommendations of American Society for Nondestructive Testing (ASNT), Recommended Practice No. SNT-TC-1A, ACCP for MP or any other recognized national certification program that shall be acceptable to the operator for the test method used.

OQ Task Name

Task 38.7 – NDT – Ultrasonic Testing

1.0 Task Description

This task involves verifying that welds meet the specifications of the latest DOT-approved edition of API Standard 1104 utilizing ultrasonic testing and to identify any indications and imperfections that may affect the integrity of a pipeline tie-in, component installation/replacement, or pipeline repair.

Visually Inspect that Welds Meet DOT Requirements is a separate covered task (Reference Task 38.3).

2.0 Knowledge Component

An individual performing this task must provide documentation of certification through the American Society for Nondestructive Testing, Recommended Practice No. SNT-TC-1A, ACCP certification for ultrasonic testing (UT) or any other recognized national certification program that shall be acceptable to the operator for the test method used.

3.0 Skill Component

The certificate demonstrates task performance proficiency. No other steps are required for OQ qualification.

Step	Action	Explanation
1	Evaluate completed welds utilizing ultrasonic testing to ensure they meet the requirements of the latest DOT-approved edition of API 1104.	Certification required to Level II or III in accordance with the recommendations of American Society for Nondestructive Testing (ASNT), Recommended Practice No. SNT-TC-1A, ACCP for UT or any other recognized national certification program that shall be acceptable to the operator for the test method used.

OQ Task Name

Task 39.0 – Backfilling a Trench Following Maintenance

1.0 Task Description

This task begins with observation and monitoring of the backfilling or replacement of soil or other material into a trench/ditch and over a pipeline after maintenance or repairs. When a trench for a pipeline is backfilled, it must be done in a manner that provides firm support under the pipe and prevents damage to the pipe and its coating from equipment or the backfill material. This task ends when the pipe is covered such that further backfilling would not cause damage to the pipe.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Backfill material must be free of rocks, roots, and any other foreign material that could damage pipe coating or cause uneven loading of pipe.

- Visual inspection of backfill material to identify foreign objects that could cause damage to the pipeline system and make it unsuitable for backfilling around the pipeline. Material should be free of the following:
  - Items that could affect compaction such as roots, stones, cans, packing boxes, brush, broken skids, broken tools, refuse, etc.
  - Items that could affect cathodic protection systems such as cans, hand tools, welding rods, clamps, scrap metal left in the ditch, etc.
  - 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.
  - Items that could contain organic or corrosive materials that could cause localized pipe wall corrosion such as battery acid, nitrate material, caustic matter, etc.

Pipe and pipe coating must be continuously monitored during backfilling to ensure that they are not damaged. Pipe must be properly supported after any temporary supports are removed.

- Allow extra compaction at road crossings or other locations where heavy loads may cross a pipeline.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Response
Pipeline System Damage: Coating damage from coarse materials.	Remove coarse materials from backfill, and notify appropriate personnel for repair of coating, if necessary.
Pipeline System Damage: Pipeline damage from a bucket or other equipment inadvertently contacting a pipe (e.g., dent, gouge, scrape, etc).	Perform inspection of damaged area. Notify appropriate personnel for repair of a pipeline, if necessary.
Pipeline System Damage: Pipeline stress resulting from pipe movement (e.g., pipe sag).	Notify appropriate operator personnel.
	Level pipe and support properly. An engineering plan may be required.

3.0 Skill Component

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

Step	Action	Explanation
1	Inspect trench for presence of foreign objects or debris. Remove any objects that could cause damage to the pipe or coating.	Visual inspection will determine if objects of foreign material are in the trench.
2	Perform a visual inspection of backfill material. Identify foreign objects that could cause damage to the pipeline system. Remove any objects that could cause damage to the pipe or coating.	Visual inspection will determine if large objects of foreign material are in the backfill material and whether the backfill material has smaller but potentially damaging material.
3	Determine whether backfill material is suitable for backfill directly around pipeline. Non-coarse material must be used near the coating. If excavated material is not suitable to refill the trench, replace with suitable material or use a rock shield.	Unsuitable backfill material may damage the pipe coating and potentially the pipe.
4	As fill material is added to a trench, continue to observe material.	Some soil types compact better than others.
5	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.
6	Continue to backfill equally along both sides of the pipe until adequate cover is achieved.	
7	When applicable, compact soil using backhoe or roller equipment.	Settlement could mean increased risk to pipeline by third-party damage.
8	Crown the backfill according to procedures.	Crowning is usually performed to compensate for settlement of backfill.
9	Backfilling must be documented as required.	

OQ Task Name

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 the preparation of the carrier pipe and installation of the sleeves. The task ends with confirmation that the sleeves are correctly installed and the proper welding gap has been established.

This task does not include the welding of the split sleeves or sleeve type determination.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

The full encirclement welded split sleeve is a permanent pressure-containing repair applied to a leaking or non-leaking defect.

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.

Definitions applicable to this task are as follows:

Full Encirclement Sleeve
Rolled steel formed in two halves to encase the pipeline. The pressure rating of the sleeve must 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)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Anomaly or other defect on carrier pipe outside the area of application.	Notify the operator or appropriate individual.
Unexpected release of hazardous liquid or gas.	Stop operation, and secure equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.
Fire or explosion resulting from ignition of hazardous liquids or gas.	Stop operation, and secure equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Confirm surface has been properly prepared according to applicable covered task.	Coating removal and surface preparation is performed under Covered Tasks 13.1, 13.2, or 13.3.
2	Confirm pipe surface has been inspected for dents, gouges, or other irregularity according to applicable covered task.	Inspection of the pipe surface is performed under Covered Tasks 5.1, 5.2, or 5.3.
3	Confirm proper type of sleeve to be installed.	Ensures 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 manufacturer's recommendations.	Restricts flexion of carrier pipe to maintain integrity.
5	If the installation is to be a Type B sleeve, confirm 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. AOC: Potential loss of pressure or product resulting from breach of thin carrier pipe wall. Stop operation, and secure equipment, if safe to do so. Inspect equipment and readjust or reset, as necessary. Wall thickness measurement is performed under Covered 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 pre-heating and mechanical compression.
7	Verify proper sleeve length and material grade per operator 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.

OQ Task Name

Task 40.3 – Apply Composite Sleeve

1.0 Task Description

The application of composite material, in the form of multiple layers of woven fiber wrap or rigid fiber sleeves, are acceptable alternatives to steel split sleeves for permanently 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.

This task begins with confirming the preparations of the pipe as required by the manufacturer prior to applying the composite material and ends with a completed application as defined in the manufacturer's procedures.

2.0 Knowledge Component

An individual performing this task must have knowledge that composite material must 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.

The definition applicable to this task is as follows:

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)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Anomaly or other defect on carrier pipe outside the area of application.	Notify the operator of suspected defect.
Unexpected release of hazardous liquid or gas.	Stop operation, and secure equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Ensure the carrier pipe surface is cleaned and prepared according to manufacturer's procedures.	Ensures proper adhesion/bonding of material to pipe surface.
2	Fill defects, as needed, according to composite material manufacturer's procedures.	Restricts flexion of carrier pipe to maintain integrity.
3	Apply composite material according to manufacturer's instructions.	Follow manufacturer's procedures for all steps such as applying adhesive, wrapping, and sealing the material.

OQ Task Name

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 device is a type of pipeline repair used for covering anomalies with a full encirclement component secured onto the 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 the preparation of the carrier pipe required by the device manufacturer's procedures prior to installing the device and ends with confirmation that the device has sealed properly.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- 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.
- The bolts used to secure the repair device must be tightened in the proper torque sequence and value to properly establish a satisfactory seal. The bolting sequence and torque must be completed according to the manufacturer's specifications.
- Bolt-on repair devices should be delivered with specifications identifying the pressure rating, material grade, and other details that must be verified to ensure compatibility with the pipeline operating pressure and service.

Terminology associated with this task is as follows:

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)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Anomaly or other defect on carrier pipe outside the area of installation.	Notify the operator of the suspected defect.
Unexpected release of hazardous liquid or gas.	Stop the operation, and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.
Fire or explosion resulting from ignition of hazardous liquids or gas.	Stop the operation, and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.
Potential loss of product resulting from breach of thin carrier pipe wall.	Stop the operation, and secure the equipment, if safe to do so. Inspect the equipment and readjust or reset, as necessary.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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 manufacturer's specifications.	Ensures the proper location and sealing integrity of the repair device.

OQ Task Name

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, and the task ends with confirmation that the device has sealed properly.

The weldable compression coupling may be used as a temporary or permanent repair.

Measure Wall Thickness with Ultrasonic Meter is a separate covered task (Reference Task 8.2).

NDT – Ultrasonic Testing is a separate covered task (Reference Task 38.7).

A permanent repair is welded to the pipe surface; Welding is a separate covered task (Reference Task 42.7).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- 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.
- Proper torque sequence to establish a satisfactory seal. The bolts used to secure a coupling must be tightened in the proper torque sequence and value in order to properly establish a satisfactory seal. The bolting sequence and torque must be completed according to the manufacturer's specifications.
- Compatibility of weldable compression coupling device with existing pipeline. Weldable compression coupling devices should be delivered with specifications identifying the pressure rating, material grade, and other details that must be verified to ensure compatibility with the pipeline operating pressure and service.

Definitions applicable to this task are as follows:

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 which 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)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Inadequate tightening of bolts results in a failure of the seal or pipeline connection.	Ensure that the manufacturer's installation instructions are followed.
Inadequate neoprene integrity results in seal failure resulting from exceeding storage life (i.e., shelf life).	Ensure that the shelf life of the neoprene seal determined by the manufacturer has not exceeded the expiration date.
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 must perform the following steps:

Step	Action	Explanation
1	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.
2	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 that a qualified person has measured the wall thickness of the carrier pipe. This step also 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.	This step ensures the proper location and sealing integrity of the repair device.

OQ Task Name

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 and ends with the removal of the plugging machine from the valve.

2.0 Knowledge Component

An individual performing this task must have knowledge that a plugging machine is installed on an operating pipeline to temporarily isolate a section of the pipeline. The plugging machine serves as a temporary block valve.

Definitions applicable to this task are as follows:

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 bolted 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.

Valve
The component installed on the fitting to control product flow while inserting the plug into the pipeline and during removal of the plug and plugging machine.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Loss of pressure or product due to a malfunction of the plugging machine, valve, or other related equipment.	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 causes 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.

AOC Recognition	AOC Reaction
Unexpected release of hazardous liquid or gas.	Stop operation, and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.
Fire or explosion resulting from ignition of hazardous liquids or gas.	Stop operation, and secure the equipment, if safe to do so. Immediately notify the operator, and execute applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Install the plugging machine and other fittings and appurtenances as required by manufacturer's specifications.	This step allows for the insertion of the plug into the pipeline and for pressure equalization.
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	Equalize the pressure on either side of the valve.	Equalizing pressure across the valve enables operation of the valve.
4	Open the valve.	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 it does not exceed manufacturer's specifications.
7	Confirm 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 valve and relieve the pressure from the plugging machine.	The plugging machine is isolated from the product flow. Ensures that the valve is fully closed.
11	Drain the plugging machine before removal.	
12	Remove the plugging machine from the valve.	

OQ Task Name

Task 40.7 – Installing 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 valve and ends with the removal of the tapping machine from the valve and retrieval of the coupon, if applicable. The installation of the fitting onto the pipeline or breakout tank, the installation of the valve onto the fitting, and the removal and installation of the completion plug are separate covered tasks.

2.0 Knowledge Component

Hot tapping is performed on an in-service pipeline or breakout tank to make connections without having to shutdown.

An individual performing this task must have knowledge of:

Definitions applicable to this task are as follows:

Bleeder Valve
A valve that allows the controlled relief of pressure.

Boring Bar
The main shaft of a tapping machine that turns the cutter.

Completion Plug
A plug designed to establish a pressure-tight seal of the opening created by a hot tap. The plug will allow installation and removal of the tapping machine or plugging machine and valve.

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 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 or Drilling Machine
A machine installed onto the appropriate valve for the purpose of boring a hole into a pipeline or breakout tank.

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)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Malfunction of or damage to tapping machine, 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 or gas.	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 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 valve or tapping machine.	Stop operation and secure equipment, if safe to do so. Inspect equipment and readjust or reset, as necessary.
Fire or explosion resulting from ignition of hazardous liquids or gas.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Verify the proper valve and fitting were installed according to applicable procedure.	This will ensure valve and fitting will maintain integrity and prevent leakage during the hot tapping task.
2	Confirm proper operation of the valve.	This allows insertion of the boring bar and cutter through the 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.
5	Prior to connecting the tapping machine to the 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 company procedures and requirements.	Ensure that pressures, level, product or other operational parameters are as specified by the company.

Step	Action	Explanation
7	Install the tapping machine on the valve, ensure the cutter can pass through the open valve and the valve can be fully closed when the cutter is retracted.	Performing this step assures valve operation and isolation can occur before and after the tap is made.
8	Lower the boring bar to verify proper alignment and initial depth measurements.	Accurate measurement is important to ensure the tap is performed correctly.
9	Operate tapping machine and perform hot tap according to manufacturer's instructions.	
10	Raise the boring bar and close the valve.	Prevent release of product when tapping machine is removed by ensuring the valve is fully closed.
11	Depressurize and drain the product trapped between the valve and the hot tap machine.	Prepare for removal of the tapping machine.
12	Remove the tapping machine.	
13	Confirm retrieval of coupon, if applicable, and verify integrity.	

OQ Task Name

Task 40.8 – Installing a Tap Larger than 2 Inches 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 will require the removal of a coupon. The fitting referenced in this task has been installed by a person qualified to perform the respective task, prior to installing the hot tap machine.

This task begins with the installation of the valve on the fitting and ends with the removal of the tapping machine from the valve and retrieval of the coupon. The removal and installation of the completion plug related to this task is completed by a person qualified to perform the respective task prior to installation and after removal of the tapping machine.

2.0 Knowledge Component

An individual performing this task must have knowledge of:

Hot tapping is performed on an operating pipeline or breakout tank to bore a hole for the purpose of installing process piping, instrumentation, or other components, or the verification of contents and/or pressures, pipeline evacuation, and other applications.

Definitions applicable to this task are as follows:

Bleeder Valve
A valve that allows the controlled relief of pressure.

Boring Bar
The main shaft of a tapping machine that turns the cutter.

Completion Plug
A plug designed to establish a pressure-tight seal of the opening created by a hot tap. The plug will allow installation and removal of the tapping machine or plugging machine and valve.

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 valve is bolted to allow tapping and plugging.

Hot Tap
The process of safely cutting or boring a hole into an operating pipeline or breakout tank.

Tapping Machine
A machine installed onto the appropriate valve for the purpose of cutting a hole into a pipeline or breakout tank.

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)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Malfunction of or damage to tapping machine, 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.
Lost coupon may damage downstream equipment.	Immediately notify the operator.
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 valve or tapping machine or fitting.	Stop operation and secure equipment, if safe to do so. Inspect equipment and readjust or reset, as necessary.
Loss of pressure or product if the valve is not properly installed or secured.	Stop operation and secure equipment, if safe to do so. Inspect valve, gasket, and bolts for tightness; readjust or reset, as necessary.
Unexpected release of hazardous liquid or gas.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.
Fire or explosion resulting from ignition of hazardous liquids or gas.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.

3.0 Skill Component

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

Step	Action	Explanation
1	Properly install the valve on the fitting according to the manufacturer's specifications.	This will control product flow and allow installation and removal of tapping machine.
2	Confirm proper operation of the valve and that it is in the open position.	This allows insertion of the boring bar and cutter through the valve bore.
3	Prepare tapping machine per the manufacturer’s procedures.	Prepares tapping machine to properly cut the hole.
4	Confirm the tapping machine manufacturer’s specifications.	Verifies the proper machine rating on specific size pipelines.
5	Attach the appropriate cutter and pilot bit to the boring bar.	Ensure correct cutting tool.
6	Prior to connecting the tapping machine to the valve, confirm accurate measurements have been made for the depth of cut.	Accurate measurement is important to ensure the tap is performed correctly.

Step	Action	Explanation
7	Install the tapping machine on the valve with the valve in the open position.	
8	Ensure that the cutter or drill bit can pass through the open valve and that, with the cutter and drill bit in the retracted position, the valve can be fully closed.	Performing this step assures valve operation and that isolation can occur before and after the tap is made.
9	Verify the operating conditions meet company procedures and requirements.	Ensure that pressures, level, product or other operational parameters are as specified by the company.
10	Lower the boring bar, cutter and pilot bit to verify proper alignment and initial depth measurements.	Accurate measurement is important to ensure the tap is performed correctly.
11	Operate tapping machine to complete hot tap and verify depth measurements of cutter assembly.	Ensures prevention of drilling through the opposite pipe wall.
12	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.
13	Close the valve.	Prevent release of product when tapping machine is removed. Ensure valve is fully closed.
14	Release pressure from the product trapped between the valve and the tapping machine.	Prepare for removal of the tapping machine.
15	Remove the tapping machine.	
16	Confirm retrieval of coupon and verify integrity.	

OQ Task Name

Task 40.9 – Install and Remove Completion Plug on Pipelines Larger than 2 Inches

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 and 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 hole created by a hot tap and allow removal of the valve and tapping machine from the fitting. 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.

A completion plug is installed and removed with a tapping machine.

Definitions applicable to this task are as follows:

Completion Plug
A plug designed to establish a pressure-tight seal of 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. The tapping machine is also used to install and remove the completion plug.

Valve
The component installed on the fitting to control product flow while inserting the completion plug into the fitting and during removal of the plug and plugging machine.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

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 hazardous liquid or gas from pipeline or completion plug.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures. Remove completion plug or leaking component, inspect or replace components, and reinstall the plug in the fitting.
Unexpected release of pressure or product while removing cap or blind flange.	Allow pressure to dissipate before completing removal of cap or flange bolts. If release continues, retighten cap or flange bolts, if safe to do so. Notify operator.
Fire or explosion resulting from ignition of hazardous liquids or gas from pipeline.	Stop operation and secure equipment, if safe to do so. Immediately notify the operator and execute applicable emergency procedures.

3.0 Skill Component

A. To demonstrate proficiency of this task, an individual must perform the following steps for installation:

Step	Action	Explanation
1	Install the plug holder onto boring bar, confirming the arrows are aligned. Attach the completion plug to the plug holder.	Proper alignment ensures the plug correctly fits the void and remains in place once installed. Proper alignment also ensures correct retrieval and removal of the plug.
2	Inspect and assemble tapping machine and plug holder components.	Ensures components are in good condition.
3	Take necessary measurements prior to installing the tapping machine on the valve.	Ensures proper fit.
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.
6	Slowly open the valve fully on the fitting.	Ensure valve is 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. Set holding segments according to manufacturer's specifications.	
8	Relieve pressure above plug and verify proper sealing of plug.	

Step	Action	Explanation
9	Retract the boring bar and plug holder from the fitting and valve.	
10	After retracting the boring bar and plug holder, close the valve and relieve pressure above the valve.	Relieve pressure and drain.
11	Remove the tapping machine from the valve.	
12	Remove the valve if required.	
13	Install the cap blind flange, piping, instrumentation, or other component onto the fitting or valve.	Provides permanent seal on pipeline and fitting.

B. To demonstrate proficiency of this task, an individual must perform the following steps for removal:

Step	Action	Explanation
1	Slowly open the valve fully on the fitting.	Ensure valve is fully opened to allow removal of the completion plug.
2	Visually inspect that the completion plug is seated in the fitting and verify access for connecting the plug holder.	Proper alignment also ensures correct retrieval and removal of the plug.
3	Inspect and assemble tapping machine and plug holder components.	Ensures components are in good condition.
4	Take necessary measurements prior to installing the tapping machine on the valve.	Ensures proper fit.
5	Install tapping machine onto the valve with the plug holder fully retracted.	Prevents damage to tapping machine.
6	Prior to removing the plug, equalize the pressure on each side of the plug if possible.	Equalized pressure facilitates operation of tapping machine.
7	Remove the completion plug: a. Lower the plug holder into the fitting with the boring bar. b. Verify proper alignment and initial depth measurements. c. Connect the plug holder to the completion plug. d. Set holding segments according to manufacturer's specifications.	
8	Retract the boring bar and plug holder from the fitting and valve.	
9	After retracting the boring bar and plug holder, close the valve and relieve pressure above the valve.	Relieve pressure and drain.
10	Remove the tapping machine from the valve.	
11	Install the cap, blind flange, piping, instrumentation, or other component onto the valve.	

OQ Task Name

Task 41.0 – 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. 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:

- Maximum operating pressure certification or integrity management
- Testing for certification
- Testing of replacement pipe for sections being relocated, replaced, or otherwise changed
- Conversion of service

This task begins with isolation of the pipeline segment to be tested and ends with the release of test pressure according to the operator's procedures.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

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: a) the pipeline test section is outside of cities and populated areas, b) buildings within 300 feet of test section are unoccupied when test pressure is greater than a pressure which produces a hoop stress of 50% specified minimum yield strength, and c) surveillance and continuous communication is maintained along the test section.

Test pressure must 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 must maintain an additional four continuous hours of test pressure equal to 110% of the MOP.

A pressure test plan must 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 must be included with the plan: a) date and time of the test, b) pressure recording charts, c) test instrumentation calibration data, d) minimum and maximum test pressures, e) minimum time duration of the test, f) description of the facility tested and the test apparatus, and g) temperature of the test medium or pipe during the test period. In the event elevation differences in the test segment exceed 100 feet, a profile of the pipeline identifying the elevations and test sites must also be included with the plan documentation.

The testing instrumentation calibration must be current and certified prior to the test. All pipe, components and test equipment must 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 must be explained in the pressure test plan.

Definitions applicable to this task are as follows:

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 pre-determined 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 a temperature increase or decrease on the test medium and the pipe.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Valve failure, pipe failure, gasket failure, threaded fitting failure, or weld failure.	Assess damage, and notify appropriate operator personnel.
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.

3.0 Skill Component

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

Step	Action	Explanation
1	Confirm the pipeline segment has been isolated for the test according to the specified procedures.	Ensures affected pipeline segment is prepared to accept test pressure.
2	Confirm calibration and certification of testing instrumentation is current.	Ensures proper measurement of test parameters.
3	Connect a pump or compressor to the pipeline segment.	Ensures 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.	Ensures 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.	
9	After confirming the test was successful, release pressure according to specified procedures.	Ensures completed documentation.

OQ Task Name

Task 42.7 – Welding

1.0 Task Description

This task involves the performance of gas and arc welding on pipelines and breakout storage tanks according to the operator's applicable welding procedures. This task begins with the first step identified in the operator's applicable welding procedure. The task concludes once the weld has been completed.

This task pertains to numerous welding types. Examples of welding types include, but are not limited to, joining steel pipe or installing components such as flanges, reinforcing saddle, nozzles, or a door sheet on a breakout tank. Each individual welding type must have a qualified welding procedure, and the individual must satisfactorily complete the weld according to that procedure.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Operator qualified welding procedures applicable to the welds to be performed

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Burn-through during the performance of a butt weld	Follow the operator's approved welding procedure recommendation for an acceptable repair.
Fire or explosion resulting from ignition of flammable or combustible liquid or gas	Stop welding immediately. Execute applicable emergency procedures, and notify the operator as appropriate.
Arc burns outside the weld area	Follow the operator's approved welding procedure recommendation for an acceptable repair.

3.0 Skill Component

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

Step	Action	Explanation
1	Successfully complete the qualifying weld(s) according to the operator's qualified welding procedures.	Welding procedures are qualified to standards applicable to the type of welding being performed, and welders must use a qualified procedure to perform their qualifying test. Successful completion of the qualifying weld(s) is determined either through destructive or nondestructive testing results interpreted by a qualified person.

OQ Task Name

Task 43.1 – Start-Up of a Liquid Pipeline (Control Center)

1.0 Task Description

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.

Shutdown of a Liquid Pipeline (Control Center) is a separate covered task (Reference Task 43.2).

Monitor Pressures, Flows, Communications and Line Integrity and Maintain Them within Allowable Limits on a Liquid Pipeline System (Control Center) is a separate covered task (Reference Task 43.3).

Remotely Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 43.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

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, and over/short 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 is 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.

MOP
Maximum operating pressure 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. Pipeline hydraulics may be affected by the following:

- Elevation profile of the given pipeline
- The product characteristics, including drag reducing agents (DRA)
- Operational changes, including start-ups and shutdowns.

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)
The following AOCs could be encountered while performing this task. These conditions are typically indicated by an alarm.

AOC Recognition	AOC Reaction
Activation of a Safety Device: Pressure relief, emergency/abnormal shutdown, high pressure shutdown, case pressure/temperature shutdown, etc. These devices are typically designed to operate and reduce or eliminate a hazardous situation.	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.
Receipt of a Safety-Related Alarm: Each operator defines safety-related alarms.	If a safety-related alarm is received, the controller should investigate the cause of the safety-related alarm 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.	Ensure that back-up systems are activated. Follow trouble-shooting procedures, and take appropriate action to mitigate the situation. Make appropriate notifications.
Flow Rate Deviation (Unexplained): High flow, low flow, or no flow.	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.	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.	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 must 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 operator's procedures, documentation, and historical trends.
4	Determine which pumping units will be started to provide a scheduled flow rate.	Follows operator's procedures. Refer to pumping schedule, documentation, and historical trends.
5	Verify that pumps and other equipment are in a ready state.	
6	Start pump(s) according to written operating procedures.	
7	Monitor pressures and flow rates after start-up, and make adjustments to achieve a steady state.	
8	After steady state has been achieved, set pressure and flow alarms.	

OQ Task Name

Task 43.2 – 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 assure safe operation. This task begins with identifying the part of the pipeline system to be shutdown. 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 or steady state.

Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them within Allowable Limits on a Liquid Pipeline System (Control Center) is a separate covered task (Reference Task 43.3).

Remotely Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 43.4).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

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 alerts a controller 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, and over/short rate of change alarms.

Line Pack
Line pack is a condition where product vaporization and product mixing is 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.

MOP
Maximum operating pressure means the maximum pressure at which a pipeline or segment of a pipeline may be normally operated. Parts of a pipeline system should be shut down in a manner not to exceed a pipeline segment's MOP.

Pipeline Hydraulics
Characteristics of fluid flow in a pipeline may impact shutdown operations. Pipeline hydraulics may be affected by the following:

- Elevation profile of the given pipeline.
- The product characteristics, including drag reducing agents (DRA)
- Operational changes

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.

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)

The following AOCs could be encountered while performing this task. These conditions are typically indicated by an alarm.

AOC Recognition	AOC Reaction
Activation of a Safety Device: Pressure relief, emergency/abnormal shutdown, high pressure shutdown, case pressure/temperature shutdown, etc. These devices are typically designed to operate and reduce or eliminate a hazardous situation.	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.
Receipt of a Safety-Related Alarm: Each operator defines safety-related alarms.	If a safety-related alarm is received, the controller should investigate the cause of the safety-related alarm 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.	Ensure that back-up systems are activated. Follow trouble-shooting 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.	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.	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.	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 must 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 non-automated functions.
2	Identify the pumping units that will be shut down.	
3	Shut down the identified part of the pipeline system according to written operating 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 to achieve desired static/steady state.	
5	When pump shutdown is completed, verify valve status and static/steady state have been achieved.	

OQ Task Name

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. The task begins when a pipeline reaches steady state and ends when the start up or shutdown of the pipeline begins.

Start-Up of a Liquid Pipeline (Control Center) is a separate covered task (Reference Task 43.1).

Shutdown of a Liquid Pipeline (Control Center) is a separate covered task (Reference Task 43.2).

Remotely Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 43.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

Alarm
SCADA generated visual and/or audible alert that indicates an operating parameter has been exceeded. A controller must be able to interpret the alarm, determine the impact to safe pipeline operation, and respond accordingly.

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, and over/short 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 is 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.

MOP
Maximum Operating Pressure means the maximum pressure at which a pipeline or segment of a pipeline may be normally operated**.**

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.

Pipeline Hydraulics
Characteristics of fluid flow in a pipeline. Pipeline hydraulics may be affected by the following:

- Elevation profile of the given pipeline
- The product characteristics, including drag reducing agents (DRA)
- Operational changes

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)

The following AOCs could be encountered while performing this task. These conditions are typically indicated by an alarm.

AOC Recognition	AOC Reaction
Activation of a Safety Device: Pressure relief, emergency/abnormal shutdown, high pressure shutdown, case pressure/temperature shutdown, etc. These devices are typically designed to operate and reduce or eliminate a hazardous situation.	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.
Receipt of a Safety-Related Alarm: Each operator defines safety-related alarms.	If a safety-related alarm is received, the controller should investigate the cause of the safety-related alarm 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.	Ensure that back-up systems are activated. Follow trouble-shooting procedures, and do what is necessary to mitigate the situation. Make appropriate notifications.
Flow Rate Deviation (Unexplained): High flow, low flow, or no flow.	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.	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.	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 must 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 have stabilized (steady state).	Allow time for packing line.
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 (ROC), 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.	
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.
7	Respond to alarm.	Each pipeline has its own alarm response protocols.
8	Document and/or report information, as appropriate.	Documenting provides data for compliance, historical review and trending.

OQ Task Name

Task 43.4 – Remotely Operate Valves on a Liquid Pipeline System

1.0 Task Description

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.

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of how valve indication is identified by some type of Supervisory Control and Data Acquisition (SCADA), Human Machine Interface (HMI) icon, or other indicator that changes appearance when the valve position changes.

Items to be considered prior to operation of valves include the following:

- Impacts to the pipeline operation such as pressure, flow, and tank levels
- Operation of incorrect valves could cause an unsafe condition

How communication with either local operations or control center may be required prior to or after valve operation.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Pressure Deviation (Unexplained) – Pressure display(s), alarms, or other pressure indicators show the unexplained pressure deviation.	Make the condition safe to the extent possible and according to operator's procedures. Assess the condition for safety, environmental, or physical damage. Reactions could include: • Shutting down the system (if qualified) • Returning the valve to its original position • Operating an appropriate valve • Isolating damaged equipment • Making appropriate notifications
Flow Deviation (Unexplained) – Flow gauges, flow recorders, alarms, tank levels, or other flow indicators show the unexplained flow deviation.	Make the condition safe to the extent possible and according to operator's procedures. Assess the condition for safety, environmental, or physical damage. Reactions could include the following: • Shutting down the system (if qualified) • Returning the valve to its original position • Operating an appropriate valve • Isolating damaged equipment • Making appropriate notifications

AOC Recognition	AOC Reaction
Valve Position Indication (Unexpected) – SCADA, HMI, or other valve position/status indicators show unexpected valve position indication.	Troubleshoot communications and valve control functions as appropriate. Make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task an individual must 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 (if required by operating procedure).	The control center has ultimate responsibility and authority for actions that affect the safe operation of a pipeline.
3	Remotely operate valve	
4	Ensure proper valve position, and communicate (if required by operating procedure) with field operations or the control center after valve operation.	Valve position is indicated by some type of SCADA, HMI icon, or other indicators that will change appearance when valve position changes.

OQ Task Name

Task 44.3 – Inspect, Test, and Maintain 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 signals are functioning properly and are adequate for their intended purpose.

This task begins with verification of the flow computer number/nameplate and ends with notification to appropriate personnel that the flow computer is ready for normal operation.

Inspect, Test, and Calibrate Pressure Transmitters is a separate covered task (Reference Task 25.2).

Prove Flow Meters for Hazardous Liquid Leak Detection is a separate covered task (Reference Task 44.5).

Inspect, Test, and Maintain Gravitometers/Densitometers for Hazardous Liquid Leak Detection is a separate covered task (Reference Task 44.7).

Inspect, Test, and Maintain Temperature Transmitters for Hazardous Liquid Leak Detection is a separate covered task (Reference Task (44.8).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Definitions:
    - **Flow Computer**

      A flow computer is a microprocessor-based computational device which 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.

      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 is made available externally through an electronic interface (i.e. PLC, HMI, SCADA or leak detection systems and processes).
- Topics including the following:
    - Flow computer configuration programming;
    - Analog/digital input/output (I/O);
    - Communications;
    - 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);
    - Knowledge of the control instrumentation for the process system (i.e., knowing the alarm, control, indication, and recording function of the device in the process system);
    - Differential pressure;

- Ethernet;
- Serial;
- Analog;
- Digital;
- End device that receives and processes data from field equipment. Some examples of end devices include PLC, HMI, SCADA, and flow computers.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
A flow computer is found in an inoperable condition or does not communicate to HMI/SCADA.	Notify the Control Center or appropriate personnel to take actions as specified by the operator's procedures.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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 DP 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 maintenance.	The Control Center and local operations (if applicable) must be notified that work is to be performed on the flow computer. The Control Center may be required to validate the following: • Receipt/initiation of an alarm • SCADA/HMI display values • Flow computer data corresponds to SCADA/HMI display ID This step includes consulting the operator's procedures.
4	Inspect and maintain 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 Components are repaired or replaced as needed according to the manufacturer's specifications and to the operator's procedure.
5	Verify that the input/output parameters for each identified device are correct, the displayed values are accurate, and that no unwanted override parameters exist.	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
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

Step	Action	Explanation
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.
8	Correct any errors and/or implement required changes noted in steps 5-7.	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 5-7 confirms the changes.
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.	This communication notifies the appropriate personnel that the flow computer is ready for normal operation and that the task is complete.

OQ Task Name

Task 44.4 – Inspection, Testing, and 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 and ends with appropriate notifications that the tank gauging equipment is returned.

Test Overfill Protective Devices is a separate covered task (Reference Task 30).

Inspect and Calibrate Overfill Protective Devices is a separate covered task (Reference Task 31).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

NOTE: 49 CFR §195.428(c) gives direction on overfill protection devices and requires API RP 2350 be followed. If the level device is also used for overfill protection, then testing and calibration are separate covered tasks (see Tasks 30 and 31 above).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- 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.
- Gauging equipment to maintain which may include the following:
  - Sonar,
  - Radar,
  - Mechanical (tape with displacer).
- 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).
- Control instrumentation for the process system (i.e. knowing the alarm, control, indication, and recording function of the device in the process system).
- Tank/vessel construction types.
- Tank/vessel fill/drain operations.
- Control Center communication methods.
- Operator's testing and operating procedures related to the testing of tank gauges.
- Alarms indicating that an operating parameter has been exceeded.
- Test measurement equipment required.
- Test equipment certification.

- Test equipment operation.
- Documentation/record-keeping.
- End device that receives and processes data from field equipment; some examples of end devices include PLC, HMI, and SCADA.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

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 free standing 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 must 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.
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) must 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 • SCADA/HMI display values • Gauge device number corresponds to SCADA/HMI 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.

Step	Action	Explanation
4	Inspect/maintain 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). Components are repaired or replaced as needed according to the manufacturer's specifications and the operator's procedures.
5	Confirm that the tank is in a static condition per the operator's procedures.	The tank level must be in a static condition with no movements in or out and with all mixers turned off.
6	Verify that the test equipment has been certified prior to performing verification.	The test equipment must 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.
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 must 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).
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.	
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.

OQ Task Name

Task 44.5 – Prove Flow Meters for Hazardous Liquid Leak Detection

1.0 Task Description

This task involves proving of a flow meter to obtain an accurate meter factor and proving report. This task begins with identifying and verifying the meter to prove. The task ends with a Control Center notification that the meter has returned to a normal operating condition.

Inspect, Test, and Calibrate Pressure Transmitters is a separate covered task (Reference Task 25.2).

Inspect, Test, and Maintain Flow Computer for Hazardous Liquid Leak Detection is a separate covered task (Reference Task 44.3).

Inspect, Test, and Maintain Temperature Transmitters for Hazardous Liquid Leak Detection is a separate covered task (Reference Task 44.8).

Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field) is a separate covered task (Reference Task 63.3).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Prover types including the following:
  - Master meter
  - Bidirectional
  - Unidirectional
  - Compact
- Input information used to calculate a meter factor including 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

Definitions applicable to this task as follows:

Meter Factor (MF)
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.

K Factor
The nominal number of pulses per unit volume generated by a meter.

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 is made available externally through an electronic interface (i.e. PLC, HMI, SCADA, or leak detection systems and processes).

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
A prover introduces air to the pipeline system	Notify the Control Center or the appropriate personnel to take appropriate action.
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.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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 must 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	For a portable prover, verify that the pipeline pressure is within the portable prover equipment design specifications.	The portable prover equipment should meet or exceed the pipeline pressure specifications.

Step	Action	Explanation
5	For a portable prover, make the connections to appropriate meter equipment.	The prover equipment must connect to the meter to be proven. Connections 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.
6	Line up the appropriate valves to fill and pressurize the portable prover equipment.	This step follows the manufacturer's and operator's procedures to fill the prover and purge all air out of the prover equipment.
7	Perform an equipment integrity assessment.	This step ensures connections and prover equipment are operating as intended.
8	**For stationary and portable prover equipment,** line up valves for meter proving.	The prover loop equipment diverts all meter flow.
9	Check the double block and bleed valves.	This step checks **ALL** double block and bleed valves on an associated prover loop piping for seal integrity. This step follows the valve manufacturer's and operator's procedures.
10	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.
11	Determine the product gravity/density and stability.	Stable gravity/density is required to obtain an accurate meter factor.
12	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 4-way valve, (as applicable). The operator, contract, and/or industry standards determine the number of proving run parameters.
13	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)

Step	Action	Explanation
		• Meter ID • K Factor • Meter counts • Acceptable deviation between prover runs (repeatability) • Previous meter factor
14	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.
15	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
16	For a portable prover, line up appropriate valves to drain and de-pressurize portable prover equipment.	This step follows the manufacturer's and the operator's procedures.
17	For a portable prover, disconnect all connections to appropriate meter equipment.	From step 5, 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.
18	Reset all valves to the normal operating position.	This step follows the operator's procedure.
19	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.

OQ Task Name

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 and ends with the completion of repair documentation per the operator's procedures.

Start-up of a Liquid Pipeline (Control Room) is a separate covered task (Reference Task 43.1).

Prove Flow Meters for Hazardous Liquid Leak Detection is a separate covered task (Reference Task 44.5).

Start-up of a Liquid Pipeline (Field) is a separate covered task (Reference Task 63.1).

Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field) is a separate covered task (Reference Task 63.3).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- 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.
- Types of meters to maintain including the following:
  - Turbine meter
  - Positive displacement meter
  - Ultrasonic meter
  - Coriolis meter
  - Magmeter
  - Differential pressure meter
  - Vortex meter
- Operation and safe handling of electrical systems (i.e. voltage applied to the device, electrical requirements, and connection of test equipment)
- Control instrumentation for the process system (i.e., knowing the alarm, control, indication, and recording function of the device in the process system)
- Ancillary equipment including the following:
  - Flow conditioners
  - Strainers
  - Filter
- Control Center communication methods
- Alarms indicating that an operating parameter has been exceeded

- Test / diagnostic equipment required
- Test equipment calibration
- End device that receives and processes data from field equipment; some examples of end devices include PLC, HMI, SCADA, or a flow computer

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
The 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.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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) must receive notification of work to be performed.
3	Perform routine preventive maintenance per the manufacturer's specifications and the operator's procedures.	Preventive maintenance activities are meter-type specific. This step consults the manufacturer's specifications and the operator's procedures.
4	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
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

Step	Action	Explanation
6	Determine if removal of the meter is required.	The step determines if meter removal is required and proceeds to step 9 if it is not required.
7	Isolate, depressurize, drain, and purge the piping.	This step follows the operator's procedures.
8	Remove the meter from the pipeline.	This step follows the operator's procedures.
9	Perform the repair as required.	This step performs repairs per the manufacturer's and the operator's procedures.
10	Reinstall the meter in the pipeline and ensure that the orientation is correct for product flow, as applicable.	This step follows the operator's procedures.
11	Notify the Control Center, local operations (if applicable), and any affected personnel per the operator's procedures.	This communication provides notification that meter commissioning and startup activities begin.
12	Remove isolation measures, purge, and fill the piping with product.	This step follows the operator's procedures. This step includes consulting and following the manufacturer's procedure for startup to ensure that damage does not occur to the meter.
13	Perform a meter loop integrity check.	This step inspects for leaks and verifies that the meter is ready for service.
14	Notify Operations that the meter run is ready for startup.	This step includes consulting and following the manufacturer's procedure for startup to ensure that damage does not occur to the meter.
15	Notify Operations that the meter should be proven.	
16	Document the repair results per the operator's procedures.	This step documents the results per the operator's procedures.

OQ Task Name

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. The task ends with documenting repair and/or calibration results.

Start-up of a Liquid Pipeline (Field) is a separate covered task (Reference Task 63.1).

Shutdown of a Liquid Pipeline (Field) is a separate covered task (Reference Task 63.2).

Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field) is a separate covered task (Reference Task 63.3).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- 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)
- 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)
- Control instrumentation for the process system (i.e. knowing the alarm, control, indication, and recording functions of the device in the process system)
- Density
- Pycnometer
- Density correction factor
- Test equipment certification

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

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.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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. multi-meters, multi-function calibrators, thermometers) must 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) must receive notification of work to be performed.
4	Conduct a visual inspection.	A visual inspection of the 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 density correction factor (DCF) and produce a pycnometer 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	In the event that 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
9	Determine if removal of the densitometer is required.	Inspection of the device for buildup of debris or contaminates may require removal.
10	Perform internal device maintenance and 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, depressure, and drain the device piping.	This step follows the operator's procedures.
12	Remove the densitometer from the pipeline if necessary.	This step follows the operator's procedures.
13	Perform all inspection, cleaning, and repairs as required.	Repairs are performed per the manufacturer's and the operator's procedures.
14	Reinstall 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 startup ensures that damage does not occur to the densitometers.
16	Perform a densitometer loop integrity check.	This step inspects for leaks and verifies that the densitometer 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 startup activities begin.
18	Remove the override density value at the end device per the operator's procedure.	A live density value must be observed to perform a pycnometer calibration.
19	Perform a pycnometer calibration (see steps 4–6).	After performing maintenance, this step repeats the pycnometer 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.

OQ Task Name

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 and 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"

Inspect, Test, and Maintain Flow Computer for Hazardous Liquid Leak Detection is a separate covered task (Reference Task 44.3).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

- Operation and proper use of test equipment used to perform the functions required in this task. Common test equipment can include the following:
  - Smart communicators
  - Volt / ohm / amp multimeters
  - Decade box
  - Resistance thermal device (RTD) simulator
  - Certified thermometers (digital and analog)
  - Multifunction calibrators
- 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)
- Control instrumentation for the process system (i.e., knowing the alarm, control, indication, and recording function of the device in the process system)

Definitions applicable to this task as follows:

Alarm
A SCADA or HMI generated visual and/or audible indication that an operating parameter has been exceeded.

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.

End Device
A device that receives and processes data from field equipment. Some examples of end devices include PLC, 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:

- RTD
- Thermocouple (voltage)

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

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.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must 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.
2	Confirm that test equipment has been certified, calibrated, and verified prior to performing device calibration.	Test equipment (i.e. multimeters, multifunction calibrators, thermometers) must 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.

Step	Action	Explanation
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) must 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 • SCADA/HMI display value • Transmitter device number corresponds to SCADA/HMI 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.
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.
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 in order 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.	
11	Connect the test equipment using the manufacturer's and the operator's procedures.	The test equipment is used to simulate sensor input.
12	Confirm the transmitter configuration and range values obtained in step 3.	

Step	Action	Explanation
13	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.
14	Remove the test equipment and reconnect the sensor input connections.	
15	Remove the override temperature value at the end device (step 9) per the operator's procedure.	
16	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.
17	Document "as left" results.	This step documents "as left" results per the operator's procedure.
18	Return the device to normal operating condition per the manufacturer's and the operator's procedures.	
19	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.

OQ Task Name

Task 63.1 – Start-Up of a Liquid Pipeline (Field)

1.0 Task Description

This task begins with identifying and verifying that the intended flow path is configured in accordance with applicable operating procedures and includes communicating with a control room to confirm a flow path is open for the intended operation. This task ends when the control room assumes control of the operation.

Remotely Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 43.4).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

Alarm
SCADA or HMI-generated visual and/or audible alert that indicates an operating parameter has been exceeded. An alarm receipt may require 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 to accept and implement an operator's control instructions. Typically, information is displayed in a graphic format.

MOP
Maximum operating pressure means the maximum pressure at which a pipeline or segment of a pipeline may be normally operated.

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)

The following AOCs could be encountered while performing this task:

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 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.	Ensure that back-up systems are activated. Follow trouble-shooting procedures, and take appropriate action to mitigate the situation. Make appropriate notifications.

AOC Recognition	AOC Reaction
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 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 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 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 must perform the following steps:

Step	Action	Explanation
1	Communicate with the control room the intended start-up configuration.	Allows control room and local operator to confirm start-up.
2	Verify with the control room that the intended flow path is configured in accordance with applicable operating procedures.	Verification may include local piping alignment and confirmation of remote flow path configuration from control room.
3	Verify that pumps and other equipment are in a ready state.	
4	Start pump(s) according to written operating procedures.	
5	Monitor pressures and flow rates after start-up.	
6	Communicate with the control room to verify that it has assumed control of the operation.	

OQ Task Name

Task 63.2 – 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 assure safe operation. This task begins with identifying the part of the pipeline system to be shut down. The task includes communicating with a control room to confirm intended shutdown and may include verifying all necessary valve alignments, making required communications, and monitoring pressure and flow rates to ensure operation within safe design limits. This task ends when the control room assumes control of the operation or when the identified part of a pipeline system reaches static or steady state.

Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them within Allowable Limits on a Liquid Pipeline System (Control Center) is a separate covered task (Reference Task 43.3).

Remotely Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 43.4).

Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them within Allowable Limits on a Liquid Pipeline System (Field) is a separate covered task (Reference Task 63.3).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

Alarm
An alarm is a visual and/or audible alert that indicates a parameter has been exceeded. A qualified individual must be able to interpret an alarm, determine the impact to safe pipeline operation, and respond accordingly.

Human Machine Interface (HMI)
A software application that presents information to an operator about the state of a process and to accept and implement an operator's control instructions. Typically, information is displayed in a graphic format.

MOP
Maximum operating pressure means the maximum pressure at which a pipeline or segment of a pipeline may be normally operated. Parts of a pipeline system should be shut down in a manner not to exceed a pipeline segment's MOP.

Pipeline Hydraulics
Characteristics of fluid flow in a pipeline may impact shutdown operations. Pipeline hydraulics may be affected by the following:

- Elevation profile of the given pipeline.
- The product characteristics, including drag reducing agents (DRA)
- Operational changes

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.

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.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task. These conditions are typically indicated by an alarm.

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 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.	Ensure that back-up systems are activated. Follow trouble-shooting 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 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 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 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 must perform the following steps:

Step	Action	Explanation
1	Communicate with the control room the intended shutdown configuration.	Allows the control room and local operator to confirm shutdown.
2	Identify which pumping units will be shut down, if any.	

Step	Action	Explanation
3	Shut down the identified part of the pipeline system according to written operating 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 to achieve desired static/steady state.	
5	When shutdown is complete, verify that valve status and static/steady state have been achieved.	

OQ Task Name

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 the 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 and ends when shutdown of part of the pipeline system begins.

Remotely Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 43.4).

Locally Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 63.4).

Start-Up of a Liquid Pipeline (Field) is a separate covered task (Reference Task 63.1).

Shutdown of a Liquid Pipeline (Field) is a separate covered task (Reference Task 63.2).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Definitions applicable to this task are as follows:

Alarm
An alarm is a visual and/or audible alert that indicates that a parameter has been exceeded. A qualified individual must be able to interpret an alarm, determine the impact to safe pipeline operation, and respond accordingly.

Line Pack
Line pack is a condition where product vaporization and product mixing is 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.

MOP
Maximum operating pressure 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. Pipeline hydraulics may be affected by the following:

- Elevation profile of the given pipeline
- The product characteristics, including drag reducing agents (DRA)
- Operational changes

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.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task. These conditions are typically indicated by an alarm.

AOC Recognition	AOC Reaction
Activation of a Safety Device: Pressure relief, emergency/abnormal shutdown, high pressure shutdown, case pressure/temperature shutdown, etc. These devices are typically designed to operate and reduce or eliminate a hazardous situation.	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.
Activation of an Alarm	If an alarm is activated, the qualified individual should investigate the cause of the alarm and do what is necessary to mitigate the situation. Make appropriate notifications.
Loss of Communications, Control System, or Power Interruption/Failure	Ensure that back-up systems are activated. Follow trouble-shooting procedures and do what is necessary to mitigate the situation. Make appropriate notifications.
Flow Rate Deviation (Unexplained): High flow, low flow, or no flow.	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 pressure reading.	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.	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 must 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 have stabilized (steady state).	Allows time for packing line.
2	Set appropriate operating limits such as pressure and flow rate while ensuring that MOP is not exceeded.	Each pipeline has its own normal operating parameters. If operating limits are not set appropriately, safe operating parameters may be exceeded.

Step	Action	Explanation
3	Monitor operating information such as alarms, trending, pressure, flow rates, rate of change (ROC), 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 while ensuring that MOP is not exceeded.	
5	Communicate, as necessary, with field and 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.

OQ Task Name

Task 63.4 – Locally Operate Valves on a Liquid Pipeline System

1.0 Task Description

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.

Remotely Operate Valves on a Liquid Pipeline System is a separate covered task (Reference Task 43.4).

2.0 Knowledge Component

An individual performing this task must have knowledge of the following:

Valve position indication – Each valve, other than a check valve, must have some method to indicate the valve's position. Examples include the following:

- Rising stem
- Arrow
- Handle position
- Open/close flag or display

Items to be considered prior to operation of valves include the following:

- 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.
- Operation of incorrect valves could cause an unsafe condition
- Creation of thermal traps by shutting in segments of pipeline systems where it could be over pressured because of an increase of product temperature

How communication with either local operations or control center may be required prior to or after valve operation.

Abnormal Operating Conditions (AOCs)

The following AOCs could be encountered while performing this task:

AOC Recognition	AOC Reaction
Pressure Deviation (Unexplained) – Pressure display(s), sound, vibration, alarms, or other pressure indicators show the unexplained pressure deviation.	Make the condition safe according to the extent possible and according to operator's procedures. Assess the condition for safety, environmental, or physical damage. Reactions could include the following: • Shutting down the system (if qualified) • Returning the valve to its original position • Operating an appropriate valve • Isolating damaged equipment • Making appropriate notifications

AOC Recognition	AOC Reaction
Flow Rate Deviation (Unexplained) **–** Flow gauges, alarms, tank levels, or other flow indicators show the unexplained flow deviation.	Make the condition safe to the extent possible and according to operator's procedures. Assess the condition for safety, environmental, or physical damage. Reactions could include the following: • Shutting down the system (if qualified) • Returning the valve to its original position • Operating an appropriate valve • Isolating damaged equipment • Making appropriate notifications
Valve Position Indication (Unexpected) – Valve position indicators show unexpected valve position indication.	Confirm valve position. Investigate and resolve source of discrepancy between valve position and indicator. Proper valve indication is required. Ensure appropriate notifications are made before resuming safe pipeline operation.
Valve Inoperable – Valve will not operate as intended or will 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 operator's procedures. Assess condition for safety, environmental, or physical damage. Reactions could include the following: • Re-try operation • Relieve excessive differential pressure • Shut down system (if qualified) • Make appropriate notifications
Unexpected Presence of Hazardous Liquid or Vapor – Incorrect valve operation could lead to an unintended release of product that could be observed by sight, smell, sound, or alarms.	Minimize the situation if it can be done safely. Make appropriate notifications.

3.0 Skill Component

To demonstrate proficiency of this task an individual must 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 (if required by operating procedure).	The control center has ultimate responsibility and authorization for actions that affect the safe operation of a pipeline.
3	Locally operate valve.	Valves may be operated manually and/or by a motor-operated actuator.
4	Ensure proper valve position and communicate (if required by operating procedure) with field operations or the control center after valve operation.	The control center has ultimate responsibility and authorization for actions that affect the safe operation of a pipeline.

Annex C
(Informative)

Evolution of the Covered Tasks

The covered task list was first published in 2000 in the 1st edition of API 1161, as identified in the 1st column of Table C.1. Since that first list was issued, there have been a number of changes to the list. The last iteration of the list prior to the development of the current edition of 1162 is shown in the 2nd column of Table C.1. The current edition of the covered task list (3rd column of Table C.1) is developed from the previous edition of the list. The last column of the table provides a brief description of the differences between the two lists and, when applicable, the rationale for the change. This information is provided for reference only.

Table C.1—Comparison of the Evolution of the Covered Task List

Covered Task from API 1161, 1st Edition (2000)	Old Covered (Sub)—Task Modified (pre-2012)	New Final Covered Task—API 1161, 2nd Edition (2013)	Difference
1 Conduct Annual Surveys to Electrically Inspect Unprotected Bare Pipe	1.1 Measure structure-to-soil potentials 1.2 Conduct close interval survey 1.3 Test to detect interference 1.4 Inspect and perform electrical test of bonds 1.5 Inspect and test isolation devices	1.1 Measurement of structure-to-soil potentials 1.2 Conduct close interval survey 1.3 Test to detect interference 1.4 Inspect and perform electrical test of bonds 1.5 Inspect and test electrical isolation	1.1-1.5 No Change[a]
2 Maintain Test Leads	2.1 Inspect and verify test lead continuity 2.2 Repair damaged test leads 2.3 Install test leads by non-exothermic welding methods 2.4 Install test leads by exothermic welding methods	2.1 Verify test lead continuity 2.2 Repair damaged test lead 2.3 Install test leads by non-exothermic welding methods 2.4 Install test leads by exothermic welding methods	2.1 "Inspect" included actions for "verify, and removed from title. 2.2-2.4 No Change[a]
3 Inspect Rectifier	3.1 Obtain a voltage and current output reading from a rectifier 3.2 Check for proper operation of a rectifier	3.0 Obtain a voltage and current output reading from a rectifier to verify proper performance	3.0 Old 3.1 and 3.2 combined into one task
4 Maintain Rectifier	4.1 Troubleshoot rectifier bond connections 4.2 Repair or replace defective rectifier components 4.3 Adjustment of rectifier	4.1 Troubleshoot rectifier 4.2 Repair or replace defective rectifier components 4.3 Adjustment of rectifier	4.1-4.3 No Change[a]
5 Inspect Buried Pipe When Exposed	5.1 Inspect for physical damage on buried or submerged pipe 5.2 Inspect for external corrosion on buried or submerged pipe 5.3 Inspect the condition of external coating on buried or submerged pipe	5.1 Examine for mechanical damage on buried or submerged pipe 5.2 Examine for external corrosion on buried or submerged pipe 5.3 Inspect the condition of external coating on buried or submerged pipe	5.1-5.3 No Change[a]
6 Electrically Inspect Bare Pipe	(Removed from Covered Task List)	(Removed from Covered Task List)	Does not meet the Four Part Test[b].

Table C.1—Comparison of the Evolution of the Covered Task List (Continued)

Covered Task from API 1161, 1st Edition (2000)	Old Covered (Sub)—Task Modified (pre-2012)	New Final Covered Task—API 1161, 2nd Edition (2013)	Difference
7 Prevention of Atmospheric Corrosion	7.1 Visual inspection of atmospheric coating	7.1 Visual inspection of atmospheric coatings	7.1 No Change[a]
	7.2 Prepare surface for atmospheric coating using hand and power tools	7.2 Prepare surface for coating using hand and power tools	New 7.2 combined with old 13.1 into one task
	7.3 Perform water pressure cleaning	7.3 Prepare surface for coating by abrasive water blasting	New 7.3 combined with old 13.2 into one task
	7.4 Prepare surface for atmospheric coating by abrasive blasting	7.4 Prepare surface for coating by abrasive blasting methods other than water	New 7.4 combined with old 13.3 into one task
	7.5 Apply atmospheric coating using hand application methods	7.5 Apply coating using hand application methods	New 7.5 combined with old 13.4 into one task
	7.6 Apply atmospheric coating using spray applications	7.6 Apply coating using spray applications	New 7.6 combined with old 13.5 into one task
	7.7 Use coating inspection tools	7.7 Perform coating inspection	7.7 No Change[a]
8 Measure Wall Thickness of Pipe	8.1 Measure pit depth with pit gauge	8.1 Measure pit depth with pit gauge	8.1-8.3 No Change[a]
	8.2 Measure wall thickness with handheld ultrasonic meter	8.2 Measure wall thickness with ultrasonic meter	
	8.3 Measure corroded area	8.3 Measure corroded area	
9 Cathodic Protection Remediation	9.1 Install bonds	9.1 install bonds	9.1-9.5 No Change[a]
	9.2 Install galvanic anodes	9.2 Install galvanic anodes	
	9.3 Install rectifiers	9.3 Install rectifiers	
	9.4 Install impressed current ground beds	9.4 Install impressed current groundbeds	
	9.5 Repair shorted casings	9.5 Repair shorted casings	
		9.6 Install electrical insulating device	9.6 New Task
10 Monitoring for Internal Corrosion	10.1 Insert and remove coupons	10.1 Insert and remove coupons	10.1-10.2 No Change[a]
	10.2 Monitor probes (on-line)	10.2 Monitor probes (on-line)	
11 Internal Corrosion Remediation	11 Perform internal corrosion remediation	11.0 Monitoring and controlling the injection rate of the corrosion inhibitor	11.0 No Change[a] with expanded description in title
12 Inspect Internal Pipe Surfaces	12 Inspect internal pipe surface	12.0 Visual inspection of the internal pipe surface	12.0 No Change[a]

Table C.1—Comparison of the Evolution of the Covered Task List (Continued)

Covered Task from API 1161, 1st Edition (2000)	Old Covered (Sub)—Task Modified (pre-2012)	New Final Covered Task—API 1161, 2nd Edition (2013)	Difference
13 Application and Repair Of External Coatings	13.1 Prepare surface for coating using hand and power tools 13.2 Perform water pressure cleaning 13.3 Prepare surface for coating by abrasive blasting 13.4 Apply coating using hand application methods 13.5 Apply coating using spray applications	(See Task Series 7)	Old 13.1 combined with new 7.2 into one task Old 13.2 combined with new 7.3 into one task Old 13.3 combined with new 7.4 into one task Old 13.4 combined with new 7.5 into one task Old 13.5 combined with new 7.6 into one task
14 Place and Maintain Line Markers	14.1 Locate line 14.2 Install marker 14.3 Inspect and maintain marker 14.4 Inspect and maintain aerial line markers	14.1 Locate line 14.2 Install, inspect, and maintain permanent marker 14.5 Install, inspect, and maintain temporary marker	14.1 Old 14.1 and 17.1 combined into one task 14.2 Old 14.2-14.4 combined into one task 14.5 Old 17.2 and 17.3 combined into one task
15 Inspect Surface Conditions of Right of Way	15.1 Visual inspection of the surface 15.2 Reporting protocols	15.1 Visually inspect surface conditions of right-of-way	15.1 Old 15.1 and 15.2 combined into one task
16 Inspect Navigable Waterway Crossing	16.1 Use of probing equipment 16.2 Use of sonar equipment 16.3 Reporting protocols	16.1 Inspect navigable waterway crossing	16.1 Old 16.1, 16.2 and 16.3 combined into one task
17 Provide Temporary Marking of Buried Pipeline Prior to Excavation	17.1 Locate line 17.2 Install marker 17.3 Inspect and maintain marker	(See Task Series 14)	Old 17.1 and Old 14.1 combined into new 14.1 as one task Old 17.2 and 17.3 combined into one new task 14.5
18 Inspection Following Excavation Activities and Leak Survey After Blasting	18.1 Utilize leak survey techniques 18.2 Monitor for pressure loss	(see Task 15) (See Tasks 43 and 63)	Old 18.1 incorporated into new 15.1 Old 18.2 Incorporated into new 43.3 and 63.3

Table C.1—Comparison of the Evolution of the Covered Task List (Continued)

Covered Task from API 1161, 1st Edition (2000)	Old Covered (Sub)—Task Modified (pre-2012)	New Final Covered Task—API 1161, 2nd Edition (2013)	Difference
19 Maintain Valves	19.1 Valve body winterization or corrosion inhibition	19.1 Valve body winterization or corrosion inhibition	19.1-19.7, No Change[a]
	19.2 Valve lubrication	19.2 Valve lubrication	
	19.3 Valve seat sealing	19.3 Valve seat sealing	
	19.4 Valve stem packing maintenance	19.4 Valve stem packing maintenance	
	19.5 Actuator/operator adjustment, electric	19.5 Adjust actuator/operator, electric	
	19.6 Actuator/operator adjustment, pneumatic	19.6 Adjust actuator/operator, pneumatic	
	19.7 Actuator/operator adjustment, hydraulic	19.7 Adjust actuator/operator, hydraulic	
20 Inspect Valves	20.1 Routine walk-around inspection	20.0 Inspect mainline valves	20.0 Old 20.1,20.2, 20.3 and 20.4 combined into one new task
	20.2 External integrity inspection		
	20.3 Function test valve		
	20.4 Leak test valve		
21 Repair Valves	21.1 Repair valve actuator/operator, pneumatic	21.1 Repair valve actuator/operator, pneumatic	21.1-21.5, No Change[a]
	21.2 Disassembly/re-assembly of valve	21.2 Disassembly/Re-assembly of valve	
	21.3 Internal inspection of valve	21.3 Internal Inspection of valve and components	
	21.4 Repair valve actuator/operator, hydraulic	21.4 Repair valve actuator/operator, hydraulic	
	21.5 Repair valve actuator/operator, electric	21.5 Repair valve actuator/operator, electric	
22 Inspect, Test, and Calibrate Relief Valves	22 Inspect Tank Pressure/Vacuum Breakers and Inspect, Test and Calibrate HVL Tank Pressure Relief Valves (Liquid)	22.1 Inspect tank pressure/vacuum breakers	Old 22 split into two new tasks
		22.2 Inspect, test, and calibrate HVL tank pressure relief valves	
23 Maintain/Repair Relief Valves	23.1 Maintain/repair relief valves	23.1 Maintain/repair relief valves	23.1-23.2, No Change[a]
	23.2 Maintain/repair pressure limiting devices	23.2 Maintain/repair pressure limiting devices	
24 Inspect, Test, and Calibrate Pressure Limiting Devices	24 Inspect, Test and Calibrate Pressure Limiting Devices and Relief Valves	24.1 Inspect, test and calibrate pressure limiting devices	Old 24 split into two new tasks
		24.2 Inspect test and calibrate relief valves	
25 Inspect, Test, and Calibrate Pressure Switches and Transmitters	25.1 Inspect, test and calibrate pressure switches	25.1 Inspect, test and calibrate pressure switches	25.1-25.2, No Change[a]
	25.2 Inspect, test and calibrate pressure transmitters	25.2 Inspect, test and calibrate pressure transmitters	
26 Verify or Set Protection Parameters for Programmable Controllers and/or Instrumentation Control Loops	26 Verify or Set Protection Parameters for Programmable Controllers and/or Other Instrumentation Control Loops	(Removed from Covered Task List)	Determined that PLC programming is not required by regulation (is an engineering function) and therefore does not meet the Four Part Test[b]

Table C.1—Comparison of the Evolution of the Covered Task List (Continued)

Covered Task from API 1161, 1st Edition (2000)	Old Covered (Sub)—Task Modified (pre-2012)	New Final Covered Task—API 1161, 2nd Edition (2013)	Difference
27 Inspect and Repair Breakout Tanks	27.1 Routine monthly inspection of breakout tanks 27.2 Inspection of in-service breakout tanks	27.1 Routine inspection of breakout tanks (API 653 monthly or DOT annual) 27.2 API 653 inspection of in-service breakout tanks 27.3 API 510 inspection of in-service breakout tanks	27.1 No Change[a] Old 27.2 split into two new tasks (27.2 and 27.3)
28 Provide Security for Pipeline Facilities	28 Provide Security for Pipeline Facilities	(Removed from Covered Task List)	Does not meet the Four Part Test[b]
29 Protect Breakout Tanks From Static Electricity, Lightning, and Stray Electrical Currents	29.1 Launching in-line inspection devices 29.2 Receiving in-line inspection devices	(Removed from Covered Task List)	Does not meet the Four Part Test[b]
30 Test Overfill Protective Devices	30 Test overfill protective devices	30.0 Test overfill protective devices	30.0 No Change[a]
31 Inspect and Calibrate Overfill Protective Devices	31 Inspect and calibrate overfill protective devices	31.0 Inspect and calibrate overfill protective devices	31.0 No Change[a]
32 Repair Overfill Protective Devices	32 Monitoring excavation activities	32.0 Observation of excavation activities	New 32.0 includes old 32 and old 35 incorporated into one task
33 Moving In-Service Pipe	33.1 Determine allowable line pressure in section to be moved 33.2 Preparation for movement activities 33.3 Moving in-service pipeline	(Removed from Covered Task List)	33.1 – Engineering function not performed on pipeline facility 33.2-33.3 – Not in regulations All do not meet the Four Part Test[b]
34 Inspect Existing Pipe Following Movement	34 Inspect existing pipe following movement	(Removed from Covered Task List)	Not in the regulations Does not meet the Four Part Test[b]
35 Inspection of Clearance of Existing Pipe to Underground Structures	35 Measure clearance from existing pipe to underground structures installed by excavation, boring, directional drilling	(See Task 32)	Old 35 incorporated into new 32
36 Abandoning, Safe Disconnect, Purging, and Sealing of Pipeline Facilities	36.1 Safe disconnect of pipeline facilities 36.2 Purging of pipeline facilities 36.3 Sealing a disconnected portion of pipeline	c	Gas Task - Not applicable to liquids
37 Installation or Repair of Support Structures on Existing Aboveground Components	37 Install or repair support structures on existing above ground components	(Removed from Covered Task List)	Engineering function. Does not meet the Four Part Test[b].

Table C.1—Comparison of the Evolution of the Covered Task List (Continued)

Covered Task from API 1161, 1st Edition (2000)	Old Covered (Sub)—Task Modified (pre-2012)	New Final Covered Task—API 1161, 2nd Edition (2013)	Difference
38 Inspection Activities for Tie-Ins, Pipe Replacements, or Other Components Connecting to an Existing Pipeline	38.1 Visually inspect pipe and pipe components 38.2 Verify non-destructive weld test (NDT) 38.3 Visually inspect that welds meet DOT requirements (API 1104) 38.4 Radiographic testing of pipeline weld	38.1 Visually inspect pipe and pipe components prior to installation 38.3 Visually inspect that welds meet DOT requirements 38.4 NDT - radiographic testing 38.5 NDT - liquid penetrate testing 38.6 NDT - magnetic particle testing 38.7 NDT - ultrasonic testing	38.1, 38.3, and 38.4, No Change[a] Old 38.2 split into three new tasks (38.5, 38.6 and 38.7) due to specificity of each testing type
39 Backfilling a Trench Following Maintenance	39 Backfilling a trench following maintenance	39.0 Backfilling a trench following maintenance	39.0 No Change[a]
40 Perform General Pipeline Repair Activities	40.1 Tight fitting sleeve 40.2 Oversleeve 40.3 Clock spring 40.4 Plidco split repair sleeve 40.5 Weld plus coupling 40.6 Stopple fitting preparation/sandwich valve installation 40.7 Tapping a pipeline 2" and under 40.8 Tapping a pipeline 2 ½" and larger 40.9 Sealing the pipeline with a stopple plugging machine 40.91 Plugging the pipeline with the lock-o-ring completion plug	40.1 Fit full encirclement welded split sleeve (oversleeve, tight fitting sleeve, etc.) 40.3 Apply composite sleeve 40.4 Install mechanical bolt-on split repair sleeve 40.5 Install weldable compression couplings 40.6 Install and remove plugging machine 40.7 Hot tapping a hole 2 in. or under 40.8 Installing a tap larger than 2 inches on a pipeline 40.9 Installation and removal of a completion plug	New 40.1 includes Old 40.1 and 40.2 combined into one task 40.3 and 40.4, No Change[a] 40.5 Renamed, otherwise, No Change[a] New 40.6 includes Old 40.6 and 40.91 combined into one task 40.7 and 40.8, No Change[a] 40.9 Renamed, otherwise, No Change[a]
41 Conduct Pressure Tests	41 Conduct pressure test	41.0 Conduct pressure test	41.0 No Change[a]
42 Welding on Existing Pipeline Systems	42.1 Repair of arc burns 42.2 Repair of defective welds, other than welds containing cracks 42.3 Repair of a direct pass on a weld containing a defect other than a crack 42.4 Repair of butt welds containing cracks 42.5 Repair of a previously repaired area 42.6 Replacement of a weld or cylinder of pipe	42.7 Welding	Old 42.1, 42.2, 42.3, 42.4, 42.5, 42.6 all combined into one new task

Table C.1—Comparison of the Evolution of the Covered Task List (Continued)

Covered Task from API 1161, 1st Edition (2000)	Old Covered (Sub)—Task Modified (pre-2012)	New Final Covered Task—API 1161, 2nd Edition (2013)	Difference
43 Operations of Pipeline System		43.1 Start-up of a liquid pipeline (control center) 43.2 Shutdown of a liquid pipeline (control center) 43.3 Monitor pressures, flows, communications, and line integrity and maintain them within allowable limits on a liquid pipeline system (control center) 43.4 Remotely operate valves on a liquid pipeline system	43.1 through 43.4, New Tasks Old 18.2 incorporated into new 43.3
44 CPM Leak Detection	44.1 Inspection, testing and calibrations of leak detection equipment 44.2 Verify the leak detection system meets design parameters	44.3 Inspect, test, and maintain a liquid pipeline leak detection flow computer 44.4 Inspection, testing, corrective and preventative maintenance of tank gauging for leak detection 44.5 Prove flow meters for hazardous liquid leak detection 44.6 Maintain flow meters for hazardous liquid leak detection 44.7 Inspect, test and maintain gravitometers/ densitometers for hazardous liquid leak detection 44.8 Inspect, test and maintain temperature transmitters	Old 44.1 and 44.2 replaced by new, expanded tasks (44.3 through 44.8)
45 Operate Pressure Relieving Devices for Launching and Receiving Facilities	Renumbered as 29.1 Launching in-line inspection devices 29.2 Receiving in-line inspection devices	(Removed from Covered Task List)	Does not meet the Four Part Test[b] Any valve operation included in Task 63.4
d	50 Purge gas from a pipeline	c	Gas Task - Not applicable to liquids
d	51 Purge air from a pipeline	c	Gas Task - Not applicable to liquids
d	52 Leakage survey 52.1 Conduct vegetation survey 52.2 Conduct a leak survey with a CGD 52.3 Conduct a leak survey with a flame ionization unit	c	Gas Task - Not applicable to liquids

Table C.1—Comparison of the Evolution of the Covered Task List (Continued)

Covered Task from API 1161, 1st Edition (2000)	Old Covered (Sub)—Task Modified (pre-2012)	New Final Covered Task—API 1161, 2nd Edition (2013)	Difference
d	54 Test remote control shutdown devices	c	Gas Task - Not applicable to liquids
d	55 Maintain fixed gas detection equipment	c	Gas Task - Not applicable to liquids
d	56 Perform incremental pressure increases to uprate MAOP	c	Gas Task - Not applicable to liquids
d	57 Operate odorant equipment	c	Gas Task - Not applicable to liquids
d	58 Monitor odorant level	c	Gas Task - Not applicable to liquids
d	59 Vault maintenance	c	Gas Task - Not applicable to liquids
d	63.1 Start-up of a pipeline (liquids) 63.2 Shutdown of a pipeline 63.3 Monitor pressures, flows, communications and line integrity and maintain them within allowable limits 63.4 Manually or remotely open or close valves or other equipment	63.1 Start-up of a liquid pipeline (field) 63.2 Shutdown of a liquid pipeline (field) 63.3 Monitor pressures, flows, communications, and line integrity and maintain them within allowable limits on a liquid pipeline system (field) 63.4 Locally operate valves on a liquid pipeline system	63.1, 63.2 & 63.4, No Change[a] Old 18.2 incorporated into new 63.3
d	65.1 Start-up of a pipeline (gas) 65.2 Shutdown of a pipeline 65.3 Monitor pressures, flows, communications and line integrity and maintain them within allowable limits 65.4 Manually or remotely open or close valves or other equipment	c	Gas Task - Not applicable to liquids

[a] May include minor editorial changes in title.

[b] See Clause 4.3 for guidance on determining the applicability of the Four Part Test and eligibility as a Covered Task.

[c] Gas covered task that falls outside the scope of the current API 1161 document.

[d] Not included in the original API 1161 Covered task list but added after publication.

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