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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.
Contents
Will be generated during page proof.
Recommended Practice for Pipeline Inspection

1 Scope

This recommended practice (RP) covers the basic requirements and their associated references needed to perform inspection activities safely and effectively during onshore pipeline related construction activities. Use of this document will provide the basis for what pipeline inspectors should have a basic knowledge of and where to find detailed information related to each facet of both new construction and construction related to the maintenance of existing pipelines.

In-line inspection and anomaly evaluation is not included in this document's scope.

The requirements are organized into the following major sections:

— inspector responsibilities,
— personnel and general pipeline safety,
— environmental and pollution control,
— general pipeline construction inspection.

Users of this document include pipeline owner/operators and those individuals either engaged in pipeline construction inspection or seeking to become certified inspectors. Pipeline owner/operators and pipeline inspection service companies should use this document to develop their inspection processes and responsibilities to inspectors as well as developing and enhancing their inspector training programs.

2 Normative References

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

API Specification 5L, Line Pipe
API Recommended Practice 5L1, Railroad Transportation of Line Pipe
API Recommended Practice 5LT, Truck Transportation of Line Pipe
API Recommended Practice 5LW, Transportation of Line Pipe on Barges and Marine Vessels
API Specification 6D, Pipeline Valves
API Recommended Practice 1102, Steel Pipelines Crossing Railroads and Highways, 2007
API Standard 1104, Welding of Pipelines and Related Facilities
API Recommended Practice 1109, Marking Liquid Petroleum Pipeline Facilities
API Recommended Practice 1110, Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids or Carbon Dioxide
API Publication 1157, Hydrostatic Test Water Treatment and Disposal (withdrawn)
Options for Liquid Pipeline Systems
API Recommended Practice 1166, Excavation Monitoring and Observation
ASME B16.51, Pipe Flanges and Flanged Fittings
ASME B16.9, Factory-made Steel Buttwelding Fittings
ASME B16.20, Metallic Gaskets for Pipe Flanges

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1 American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, New York 10036, www.ansi.org
3 Terms, Definitions, and Abbreviations

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

3.1 Terms and Definitions

3.1.1 contractor
An entity that includes the primary organization and any subcontractors engaged in pipeline construction covered by this RP.

3.1.2 inspector
An individual qualified to monitor, assess, evaluate, verify, discuss, decide, resolve, report, and document pipeline construction activities to ensure the requirements of the design, drawings, specifications, regulations, and industry practices are being met safely, efficiently, and in an environmentally sound manner.

There may be numerous types of inspectors, such as utility, coating, welding, and chief inspectors with employment arrangements including owner/operator employees, inspection service company supplied inspectors, or freelance contract inspectors (see annexes for details on other inspector classifications).

3.1.3 owner/operator
An entity, usually a pipeline company, who owns and/or operates and is responsible for pipeline or other utility assets.

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2 American Society for Nondestructive Testing, 1711 Arlingate Lane, P.O. Box 28518, Columbus, OH 43228, www.asnt.org
5 NACE International, 1440 South Creek Drive, Houston, TX 77218-8340, www.nace.org
6 National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471, www.nfpa.org
7 U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Avenue, NW, Washington, DC 20210, www.osha.gov
8 The Society for Protective Coatings, 40 24th Street, Sixth Floor, Pittsburgh, PA 15222, www.sspc.org
NOTE Regulators typically hold operators, not owners (if not one in the same) accountable for regulatory compliance.

### 3.1.4 quality assurance
**QA**
Proactive, process-oriented activities, independent of production, with the goal of preventing nonconformances.

### 3.1.5 quality control
**QC**
Reactive, product-oriented activities with the goal of identifying nonconformances before work is finalized.

### 3.2 Abbreviations

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

- **ACI** American Concrete Institute
- **BMP** best management practices
- **CERCLA** Comprehensive Environmental Response, Compensation and Liability Act
- **CFR** *Code of Federal Regulations*
- **CP** cathodic protection
- **dbA** decibels measured on A scale
- **FWPCA** Federal Water Pollution Control Act, aka Clean Water Act
- **HAZCOM** hazard communication
- **HAZMAT** hazardous material
- **HDD** horizontal directional drilling
- **HVAC** high voltage alternating current
- **GPS** global positioning system
- **IDLH** immediately dangerous to life and health
- **JSA** job safety analysis
- **LFL** lower flammable limit
- **LOTO** lockout/tagout
- **MARSEC** Marine Security
- **MOC** management of change
- **MSDS** material safety data sheet
- **NDE** nondestructive examination
- **NDT** nondestructive testing
- **NORM** naturally occurring radioactive material
- **NPDES** National Pollution Discharge Elimination System
- **OQ** operator qualification
- **PE** professional engineer
- **PEL** permissible exposure limit
- **PPE** personal protective equipment
- **RCRA** Resource Conservation and Recovery Act
4 Pipeline Construction Inspector Responsibilities

4.1 Scope

This section outlines the responsibilities, personal conduct, and job performance expectations for pipeline inspectors that enable them to effectively carry out their duties using the knowledge and skills covered in the following sections on inspector requirements.

An inspector is an individual qualified to monitor, assess, evaluate, verify, discuss, decide, resolve, report, and document pipeline construction and maintenance activities to ensure the requirements of the design, drawings, specifications, regulations, and industry practices are being met safely, efficiently, and in an environmentally sound manner. Inspector or inspection team authority is backed up by contractual provisions that state all work done, as well as material provided, shall be subject, at all times, to inspection by the company in charge of the project.

Owner/Operators are responsible for informing inspectors of particular concerns and their responsibilities at every job site. While inspectors are expected to exercise professional judgment and have expertise in their field, they cannot be expected to arrive on-site with a full understanding of owner/operator concerns unless they have been briefed beforehand.

4.2 Owner/Operator Representative

Inspectors are expected to function as representatives of the owner/operator or the project management firm. The inspector often works for or represents a pipeline company, where strict procedures and/or contract provisions are in place that detail the expectations and obligations of the inspector's performance. Because inspectors occupy the primary quality position in the field, they are expected to proactively seek out potential concerns, mitigate them if appropriate, and accurately report them to the operator.

If required by the owner/operator, inspectors are expected to pass a drug or alcohol test and a background check.

4.3 Quality Assurance and Quality Control

Quality assurance includes those activities focused on providing confidence that quality requirements are consistently fulfilled. Inspectors are expected to be the principal means of assuring work and material quality during field construction and maintenance activities. Early insistence that work is not to be performed without an inspector present strengthens quality assurance and quality control. Any questions that may arise regarding quality and acceptability of work, materials furnished, and services provided are decided upon by the inspector, inspection team, and/or owner/operator. Inspectors are required to reject work, materials, and services that do not meet the standards, contract terms, specifications, drawings, or other requirements of the project. Decisions by the inspector, inspection team, and/or owner/operator regarding quality, acceptability, and materials provided are final and conclusive.

4.4 Relationship with Contractors, Suppliers, and Vendors

Inspectors are expected to establish a professional business relationship with contractors, suppliers, and vendors involved in the project. These relationships should be based on interactions that are characterized by a reasonable, prudent, and forthright attitude and grounded in the highest degree of integrity. Inspectors should remember that contractors function independently with the power and authority to select the means, methods, and manner to perform the contracted work.

Inspectors should not direct contractors, except when required by the owner/operator.
4.5 Planning Activities
Inspectors should mutually plan upcoming tasks with their contractor counterparts, supervisor and owner/operator representatives, which assists in smoother job performance and work completion. This should solidify a team approach in tackling each day's work and lessen the threat of potential problems.

4.6 Authority to Stop Work
Inspectors are empowered and expected to shut down any work on the basis of, but not limited to, conditions, situations, or activities that have occurred, are occurring, or may occur that could result in:

— imminent danger to any person;
— imminent danger to property or the environment;
— substandard quality or work techniques that do not meet owner/operator specifications.

4.7 Reporting
Inspectors are required to report safety and environmental incidents or injuries, non-conformances, deficiencies, unsatisfactory work, thefts, vandalism, missing materials/property, or suspicious activities/occurrences and other concerns in a timely, complete, and accurate manner to the chief inspector (Annex A), project manager, or designated owner/operator personnel depending on the project organization.

4.8 Documentation
Inspectors should complete required documentation in a timely, concise, and accurate manner, including daily inspection reports, pipe tallies, red line drawing markups (showing physical changes) for as-built, extra work authorizations (if allowed by owner), and other reports or forms as directed by the owner/operator.

4.9 Public Relations
Landowners, residents, and the general public with whom the inspector comes in contact frequently consider the inspector to be a representative of the owner/operator. In dealing with these individuals or groups, the inspector should always conform to owner/operator expectations and behave in a professional and courteous manner. Unfavorable publicity from inappropriate behavior could reflect adversely on all parties involved in the construction of the pipeline and the broader industry. Inspectors should ensure that complaints, misunderstandings, and other concerns expressed by landowners, residents, and the public are reported to the appropriate owner/operator representative for investigation and resolution.

4.10 Media Relations
Inspection personnel do not interact with representatives of newspapers, TV, or other media seeking information, unless expressly allowed to do so by the owner/operator. Inquiries from the media should be received in an open, honest way but referred to project management, public relations staff, or others designated by the owner/operator to handle these situations.

4.11 Safety
Each inspector is responsible for their personal safety and share responsibility for those personnel around them. Attentiveness, caution, and hazard awareness (outlined in Section 5) should be a continuous and integral part of each inspector's behavior.

4.12 Ethics
As the inspector represents the owner, they should act ethically, professionally, objectively, and honestly.

Operators should inform inspectors of their policies regarding ethics and behavior and understand the consequences of taking part in any activity that would not withstand the scrutiny of owner/operator management or other observers due to the appearance of the activity. These activities include offers of gifts, entertainment, trips, excursions, etc., offered by contractors, vendors, or suppliers.

Inspectors should avoid and disclose potential conflicts of interest to their employers and clients, such as familial, business, and personal relationships.
All information, data, and knowledge of the affairs of the owner/operator acquired during the performance of work shall be kept confidential and shall not be disclosed to third parties, including social media without prior written consent from the operator.

Inspectors should notify their employer as well as the appropriate operator resource of any ethical concerns and cooperate with investigations and resolution processes.

5 Personnel and General Pipeline Safety Requirements

5.1 General

The requirements set forth in this section should be used to establish pipeline inspector knowledge and awareness of hazards inherent to new pipeline construction and the safety regulations, practices, and responses needed to address these hazards.

It is the duty of pipeline owner/operators and their contractors to be aware of, and comply with, all applicable regulations and manufacturer’s requirements that apply to specific work activities being performed and materials used.

5.2 Job Safety Analysis (JSA)

5.2.1 General

Job safety analysis (JSA) shall be conducted per owner/operator requirements, and inspectors shall participate. This analysis determines potential hazards and the plans and mitigative measures needed to address these hazards. Pipeline owner/operator documents supplement these safety awareness concepts.

The practice of analyzing and planning hazardous jobs, use of written procedures or permits, job review and discussion among key personnel, and walk through inspections ensure personnel understand potential hazards and the precautions needed to address them.

5.2.2 Hazard Recognition

Inspectors should evaluate the following areas to avoid incidents and raise awareness of hazards.

a) Job Site—Job site incidents, including, but not limited to: slips, trips and falls, pinch points, elevated work surfaces, planned lifts, atmospheric conditions, etc.

b) Environmental—Changing environmental conditions, such as flooding, wind, dust, fires, and other potential conditions that could affect personnel and their work performance.

c) Site-specific Hazards—Physical features, such as terrain, waterway crossings, utilities, general right-of-way (ROW) conditions, and other features the pipeline construction activities will encounter as they traverse the selected route.

d) Climatic and Other Work Condition Hazards—The impact of adverse conditions, such as extremely hot weather (which could cause heat exhaustion and heat stroke) and cold weather (frostbite, hypothermia, encumbrance from extra clothing, etc.) on personnel.

e) Materials and Material Handling—Materials, including but not limited to their use, movement, and handling within the job site to consider adverse exposure and potential handling incidents. This may include but not be limited to pipe, valves, fittings, equipment, and materials such as asbestos-containing material, petroleum solvents, and heated materials. Use of safety data sheets (SDS) should be included along with hazard communication (HAZCOM) principles to inform workers of potential hazards and protective measures to be followed. Also, be aware of hazardous materials (HAZMAT) exposed during work activities.

f) Work Task Review—An overall review of all major tasks to be performed since most construction and maintenance activities involve moving equipment and lifting and carrying heavy loads in the proximity of personnel, trenches, holes, welding, metal sparks, and other hazardous activities.
5.3 Occupational Safety

5.3.1 Personal Protective Equipment (PPE)
JSAs identify hazards that necessitate the use of PPE. Inspection personnel should be knowledgeable about personal protective equipment (PPE) requirements, uses, and limitations. PPE for pipeline construction activities includes but is not limited to approved eye, head, foot, hand, and hearing protection; safety apparel; respiratory devices; various protective shields; personal gas monitors, and fall protection.

5.3.2 Near Misses
Inspectors should be familiar with near-miss programs, which formalize observation, analysis, reporting, and communication of occurrences which had the potential to, but did not, lead to injury or damage. These programs can improve awareness and avoid future reoccurrences. Near misses should be discussed and communicated with everyone on the job site.

5.3.3 Safety Meetings
Inspectors should be capable of organizing and conducting daily safety meetings, prior to beginning work, to cover such topics as potential hazards likely to be encountered, precautions necessary to lessen their threat, use of PPE, lessons learned, near misses, and other topics relevant to the safety of workers, the general public, the inspection team, and potential property damage.

5.4 Property Protection

5.4.1 Loss Prevention
Inspectors should have a basic knowledge of general loss prevention systems and may be required to have additional training in owner/operator-specific processes. Inspectors should be familiar with these systems, which are designed to aid in observation, analysis, and reporting occurrences or actions that could harm or damage property, equipment, or materials.
Examples include: lifting/hoisting pipe and equipment, excavation near pipelines or other utilities, marking/labeling, and other programs to increase awareness.

5.5 Protective Measures for Radiation
Inspectors should be aware of valid certification and licensing of nondestructive testing (NDT) personnel handling radioactive sources. Inspectors should also be aware of signage and safety monitoring rules and requirements. NDT inspectors also should know the rules and regulations for the locality that they are working in.
Inspectors should be familiar with radiation exposure dosage limits, monitoring methods, precautions needed, and documentation of radiation exposure.

5.6 Job Site and Facility Security
Inspectors should have knowledge of the measures needed to ensure public and worker safety as well as safeguards for equipment, property, and materials such as the following.
— Procedures for site security and other safekeeping procedures, including use of surveillance and monitoring devices, security personnel, barriers, locking devices/systems, fencing, and other methods to deny access to materials, supplies, and equipment.
— Traffic control, barrier, and marking procedures
— Familiarity with and requirements for transportation worker identification credentials (TWIC) and maritime levels of security (MARSEC). This is only necessary when working in facilities covered by these requirements. Owner/operators should provide training on the pertinent requirements.
Inspectors are responsible for recognizing and reporting security concerns to the operator, including but not limited to:

- Terrorist threats
- Threats of sabotage
- Threats of violence, including workplace violence
- Labor disruptions, protests or work stoppages

5.7 Work Permits

5.7.1 General
Inspectors should have knowledge of work situations that require work permits and the permit limitations and restrictions. Required permitting is specific to owner/operator requirements, and inspectors should have general knowledge of all identified areas, including but not limited to the following:

- confined space entry;
- isolation of hazardous energy sources;
- hot work;
- excavation;
- explosive blasting;
- Working at heights.

5.7.2 Road and Highway Use
Inspectors should have knowledge of permit requirements and restrictions for heavy equipment, stringing trucks, and tracked equipment (either its movement or hauling from one location to another) as to any size and weight restrictions relative to the roads and bridges being used by these types of vehicles.

5.8 Rigging and Lifting Safety
Rigging and lifting requirements are owner/operator-specific programs. Inspectors should have general knowledge of the following:

- rigging techniques, terminology, labeling, tagging, and inspection prior to use;
- lifting devices and types, terminology, locating and observing condition of equipment, extension and boom height limits, device inspection requirements, hand signals, proficiency of personnel involved in rigging and machine operation, suspended loads over personnel, and reporting unacceptable practices.

5.9 Isolation of Hazardous Energy Sources

5.9.1 General
Inspectors should understand when and how electrical, mechanical equipment, or pressure in the system is de-energized and isolated to prevent unexpected startup or release of stored energy that may cause a hazard.

5.9.2 Electrical Energy Sources
Inspectors should recognize energy sources, de-energized and energized, requiring lockout/tagout (LOTO) or other practices to prevent exposure to electrical hazards.

5.9.3 Other Energy Sources
Inspectors should recognize equipment and piping, valves, etc. requiring LOTO or other precautions to prevent exposure to machinery operation or pressure release.

5.10 Excavation, Trenching, and Boring Safety

5.10.1 General
Inspectors should be knowledgeable about excavation safety. Pipeline construction and maintenance activities frequently involve an extensive amount of excavation and trenching work in one form or another. As a result,
the existence of and exposure to potential hazards related to this activity is widespread. Because of the magnitude of this activity and its associated hazards, pipeline inspectors are required to know what facets to observe, how to take corrective action, and what protective systems and procedures should be employed.

5.10.2 One Call

One call is an excavation notification system set up to coordinate excavators’ activities with utility owner/operators to prevent damage to underground facilities. Inspectors should have an understanding of these systems, know the appropriate contact information for the area of pipeline construction activity, and assure the work can proceed safely after utilities are located and marked by the one call responder(s). (See CGA’s Best Practices—Chapter 3, One Call Center.)

NOTE One call only applies to US & Canada

5.10.3 Excavation Regulations and Requirements

Regulations around excavations should be part of pipeline inspector’s knowledge. These provisions are often supplemented by pipeline owner/operator requirements.

Inspectors should know pertinent definitions such as competent person, benching, sloping, and shields as well as hazardous conditions that could be present and precautionary measures to be considered prior to and during trenching/excavations (competent person).

It is also important to know about spoil placement, soil classification, soil testing procedures, and the soil types along with the use of test equipment, protective measures needed, documentation requirements, and the potential impact of other factors, such as weather conditions, traffic, groundwater, and machinery operating near excavations. Additionally it is important to know the plans for handling and disposal of previously existing contaminated materials.

5.10.4 Use of Explosives for Excavation

Inspectors should have a basic understanding of blasting plans, how explosives are used, the hazards associated with their use, and precautionary measures to be taken to ensure the safety of workers and the general public. Inspectors should know the operator procedures for blasting as well as the contractor’s blasting plan.

5.10.5 Foreign Crossings (other utilities)

Inspectors should be familiar with location and marking methods for utilities such as pipelines, telephone lines, television cables, sewers, fiber optic cables, electric lines, water pipes, and other underground (or overhead) structures, marking such structures, and communicating with third-party utility owner/operators to prevent damage due to mechanized excavation activities. Inspectors should also be familiar with how to monitor and assess hand digging, hydro-vacuum, dry air techniques, and other non-mechanized means to uncover these utilities when working near underground structures as well as how to support exposed lines once they are uncovered. (See CGA’s Best Practices—Chapters 3, 4, and 5 and Appendices A and B.)

5.11 Confined Space Entry Requirements

5.11.1 General

Inspectors should be familiar with the confined space requirements for pipeline construction and maintenance. A confined space is a space that can be bodily entered by an individual but is not designed for continuous occupancy and has a limited and restricted means of entrance or exit (egress). Inspectors should also be aware that areas may contain an atmosphere that is hazardous (toxic, explosive, oxygen deficient, or otherwise harmful to personnel). Inspectors should be aware that permits are required for confined space entry when either a hazardous atmosphere exists, it contains material where an occupant could be engulfed, or is configured where an occupant could be trapped.

5.11.2 Rescue and Emergency Services

[see OSHA 1910.146(k)]

5.12 Atmospheric Testing
5.12.1 General
Inspectors should be knowledgeable about conditions that may require atmospheric testing. Atmospheric testing, particularly in cases involving confined spaces, hot work, and work in hazardous areas, is required to evaluate the hazards of a work space. A hazardous atmosphere means an atmosphere that may be immediately dangerous to life and health (IDLH) or exceeds permissible exposure limits (PELs). Conditions which may require testing are:
- flammable gas, vapor, mist, or dust in excess of LFL;
- hydrocarbon gas in excess of permissible LEL
- oxygen deficient/excess environments where oxygen levels are IDLH (below 19.5% or above 23.5%);
- other atmospheric conditions or concentrations of toxic contaminants that may be IDLH, such as H2S and benzene.

5.12.2 Other Facets of Atmospheric Testing
Inspectors should have an understanding and knowledge of the following facets of atmospheric testing:
- products and materials including HAZMAT being used on the job site that could be exposed during work activities and create hazards to personnel safety (see OSHA 1926.57);
- Physical properties of toxins (lighter/heavier than air, etc.) and PELs, including use of SDS information;
- Measurement and monitoring techniques and use of testing equipment, procedures to calibrate this equipment, calibration frequency, and calibration verification;
- precautionary measures to be taken considering the findings from testing and monitoring both prior to entry into or work episodes within a hazardous atmosphere.

5.13 Respiratory Protection
Inspectors should be knowledgeable about conditions that may require utilization of dust masks, SCBA or air-purifying respirators. Inspectors should be aware of the different types of equipment, the availability and accessibility of respirator equipment, including air-purifying, air-supplied, and SCBA respirators, and when respirators may be needed.

5.14 Fall Prevention and Protective Systems

5.14.1 General
New pipeline construction work sites commonly have fall and tripping hazards primarily due to extensive excavations, rugged and varied terrain features, and the constant movement of the work.Inspectors should be aware of owner/operator requirements addressing these hazards.

5.14.2 Fall/Tripping Hazard Measures
Inspectors should be able to observe, recognize, assess, and be prepared to take appropriate action on the following fall hazards:
- the nature and extent of fall hazards;
  - fall protective systems such as barricades, fall prevention markers, limitations on access, and other protection systems in place as well as construction personnel awareness of potential fall hazards;
  - general housekeeping within the work area and adequacy of work site illumination to minimize fall and tripping hazards.

5.15 Scaffolding and Ladders
Scaffolding and ladders are occasionally used in pipeline construction and maintenance. Inspectors should be familiar with when scaffolding is needed, how it is to be used safely, and proper erection/construction by qualified scaffold erectors. Inspectors should be aware of owner/operator requirements covering safe use of scaffolding.
Inspectors should be familiar with safe ladder use as well as assuring the proper equipment is used for the work situation (see OSHA 1926.1053 and 1926.1060). Inspectors should be aware of owner/operator requirements regarding safe use of ladders.

5.16 Use, Movement, Storage, and Inspection of Tools, Equipment, and Materials

5.16.1 General

It is a contractor’s responsibility to inspect and maintain and safely use their equipment. Inspectors should be aware and observant of the use, movement, storage, condition, and inspection of tools, equipment, and materials being used in pipeline construction and maintenance work, even though these materials may be owned and used by the contractor.

5.16.2 Transportation, Use, and Storage of Flammable and Combustible Liquids

Inspectors should observe and ensure that contractors are complying with the requirements for the way flammable and combustible liquids are being moved and handled.

— Flammable Liquids—Liquids having a flashpoint below 100 °F (37.8 °C) are known as Class I liquids. The most common is gasoline.

— Combustible Liquids—Liquids having a flashpoint at or above 100 °F (37.8 °C) and are known as Class II liquids. The most common are diesel fuel; Class III liquids include jet fuel and motor oil. (See NFPA 30)

Inspectors should know how these liquids are used, transported, and stored, which requires ongoing observation and correction action when safety is jeopardized. Fueling practices, condition of equipment, containers, signs, and spillage are additional areas of interest for inspectors.

5.16.3 Transportation, Handling, Labeling, Storage, and Use of Compressed Gases

Inspectors should be aware of the proper use, movement, handling, and storage of pressurized gases.

Typical compressed gases used in pipeline construction and maintenance activities include: oxygen and acetylene (welding/cutting operations), nitrogen (purging), LPG (heating/drying), and compressed air (pneumatic tools, grit blasting, tire inflation, painting, etc.). Inspector’s knowledge of the properties of these gasses aids in their safe handling, storage, and use.

All compressed gas cylinders and tanks should be properly secured and labeled when transported and stored with valve protective caps in place when cylinders are not in use. Cylinders, safety release devices, and piping should be regularly inspected to ensure the equipment and its appurtenances are in acceptable condition.

Nitrogen supplied from truck tanks (large cylinders), piping, connections, and appurtenances should be checked for safe design, periodic inspection and testing, installation, and use.

Compressed Air—Compression equipment should be in serviceable condition for the service needed with operable safety devices in place. Hoses, piping, and connections should be checked for suitability for service and safe placement to prevent damage or rupture. Use of compressed air should follow established safety practices.

5.16.4 Safe Use of Tools, Equipment, and Materials

5.16.4.1 General

Inspectors should monitor the following for both safety and job efficiency purposes.

5.16.4.2 Tools

Pipeline construction requires many different kinds of tools, from hand tools to various power tools (electric and pneumatic), and with the large number and types of tools, numerous hazards exist.

Key factors for avoiding these hazards include:

− use the right tool for the job;
− tool condition;
− correct use of the tool;
− safety features such as guards and welding hoods are in place;
o personnel are properly using protective equipment, including but not limited to: hard hats, facial shields, and other PPE as well as suitable clothing for the type of work.

5.16.4.3 Motorized Work Equipment

Work equipment from large trucks to tracked dozers/side booms to trenching equipment and other machinery may be employed from one end of the job site (spread) to the other. The safety issues to be considered with this equipment when working near or around it as they move throughout the spread while carrying and lowering loads include:

— operator actions and ability to smoothly and properly operate his/her assigned machine (i.e. an indication of the level of training, operating proficiency, awareness of his/her surroundings, and ability to follow hand signals and safety rules);
— equipment condition, maintenance level, and protective equipment in place;
— correct equipment and operation for the job (e.g. lifting capacity, boom positions, stabilizer use, and load limitations).

5.17 Facility, Commissioning, and Pre-start-up Review

Inspectors should be familiar with pipeline owner/operator pre-start-up review procedures and checklists.

5.18 Management of Change

Inspectors should understand owner/operator management of change (MOC) requirements and why adherence to them can prevent incidents. In the case of construction, MOC concepts recognize, document, and communicate such factors as changes in personnel, organizational makeup, physical configuration/layouts, equipment, site conditions, materials, and procedures, if required.

5.19 Regulatory Agency Inspections

Inspectors should follow pipeline operator procedures in handling regulatory inspection of pipeline activities. These agencies have the authority to come on the job site to inspect activities and documents/records. Inspectors should be able to determine the agency involved, determine their objectives, verify credentials, and know the requirements set forth by the owner/operator on providing information and safe job site access to the agency conducting the inspection.

5.20 Vehicle Operation

Inspectors operate various types of vehicles off and on the pipeline ROW, including vehicles that may be company owned, rented/leased, or personal vehicles. Inspectors should understand the owner/operator policies and procedures governing the use of vehicles and be licensed appropriately. Additionally, inspectors should be able to identify vehicles which may not be suitable for operation and are driven with due care and attention and according to the conditions of the road and weather.

5.21 Fatigue and Fitness for Duty

Inspectors should be able to recognize when personnel appear either physically or mentally unfit to perform work and other activities associated with work, including driving. Operators should communicate fatigue management plans with inspectors and contractors to ensure that all personnel are operating at full capacity.

6 Environmental and Pollution Control Requirements

6.1 General

This section outlines the requirements to be used to establish the pipeline inspector’s knowledge of environmental protection and pollution control to ensure compliance with regulations, industry practices, and pipeline owner/operator requirements. Inspectors with basic knowledge of the areas below should have an improved ability to observe, monitor, verify, report, and correct deficiencies involving protection of the environment.

If the owner/operator has procedures for compliance in this area the inspector should understand where their job function involves covered activities. The owner/operator is responsible for identifying environmental and
pollution control requirements prior to initiating work activities and effectively communicating them to the inspector. The inspector is responsible for adhering to owner/operator procedures, ensuring that they are followed in the field, and reporting to the owner/operator. Additionally, the inspector should exercise their professional judgment with regard to environmental and pollution hazards.

6.2 Erosion, Sediment, and Runoff Control on the Pipeline ROW

Inspectors should have an understanding that excavation work, earthmoving, clearing, and other similar activities associated with pipeline construction have the potential to impact the environment. Inspectors should be observant of these activities to avoid incidents. Inspectors should be familiar with key practices which will aid in safeguarding the environment:

— the installation, uses, and maintenance of erosion, sediment, and runoff controls, such as diversion devices, silt fences, and other equipment for control of surface water;
— familiarity with storm water pollution prevention plans (SWP3), including federal and state plans (where construction is taking place);
— local revegetation requirements and pipeline owner/operator practices consistent with the needs of the ROW, landowners, and local practices should be reviewed by the inspection team.

6.3 Regulatory Environmental and Water Crossing Permits

Operators are responsible for verifying that environmental permits have been granted prior to commencing work and transmitting permits to inspectors and contractors. Inspectors shall ensure that permit conditions are met.

6.4 Site Specific Environmental Concerns

6.4.1 General

Pipeline operators conduct examinations of the job location for potential environmental concerns, which may include, but are not limited to issues of cultural importance, endangered species, and resource use. A report should be provided by the owner/operator prior to construction that outlines the statutes and the precautions/actions that apply to the project.

Environmental compliance is a shared responsibility, and all members of the Project Team are responsible for ensuring that construction activities are conducted in compliance with environmental permits and requirements. Contract provisions generally highlight those statutes that were considered during the project planning phase. However, they may not be complete, and inspectors should use their best judgment to determine the presence or potential of hazards which were not identified to them by the operator.

6.4.2 Cultural and Heritage Concerns

Inspectors should be familiarized with local cultural and heritage concerns and how they may impact owner/operator operations. Various regulatory guidelines seek to avoid, minimize, or mitigate adverse effects on historic properties and often set out the archeological issues relating to economic development and the resultant construction activity.

6.4.3 Flora and Fauna Concerns

Pipeline operators should communicate flora and fauna of concern to the inspector. Inspectors should be familiar with procedures regarding the identification of flora and fauna of concern and the appropriate course of action following that identification.

6.4.4 Solid and Hazardous Waste Concerns

Pipeline operators should communicate solid and hazardous waste concerns to the inspector. Inspectors should be familiar with procedures regarding solid and hazardous waste concerns and the appropriate course of action following its identification.

6.4.5 Environmental Contamination
Pipeline operators should communicate environmental contamination concerns to the inspector. Inspectors should be familiar with procedures regarding environmental contamination and the appropriate course of action following its identification.

6.4.6 Hazardous Materials
Inspectors should have a general understanding of the following:
— designation of HAZMAT;
— identification and listing of hazardous waste;
   — hazardous waste table, HAZCOM, and emergency response information;
— general information and definitions.

6.5 Water Crossing Permits
Inspectors should be familiar with permits granted regarding waterway crossings, water bodies, and wetlands, including the following.
— Inspectors should be familiar with and knowledgeable of types of crossing permits and the governmental agencies overseeing these permits(s).
— Inspectors should have an understanding of different water crossing installation and timing practices to comply with permit provisions.
— Inspectors should have an understanding of requirements for waterway and water body bank restoration, stabilization, and erosion control measures, including facilities to minimize erosion.
— Inspectors should be knowledgeable of owner/operator procedures and expectations for inspections by responsible agencies, including determining the objective of the inspection, checking credentials, and knowing who should handle escorting the inspection personnel and answer their questions.
— Inspectors should have an understanding of permit documentation requirements and closeout procedures, including any deadlines.

6.6 Use of Natural Water Sources
Inspector should understand the rules governing water withdrawal from and discharges to any natural water sources for water used on the ROW including for hydrostatic test medium.
— Inspectors should have an understanding of withdrawal and/or discharge/disposal requirements within permits and operator procedures, including limitations on amounts of water used or discharged and the measurement of those quantities.
— Inspectors should have an understanding of discharge velocity, turbidity, and other restrictions, including but not limited to sediment and other foreign substances, control and planned treatment, filtration, or other methods needed to meet water quality provisions.
— Inspectors should be familiar with sampling methods, procedures, and protocols to comply with permit and/or regulatory provisions.

6.7 Handling Contamination Issues
Inspectors should strive to prevent environmental contamination. In the event of an incident, inspectors should immediately report the event to the owner/operator and be aware of owner/operator’s mitigation procedures. Inspectors should have a basic awareness of how to identify contamination and who to contact in an event of an incident. Inspectors should:
— know the procedures to obtain samples, request analytical work, and recognize, handle, and monitor contaminated substances such as: soil, pipe coating, fuels, solvents, and other waste and/or contaminants [e.g. asbestos, chromate, horizontal directional drilling (HDD) mud, and other potentially toxic/hazardous substances];
— ensure RCRA provisions are followed, if required, including waste generation and disposal activities related to the pipeline project in accordance with owner operator expectations;
— check the plan of action for the remediation of suspected or actual contamination and best practices for remediation, [e.g. fuel and drilling mud spills or other contamination]. Inspectors should have knowledge of who to contact and what response, if any, the inspector may need to take in the event of an incident;
— monitor good housekeeping practices to collect and remove waste, including those classified as hazardous, from the work site at regular intervals;
— have knowledge of the requirements in SPCC plans developed by or for pipeline owner/operators and approved and certified by a PE;
— review key points within prevention and pollution control best management practices (BMP) set forth by the U.S. EPA as they may apply to owner/operator requirements.

7 General Pipeline Construction Inspection

7.1 Scope

The requirements outlined in this section spell out the areas of knowledge that a qualified pipeline inspector needs to effectively perform his duties on the ground as the activity progresses through all stages. This section covers construction or maintenance-related areas that the inspectors are called upon to inspect, evaluate compliance versus requirements, resolve issues, assess and foster job progress, report observations/findings, and complete the documentation necessary to meet the expectations of the pipeline owner/operator or other entity in charge of the construction project.

7.2 Verification of Construction Personnel Qualifications

7.2.1 General

Inspectors should use the following to facilitate their verification process for key personnel performing work on the project.

7.2.2 Operator Qualification (OQ)

Inspectors operating in the United States should understand the concepts of OQ, including but not limited to covered tasks and evaluation of qualifications. Inspectors should know which tasks related to their purview are covered tasks (e.g. inspection activities for tie-ins, application and repair of external coating, line locating, excavation of foreign utilities, and backfilling a trench).

While Inspection activities are not considered OQ tasks, some pipeline operators require inspectors to be OQ certified for tasks under their purview.

See API 1161 and B31Q for further information about Operator Qualification programs.

7.2.3 Verification Procedures

Assurance of certification and/or qualification is a necessary step in achieving proper performance and project quality objectives. Inspectors should be prepared to check and verify the certifications and/or other qualification documentation of certain crucial pipeline construction personnel and technicians performing specialized work, including quality and materials examination and testing. The key areas to verify certification and qualification include, but are not limited to (see ASME B31.4 Sections 434.1, 434.2, and 434.3; ASME B31.8 Sections 802.2.5, 806, and 841.2.2; and ANSI/ASNT SNT-TC-1A):
— welders,
— heavy equipment operators,
— blasting/explosive personnel,
— excavation (competent personnel),
— NDE/NDT technicians,
— coating personnel,
— corrosion control technicians,
— safety professionals,
— environmental specialists,
— qualified pipeline inspectors.

Pipeline regulation, code, standard, and practice references, such as 49 CFR 195, ASME B31.4, ASME B31.8, API, ASNT, AWS, and NACE, contain various provisions for use of certified, qualified, and/or competent personnel, including pipeline construction inspectors.

7.3 ROW Inspection Requirements

7.3.1 General

Pipeline inspectors should be familiar with the following ROW-related requirements (see ASME B31.4 Section 434.3; ASME B31.8 Sections 802.2.5, 806, and 841.2.2; 49 CFR 195.210; and 49 CFR 192).

7.3.2 Pipeline Route Review

Inspectors should know how to observe and report any discovered or any potential pipeline route selection deficiencies or obstacles, such as terrain features; landowner issues; road, railroad, or waterway crossings; environmental features; cultural features; and protected resources (i.e. drinking water and proximity to occupied facilities).

7.3.3 Land Surveying Aspects

Inspectors should be familiar with basic land surveying terminology and definitions, including section, range, and township references, legal property descriptions, metes and bounds descriptions, fee property details, color coding of flagging, and other basic Public Land Surveying System information. (See ASME B31.4 Section 434.33.)

7.3.4 Pipeline Stationing

Inspectors should be familiar with pipeline stationing and equations. Pipeline stationing and equations, including how they are determined, is defined by the owner/operator. Typically, pipeline stationing is notated in linear survey measurements and shown in hundreds with additional distance units shown as pluses. For example, 10,000 would be 100+00. Equations are used to correct the survey stationing when pipe is either added or taken out of the pipeline, necessitated, for example, by pipeline relocation. Inspectors should also understand the difference between and use of construction stationing and as-built stationing.

7.3.5 ROW Agreement Provisions

Inspectors should be knowledgeable of typical ROW agreement provisions and how and where to find the provisions in the following areas.

− Widths specified in the ROW agreement that grants an easement or legal right to work within and use the defined strip of land or area.
− Typical limitations, restrictions, and special conditions spelled out in the ROW agreement that could include temporary work space, special conditions that recognize adjacent property or structures, or access provisions.
− Ingress and egress provisions that facilitate access to and exits from the easement for work equipment and vehicles and surface damage provisions, including types of crops, trees, orchards, other ROW cover, landowner structures such as fences, drain tile, cattle guards, soil compaction, and other potential damage from construction.
− Specific instructions/agreements between the landowner and the pipeline owner regarding the easement and construction activities (i.e. preservation of certain areas, ownership of cleared trees, etc.). These are typically found on “line lists” developed and maintained by the land agents.

7.3.6 Other Defined Land Use

Inspectors should know what to look for in the following areas within and outside the construction spread as to space, dimensions, and location, including but not limited to the following.
— Work areas that may require extra space beyond the ROW to facilitate construction activities, such as waterway and roadway crossings.

— Material storage/staging areas, including pipe yards and lay down areas (e.g. space to weld up pipe for installing a waterway crossing).

— Equipment parking areas where machinery that is not in current use, such as cranes and derricks, dozers, side boom tractors, and equipment hauling tractor/trailers, can be held/staged near the construction spread until needed.

— Fee property needed for the project, which typically includes pump station or compressor station sites, block valve sites, and rectifier/ground bed locations.

7.3.7 Pipeline and Site Staking and Marking Conventions

Inspectors should understand the following as to survey directions for the pipeline route and directives for construction.

— Nomenclature on stakes and markers and its meaning—usually this includes information such as: pipeline stationing, direction changes, additional ditch depth, changes in pipe wall thickness, etc.

— Maintaining these items during construction and how to reestablish destroyed, damaged, or misplaced stakes and/or markers. A surveying contractor typically is called in to reestablish missing markers/stakes.

— Color coding of the survey flagging for common utilities, construction centerline, edge of easement, edge of temporary work space, and extra work space.

7.4 Locating and Marking Requirements

Inspectors should be knowledgeable of procedures for proper location of underground facilities being crossed or near the construction and the temporary marking of them during construction to ensure safety and avoid/minimize damage. Inspectors should:

— understand the contractor’s and operator’s approved foreign utility locating techniques, including probing (if allowed), use of electronic locators, and other equipment/means and procedures used to accurately locate underground utilities or structures;

— understand the One Call systems in the area where construction is taking place, including how the systems(s) work, pertinent phone numbers, insisting on third-party response and use of suitable markers, and who is responsible to make One Call notifications—typically the contractor is responsible for the notifying One Call. The Inspector is typically required to verify that One Call has been informed prior to excavation commencing;

— be familiar with the owner/operator specifications as applicable and contractor’s procedures for road and railway crossings, including markers, safety signs, barricades, and other safety features, especially those required by crossing permits and/or governmental authorities;

— know the owner/operator requirements for location of permanent pipeline markers, including warning signs, aerial markers, and waterway crossing signs, for placement during cleanup operations.

See the Common Ground Alliance Best Practices and API 1109 for further details on marking and locating.

7.5 ROW Preparation Requirements

7.5.1 General

Inspectors should be knowledgeable of owner/operator ROW preparation requirements. After construction begins, the inspectors should observe, monitor, and verify adherence to specifications and ROW agreements and deal with landowners/tenants or coordinate with the responsible party (i.e. land agent and other interested parties in the following areas).

7.5.2 Clearing, Grubbing, and Grading

Inspectors should be knowledgeable of owner/operator requirements for clearing, grubbing, and grading. Clearing means removal and disposal of all brush, undergrowth, and timber. Grubbing means removal and disposal of stumps and roots within the specified ROW. Grading involves the flattening, sloping, or other
excavation to modify the terrain along the pipeline route to make it safe and accessible for construction. Inspectors should know what needs to be moved out of the way, including trees, brush, and other vegetation; grass; certain rocks; and other obstacles, and if the preparation work allows the passage of construction equipment and other vehicles to facilitate the safe and satisfactory progress of the construction. In monitoring these activities, inspectors should consider the following:

— equipment for the job is suitable for the work involved, including sufficient size, power, and operating condition;
— how the equipment is being used to minimize collateral damage and assuring that equipment operators are aware of their surroundings and operate their machines in a competent manner;
— the end result of these operations (i.e. the finished work meets owner/operator specifications, and the prepared ROW allows construction to proceed smoothly and safely);
— that clearing, grubbing, and grading are typically permitted activities and that those activities meet the permit conditions.

7.5.3 Landowner/Tenant Assets
Inspectors should be aware of landowner requirements, including but not limited to the following: monitoring removal of permanent fencing, installation of temporary fencing and gates, handling cattle guards, construction pathway offsets, and bypassing other man-made facilities which aid in smooth construction progress and minimize landowner/tenant concerns and damage to surrounding property. These requirements are normally found on the construction “line list” typically developed and maintained by the land agents.

7.5.4 Interfacing with Landowners/Tenants
Inspectors should conduct open and forthright communication with landowner/tenants in communicating construction plans and requesting feedback on concerns and meet with the owner/operator concerning the release of procedures in order to minimize discontent and misunderstandings. Some owner/operators require that this function be done by the land agents, but there is usually interaction between the landowners and the inspectors.

7.6 Ditching and Excavation Requirements

7.6.1 General
Inspectors should know proper ditching and excavations procedures to ensure correct pipeline alignment, depth, width, slope, and spoil placement to facilitate efficient and safe pipe laying operations. Inspectors should consider the following in overseeing this aspect of the project (see ASME B31.4 Sections 434.3.2 and 434.6)

7.6.2 Damage Prevention Practices During Ditching/Excavation Work

7.6.2.1 General
Inspectors should be knowledgeable about damage prevention practices, including but not limited to the following.

7.6.2.2 Underground Utilities
Ensure that one call notification procedures have been followed, that crossed utilities are clearly marked and uncovered by non-mechanized means as per the owner/operator guidelines and foreign utility crossing procedure (i.e. hand digging, hydro-vacuum, or other means to prevent damage to the lines), and that uncovered utilities are properly supported to maintain their integrity (see CGA’s Best Practices, API 1166, and state one call systems).

7.6.2.3 Other Physical Property near the Excavation
Ensure adequate space is maintained between other structures and ditching/excavation equipment and that placement of spoil does not damage adjacent structures or other assets nor impede traffic and/or other pathways.

7.6.3 Ditch Features
7.6.3.1 General
Inspectors should monitor, measure, and report, if required, and conduct continual excavation inspections in the following areas related to the ditching operation and in accordance with applicable regulations.

7.6.3.2 Ditch Specifications
Ensure the specifications are followed for: ditch depth and width, bottom of ditch condition (i.e. uniform bearing surface, free of hard objects, free of water, use of dirt pads, and where possible, depth adjustments are made to minimize the need for sags and overbends).

7.6.3.3 Breaks in the Ditch
Verify that breaks are left in the ditch to allow passage of vehicles, livestock, and/or wildlife.

7.6.3.4 Extra Depth Ditch Requirements
Ensure depth specifications are met and observe and measure where extra depth starts and ends and record this information.

7.6.3.5 Multilevel Ditch Requirements
Ensure that the designated levels of soil are properly removed and separated in accordance with specifications [e.g. top soil (higher quality soil) is separated from deeper ditch spoil and/or multiple stratifications].

7.6.3.6 Ditch Breakers
Ensure that ditch breakers are installed as required at the edge of wetlands in accordance with the permits and construction specifications.

7.6.4 Open Ditch Restrictions
Inspectors should monitor the distance between the front end of ditching and the back end (backfill) and the amount of open ditch allowed by construction specifications.

7.6.5 Foreign Line and Other Structure Crossings
Inspectors should ensure that care and attentiveness is used in crossing foreign lines, including pipelines, other utilities, and farmland drainage systems. Inspectors also should ensure that the space between the new pipeline and other existing structures is in accordance with specifications (usually 12 in. to 24 in.) and that acceptable temporary installations are used and are suitable for the service required.

7.6.6 Soil Characteristics
7.6.6.1 General
Inspectors should have knowledge of methods to ensure ditching/excavation safety and specifically to address the threat of cave-in.

7.6.6.2 Soil Analysis
Inspectors should have an understanding of proper analysis of the types of soil encountered, including moisture content, compaction, angle of response, and relative stability, and should know who is the project’s competent person(s) for soil assessments.

7.6.6.3 Ditch Sloping or Other Ditch Configurations
Inspectors should be aware of ditch depth/width configurations and the ditch proximity to equipment movement / operation relative to the type of soil involved.

7.6.7 Shoring Requirements
Inspectors should check use of trench boxes, bracing, and other ditch shoring requirements and adequacy of documentation evidencing certification of the devices. Inspectors should be knowledgeable in the use of and restrictions of shoring and bracing when it is required.

7.6.8 Rock Excavation Requirements
Inspectors should know proper ditching and excavation procedures in rocky terrain to ensure the safety of personnel and proper placement and protection of the pipeline. Inspectors should check, measure, document, and report, when necessary, rock excavation. In rock excavation, owner/operators typically prefer use of mechanized equipment, such as track mounted rippers, pavement breakers, specially equipped track hoes, or ditching machines to cut through, break up, and remove rock. Inspectors should be able to perform the following:

— observe and assess the equipment being used as to size, type, condition and effectiveness, and limitations;
— ensure that depth specifications are met and accurate measurements are performed to ascertain any extra work authorization or to account for any special bid pricing.

7.6.9 Drilling and Blasting
Inspectors should understand the basics of this process, but specialized training and experience is often needed to inspect these activities (see Annex B).

Blasting activities that should be monitored include:
— checking permits, notifications, and warning signage;
— competency of personnel;
— charge placement procedures;
— amount of explosive used per blast;
— precautions around structures;
— charge padding (soil or blast mats) to avoid excessive heaving or debris scatter;
— adherence to owner/operator specifications;
— presence of a blasting plan.

7.6.10 HDD Requirements
Inspectors should know the basic process and requirements of HDD, but it is advisable to utilize an inspector with specialized training and experience in this facet of construction (see Annex C).

The following HDD activities should be monitored:
— HDD equipment size, type, condition, and suitability for the job;
— competence and proficiency of equipment operators and their supervision;
— drilling follows the specified profile, alignment, tolerances, and entry/exit locations;
— reaming, pull back procedures, and equipment and pipe string layout follow industry practice and specifications;
— use, containment, and disposal of drilling mud follow accepted practices;
— inadvertent returns of the drilling mud to the surface.

7.7 Pipe Handling, Hauling, and Stringing Operations
Inspectors should monitor, assess, and document the condition of the pipe in each phase below (see API 5L1, API 5LT, API 5LW, ASME B31.4 Section 434.5, ASME B31.8 Section 806).

Inspectors should be knowledgeable of work activities involved in moving pipe: the type and condition of equipment used, such as fabric slings, padded calipers, soft lift hooks, and other approved lifting devices; boom height versus surrounding structures, such as power lines; stacking procedures (number of tiers and padding); and other precautionary steps to protect the pipe and any coating. (See ASME B31.4 Section 434.4.)

Inspectors should complete pipe tallies; check mill certifications, heat numbers, and mill test reports; and note pipe marking on received pipe at rail heads, docks, or other receipt locations to facilitate proper tracking and documentation and to ensure correct placement by wall thickness, grade, and coating.
Inspectors should observe and note pipe and coating condition, including bevels, presence of dents, gouges, scratches, notches, grooves, or other defects, and report noted damage along with measurements of size and extent of any damage and its location. Reports of damage should be made in accordance with owner/operator procedures.

Inspectors should check locations of required gaps or spaces in strung pipe, where needed, to allow passage of equipment, vehicles, personnel, and livestock and at foreign utility crossings, if required.

Inspectors should check pipe handling and placement during stringing to minimize damage, document any assessed damage, and that ensure strung pipe is not in harm’s way from ongoing construction activities and that stringing enables a smooth pipe laying progress.

### 7.8 Piping Components, Materials, and Other Mainline Appurtenances

Inspectors should verify materials meet job specifications, including but not limited to bills of materials and drawings, check mill test reports, certification records, and markings; match components with specifications to ensure suitability for the intended service; and know what to look for when visually inspecting these components, marking deficiencies and recording findings. These major components include the following.

— Inspectors should check the condition of flanges, fittings, bolts/nuts, gaskets, and other fittings. Check ANSI ratings, flange bores and transition nipples, component condition, bevels, markings, and adequacy of supplies to ensure they are in accordance with job specifications and drawings (see ANSI B16.5, ANSI B16.9, ANSI B16.20, ANSI B16.21, and ANSI B16.47).

— Inspectors should check the following for valves: ANSI ratings, overall condition, trim, coating, operability, flange faces and/or bevels, and body condition to ensure they meet specifications and are suitable for installation in the pipeline (see API 6D, ASME B31.4 Section 434.15).

— Inspectors should check the condition of hot bends (manufactured bends): check bend angles, bend radius, markings, ovality, bevels, coating, and overall condition to ensure they meet specifications.

— Inspectors should check condition of other appurtenances, such as scraper traps, pump station mainline fittings and valves, and other components to be installed in the mainline, to ensure acceptability for installation (see ASME B31.4 Section 434.17).

### 7.9 Pipe Bending Operations

Inspectors should ensure that owner/operator specifications are adhered to and the following areas are checked during field pipe bending: produced bends meet specified angle requirements, meets minimum bend radius requirements, ovality and wall thinning is within specified limits, bends have a smooth contour, pipe seam location restrictions, if any, are correct, and any restrictions due to pipe grade have been met. Inspectors should note damage to coating, pipe wall, and bevels and record, mark, and report any damage or out of specification bends. (See ASME B31.4 Sections 434.7 and 434.7.3.)

### 7.10 Pipe Alignment and Welding Requirements

#### 7.10.1 General

Since this phase of pipeline construction, both on production and tie-ins, is critically important to the long-term integrity of the pipeline, all inspectors should know the basics of proper lineup and welding and its inspection. Qualified welding inspectors with specialized training and experience would be expected to know more in depth inspection requirements (see Annex D). All mainline pipeline welding, whether manual or automatic, follow the same codes, standards, industry practices, and specification parameters.

#### 7.10.2 Pipe Laying Operation

Inspectors should check the following per specifications and drawings;

— ensure pup joints meet specified minimum length restrictions consistent with pipe diameter and owner/operator requirements;

— for proper installation/placement of transition nipples for changes in pipe wall thickness;
— for proper location/placement of the correct type, grade, and wall thickness of pipe and other mainline appurtenances, such as hot bends, block valves, scraper traps, any pump station piping, and other fabrications per drawings. Identify changes (red line) on drawings as “as-built.”

7.10.3 Mainline Component Assembly
Inspectors should be knowledgeable in the following areas of mainline component assembly:
— bolting procedures, including but not limited to: proper bolt/nut size and condition, placement, tightening sequence, torque requirements, and use of correct tools;
— proper gasket material and use;
— installation and isolation testing of any insulating flanges;
— verify that all concrete support structures are constructed in accordance with American Concrete Institute (ACI) standards and owner/operator requirements;
— ensure proper coating and application requirements are met for the component being installed.

7.10.4 Other Pipe Laying Inspections
Inspectors should ensure open pipeline is protected with night caps or other devices to keep debris, water, and wildlife out of the welded up pipeline.

7.11 Roadway, Railroad, and Other Crossings
7.11.1 General
Inspectors should monitor, assess, and verify the activities and requirements in the following sections to ensure compliance with regulations, permits, industry practice, and owner/operator specifications (see API 1102 Sections 4, 5, and 6; ASME B31.4 Sections 434.13, 434.13.1, 434.13.2, 434.13.3, and 434.13.4; and ASME B31.8 Sections 802.2.5, 806, and 841.2.2).

7.11.2 Safety
Inspectors should ensure safety precautions are in place, including markers, signs, traffic control devices, and other related activities, including flagmen, as required, near pipe laying operations, excavations, and other locations, especially where machinery and trucks are operating and other construction activity is taking place.

7.11.3 Permits
Inspectors should be knowledgeable of different types of crossing permits, their provisions, and the governmental agency issuing the permit(s) (e.g. state and county road and city street crossing permits and railroad crossing permits).

7.11.4 Installation Activities
Inspectors should be knowledgeable of installation methods, machinery/equipment condition, and operator performance involved in completing the crossing, including wet or dry boring, HDD, ditching, or other approved method. Ensure that the pipe has been surveyed and proper documentation collected prior to installation and that tie-in points had been surveyed after installation.

7.11.5 Cased Crossings
Inspectors should be knowledgeable of cased crossings:
— casing installation methods, equipment used, operator performance, and completeness/acceptability, including the correct pipe, wall thickness, and coating, if any, versus specifications;
— mainline welding is inspected and acceptable along with the pipe coating and/or pipe jacketing;
— verify that mainline pipe insertion procedures are followed to ensure that no damage occurs to pipe and its coating, visually inspect spacers/insulators during and after installation, and check installation of seals and vents;
— verification that the completed cased crossing is not electrically shorted and testing methods are correct, that depth profile specifications are met, and the required documentation is completed.

### 7.11.6 Uncased Crossings
Inspectors should be knowledgeable of uncased crossings:

— method of crossing (boring, HDD, ditching, or other approved methods), equipment used, and operator performance, including use of heavier wall pipe and special coating, if required, is in accordance with drawings, specifications, and permit provisions;

— mainline welding is inspected and acceptable along with coating and/or jacket condition after insertion of the pipe;

— mainline crossing pipe on each side is ready for tie-in.

### 7.11.7 Documentation
Inspectors should make sure that all required documentation, including permits, owner/operator records and requirements for marked-up drawings as needed, and any special provisions in permits, such as railroad, highway, and local or other permit requirements, are completed.

### 7.12 Waterway and Water Body Crossings

#### 7.12.1 General
Inspectors should monitor, assess, and verify the following activities and requirements to ensure compliance with codes, regulations, permits, industry practices, and specifications. These crossings may include swamp, wetland, river, lake, and similar water feature crossings. (See ASME B31.4 Section 434.13.4.)

#### 7.12.2 Other Types of Crossings
Inspectors should monitor and inspect overhead crossings, such as spans and bridge attachments that should be inspected to ensure compliance with specifications, drawings, and permit provisions (see ASME B31.4 Sections 434.13.2 and 434.13.3).

#### 7.12.3 Precautions
Inspectors should be knowledgeable of safety and environmental precautions, including equipment used, excavations, markers/signs, waterway traffic, if any, pipe laying operations, and minimization of environment damage.

#### 7.12.4 Permits
Inspectors should be knowledgeable of different types of crossing permits, their provisions, and the governmental authority with oversight over the permit. For example, most major water crossings must be permitted by the U.S. Army Corps of Engineers with their NWP12 permit.

#### 7.12.5 Survey Requirements
Inspectors should ensure compliance with survey requirements as to alignment and depth, including how these requirements are determined, verified, and accepted in accordance with specifications and drawings.

#### 7.12.6 Installation Activities
Inspectors should make sure that the use of accepted/specifed pipe installation methods, bank stabilization and restoration methods, extra ROW requirements, buoyancy control, heavy wall thickness pipe, and installation and/or use of concrete jacketed pipe comply with permit provisions and specifications.

#### 7.12.7 Positioning and Buoyancy
Inspectors should verify that crossing pipe position and stability is in accordance with owner operator specifications, especially negative buoyancy requirements to prevent flotation.

#### 7.12.8 Documentation
Inspectors should ensure that all required documentation, including pipe details, permits, and owner/operator records and markup drawings to reflect as-built conditions, are completed.

7.13 Corrosion Control Requirements

7.13.1 General

Inspectors should have a basic knowledge of corrosion control, including pipe coating and cathodic protection (CP). Qualified/certified corrosion control coating inspectors with specialized training and experience would be expected to know more in depth inspection requirements (see Annex E).

7.13.2 Cathodic Protection Test Lead Requirements

Inspectors should make sure that all test leads for CP monitoring are attached to the pipeline with a low temperature welding process, such as cadweld. The welds and bare wires should be properly coated with properly applied, specified coating, and lead wires should have ample slack between the pipe and aboveground test stations to prevent damage. Leads, test station installations, and lead wire terminations should follow job specifications. Adequate testing, usually by a corrosion control specialist, should be performed to ensure these installations are functioning properly.

7.13.3 Aboveground/Belowground Coating Requirements

Inspectors should be aware of the requirements for surface preparation and application methods (see SSPC Volume 1).

7.13.4 Final Coating Inspection

Inspectors should monitor, assess, and take corrective action where necessary for all coated pipe to ensure it is inspected immediately before lowering in with a holiday detector that has an output consistent with NACE recommended voltage for the type of coating and thickness being inspected. Inspectors should verify the detector setting at least twice per day. Inspectors should make certain all coating anomalies or damaged areas are marked and properly repaired per manufacturer’s recommendations and job specifications before the pipe is allowed to be lowered into the ditch.

7.14 Lowering in Requirements

7.14.1 General

Inspectors should monitor, assess, and take corrective action where necessary in the following areas prior to and during installation of the pipe in the ditch (see ASME B31.4 Section 434.10).

7.14.2 Condition of Bottom of the Ditch

Inspectors should ensure that there is no water, rocks, hard clods, roots, or other debris in the ditch and that any padding material or rock shield is in place. Lower the line with proper slack in the line so it fits the profile of the ditch (i.e. sags and overbends are properly positioned to prevent pushing the pipeline ahead of the lowering in process).

7.14.3 Lifting and Lower Equipment

Inspectors should monitor, assess, and take corrective action, where necessary, for: slings, padded calipers, rollers, and other pipe carrying devices to prevent coating or pipe damage and assess the suitability of lifting machines as to size, type, and condition. Inspectors should review the design considerations in the lowering in plan and the equipment spacing and maximum lifting height to prevent excessive stresses.

7.14.4 Erosion Control

Inspectors should check that ditch plugs, sack breakers, retards, and water diversion features are in place and built in accordance with specifications to prevent washouts.

7.14.5 Land Drains

Inspectors should check to ensure land drainage reinstallation is correct and in agreement with specifications.

7.15 Backfill and Cleanup Requirements
Inspectors should monitor, assess, and take corrective action as needed in the following areas during backfill operations to prevent damage to the pipe and/or its coating and ensure support is provided under the pipe (see ASME B31.4 Section 434.11).

- Inspectors should check suitability of backfill material (no rocks or other hard objects to be placed on the pipe) and equipment used for backfilling and ensure the pipe is properly supported and padded. The inspector should also ensure that owner/operator specifications are met.
- Inspectors should verify depth requirements as stipulated for each location and type of terrain in accordance with applicable regulation and the job specifications.
- Inspectors should ensure compaction meets job specifications and settlement is considered for the ditch cover, including water pack requirements.
- Inspectors should check rock shield or other soft earth padding (at least 12 in. thick) is in place in rocky terrain in accordance with job specifications.
- Inspectors should monitor the following cleanup operations that involve restoring the land to its agreed upon condition prior to construction:
  - removal of waste materials, rocks, and other debris resulting from construction;
  - repair all damaged land by filling holes, ruts, and other land disturbances;
    - plow, disc, or drag ROW to dress the land and remediate excessively compacted areas, especially in cultivated areas;
  - remove temporary structures and ROW access roads/trails per agreed upon requirements;
  - repair fences with new posts, braces, and fencing material and tighten to satisfy landowner expectations;
    - ensure that proper seeding, where required, has been applied in accordance with design and permit conditions and/or the landowner agreements;
    - check that pipeline warning markers, milepost and aerial markers, and river crossing signs are placed and installed in accordance with drawings, specifications, applicable regulations, and API 1109 (see ASME B31.4 Section 434.18).

7.16 Pipeline Cleaning Requirements
Inspectors should monitor the areas below in the use of pipeline cleaning devices.

- Inspectors should check launching and receiving traps for proper configuration and suitability for the operation, including pressure relief provisions and mainline valve positioning.
- Inspectors should ensure cleaning devices are constructed per specifications to properly gauge the internal condition of the new pipeline.
- Inspectors should monitor cleaning device location and speed.
  - Inspectors should be knowledgeable in cases of damage to the gauging plate, if a swab becomes stuck, or anomalies are indicated by other devices. Such defects or obstructions should be located and repaired in accordance with job specifications.

7.17 Internal Line Inspection Requirements
Inspectors should be knowledgeable of owner/operator requirements for internal line inspection. Owner/operators often run internal line inspection devices following construction to establish their baseline assessments as part of their integrity management programs. Inspectors should monitor the following areas when these devices are used:

- Inspectors should check launching and receiving facilities for proper configuration and suitability for using these inspection tools, including pressure relief provisions and mainline block valve positioning.
- Inspectors should be knowledgeable of tool run activities and monitor tool run activities. If the inspection device becomes lodged in the pipeline, coordinate activities with contractors in order to locate the tool, perform extraction work, and make pipeline repairs.

7.18 Hydrostatic Pressure Testing Requirements
7.18.1 General
Inspectors should be knowledgeable of API RP 1110 provisions and ensure that the owner/operator test plan is implemented and then monitor, assess, and report on the hydrostatic pressure testing process steps listed below (see also ASME B31.4 Chapter VI).

7.18.2 Permit Requirements
Inspectors should review permits, if any, to obtain test water from local sources (i.e. municipal, river, streams, or other sources) and plans to treat test water (filtration, chemical treatment, or use of other conditioning means) to ensure specified quality before it enters the new pipeline. Review disposal plans and requirements following test completion to ensure that the discharged water meets permit and/or specified quality parameters (see API 1157).

7.18.3 Check Test Equipment
Inspectors should check the following to ensure that the test equipment is compatible with testing requirements.

— Filling equipment condition and suitability for service (e.g. high volume, low pressure pumping equipment, piping, scrapers, and test manifold and blinds and/or plugs are in place on all side connections and other small piping not to be included in the mainline test).

— Test equipment, including low volume, high pressure pump, dead weight tester, thermometers, recording instruments, associated piping, and other appurtenances to ensure all equipment is properly connected and suitable for the test. All test equipment should meet industry calibration standards.

7.18.4 Conduct of the Test
As required by owner/operator, inspectors should observe the performance of the test and verify the results, report any temperature/pressure variations, and verify test report completeness. Owner/operator defines roles of the inspectors in regards to the witnessing, sign off on, and recording the completed test plan. Test reports should include:

— company name, testing company, and person responsible;
— date and time of test;
— description of facility tested;
— test medium;
— deadweight tester and gauge certification including unique identifiers (serial numbers);
— temperature/pressure records including unique identifiers (serial numbers);
— minimum test pressure;
— weather conditions and explanation of any pressure deviations or other pressure discontinuities;
— records of any failures and repairs;
— PV plots;
— unique test identifier (i.e. test number);
— duration of the test.

7.18.5 Precautions During the Test
Inspectors should confirm safety precautions are in place to protect against hazards, such as sudden unexpected pressure release from piping and/or appurtenances under test.

7.18.6 Test Documentation
Inspectors should review, report, and document any failures and subsequent repairs. Confirm and acknowledge the test plan.

7.18.7 Displacement Activities
Inspectors should check displacement methods (usually with nitrogen or air) and disposal of test medium in accordance with permits and job specifications and removal of blinds/plugs and open valves to prepare the line for commissioning the completed pipeline.

### 7.19 Commissioning Requirements

Inspectors should monitor purging/cleaning practices, ensure safe disconnection procedures are followed, check dew point (moisture in the line) as necessary, following dewatering/dehydration activities, and ensure owner/operator commissioning procedures are followed.

### 7.20 Documentation Requirements

Inspectors are expected to complete all documents required by regulation and owner/operator requirements, including but not limited to:

- daily logs/reports;
- extra work memoranda;
- work shutdown/move around reports;
- completion of paperwork requirements of permits to close them out;
  - drawing markups for as-built records, including location of crossing pipelines and other utilities, valves, CP units, test station locations, and other connections installed in the new pipeline;
  - amount, size, wall thickness, grade, heat number, other pipe nomenclature and coating of pipe laid, its location, and depth of cover;
- number of welds, welds tested, rejection rates, and repairs made;
- weld logs to include weld numbers and unique identifiers (i.e. pipeline number);
  - as-built surveys to include weld identifiers, location, depth of pipe, and other information per the owner/operator specifications;
- hydrostatic tests and any test failures.

### 7.21 Inspector Tools for Communication and Documentation Requirements

Inspectors should be able to competently use the following tools and devices to aid in communication, recording data, and recordkeeping for safety/hazard observations, construction problems, logs, and other required records and documentation, including but not limited to:

- laptop computer,
- radios,
- GPS devices,
- digital cameras,
- air cards (for internet access),
- mobile devices.
Annex A  
(normative)  
Chief Inspector  

A.1 Scope  
Individuals assigned as chief inspectors are typically highly skilled and experienced in pipeline construction and have served in a number of different inspection classifications. Chief inspectors should be capable of managing, directing, and overseeing all pipeline construction inspection personnel involved in each construction activity, including welding inspectors, corrosion control inspectors, utility inspectors, and specialized inspectors, such as blasting and HDD. Chief inspectors usually report to an owner/operator project manager or other management personnel charged with completing a pipeline project.  

A.2 Qualifications  
A.2.1 General  
Chief inspectors should be knowledgeable in each of the major requirement areas of pipeline construction. The basic requirements are detailed herein and include:  
— pipeline construction inspector responsibilities,  
— personnel and general pipeline safety,  
— environmental and pollution control,  
— general construction inspection.  
A.2.2 Special Inspection Requirements  
Chief inspectors should have in-depth knowledge of welding inspection, corrosion control inspection, and specialty inspection, such as blasting, HDD, and other specialty inspection that may be required by the project.  
A.2.3 Other Knowledge and Skill Requirements  
A.2.3.1 Principles of Project Management  
Project management is responsible for designing and constructing a safe, maintainable facility that operates efficiently within design conditions, complies with laws, regulations, and industry standards, and is completed on time and within budget. Chief inspectors should be knowledgeable and capable of implementing this management process, which includes, but is not limited to: understanding project objectives, staffing and supervising the inspection organization, contract administration, planning and scheduling tasks, controlling costs, measuring and controlling job progress, managing quality assurance, and completing documentation requirements, all within the requirements of the owner/operator.  
A.2.3.2 Fundamentals of Project Accounting  
Chief inspectors should understand proper pipeline accounting requirements, including but not limited to: receipt of materials/supplies, verification of materials versus specifications, capital and operating expense booking processes, and timely communication with the accounting staff using the proper forms and procedures.  
A.2.3.3 Contract Administration  
Chief inspectors should be knowledgeable about the details of the contract governing the assigned project, including but not limited to: contract performance provisions, each parties’ contractual obligations, terms and conditions, terminology, restrictions, bid and extra work provisions, and contract dispute resolution processes.  
A.2.3.4 Project Materials Tracking/Traceability  
Chief inspectors should be familiar with the processes and procedures used in supply management systems, including but not limited to: tracking and tracing materials and supplies using identifiers, such as serial
numbers, mill numbers, and heat numbers, verifying adherence to specifications, and resolving delivery timing issues and their influence on job progress.
Annex B
(normative)

Blasting Inspector

B.1 Scope

Individuals assigned as blasting inspectors are recognized as specialists in this activity and typically have additional schooling from explosive suppliers and other sources or have gained experience while actively involved in the use of explosives. Inspectors assigned to blasting operations report to the chief inspector and may handle other inspection duties depending on their training and experience.

B.2 Qualifications

B.2.1 General

Blasting inspectors should be knowledgeable of the basic requirements included in API 1169 and be knowledgeable in the following areas related to use of explosives and pipeline construction blasting operations.

B.2.2 Transportation, Handling, and Storage of Explosives

Blasting inspectors should be familiar with applicable regulations and operator practices regarding the safe movement, storage, and handling of explosives.

B.2.3 Blasting Plan

Blasting inspectors should be familiar with the contractor’s blasting plan and ensure all safety precautions are implemented per the plan.

B.2.4 Permit

Blasting inspectors should be knowledgeable of pertinent permits and their issuing agencies and ensure the provisions of the permits are properly addressed by the contractor.

B.2.5 Safety Precautions

Blasting inspectors should be knowledgeable of safety precautions to be taken during blasting operations, including but not limited to: notifications, warning signage, use of two-way radios, barriers, and safe distance parameters from the blast zone.

B.2.6 Blasting Preparation

Blasting inspectors should be familiar with charge placement drilling operations, including configurations and depth of charge holes, charge placement procedures, charge padding activities using earth or blast mats, proper fusing techniques, use of correct wiring, and blasting machines, and ensure each of these activities follow accepted practices and owner/operator procedures.

B.2.7 Blasting

Blasting inspectors should monitor the results of the blasting to ensure its effectiveness and measure and record, if required, the area blasted in the event of extra work authorization or special bid pricing.

B.2.8 Cleanup

Blasting inspectors should monitor cleanup activities to ensure minimal collateral damage for excess heaving or debris scatter.
Annex C
(normative)
Horizontal Directional Drilling Inspector

C.1 Scope
Individuals assigned to carry out the inspection duties related to horizontal directional drilling (HDD) are
recognized as specialists due to the nature and complexity of these operations. Thorough monitoring and
documentation by qualified inspection personnel is crucial since a drilled installation is typically buried with
depth cover under inaccessible terrain or infrastructure features and its installed condition cannot be verified by
visual examination. HDD inspectors will usually have completed training provided by HDD contractors or other
sources and they have experience in this crossing methodology. HDD inspectors report to the chief inspector
and may handle other inspection duties as directed by the chief inspector.

C.2 Qualifications

C.2.1 General
HDD inspectors should be knowledgeable of the basic inspection requirements included herein and be
knowledgeable about the characteristics, features, and work performance activities of HDD operations,
including but not limited to the following:
— drill path,
— pilot hole,
— downhole survey systems/surface tracking systems,
— course length,
— inclination,
— azimuth,
— stationing,
— elevation,
— entry/exit angles,
— radius of curvature,
— pull section,
— reaming,
— buoyancy control,
— coating integrity,
— drilling fluid,
— documentation requirements.

C.2.2 Construction Staking and Marking
HDD inspectors should be familiar with staking and marking of the drilled segment, particularly the entry and
exit points, including the distance between the points, their elevations, and how each of these is determined.
Inspector should understand the importance of these accurately located points that provide a benchmark for
the downhole survey and the orientation of the survey measuring instruments.

C.2.3 HDD Equipment
HDD Inspectors should be familiar with HDD equipment of various sizes and types suitable for different jobs,
machinery condition, and suitability for the intended work.
C.2.4 HDD Personnel

HDD inspectors should observe the functioning of the HDD equipment operating personnel and their supervision as to their competence and proficiency and how they handle the HDD equipment and its associated gear, including the surface monitoring system used to determine the downhole probe location.

C.2.5 Drilled Path

HDD inspectors should monitor the drilled path during pilot hole drilling and assess if the drilling is on the proper inclination and azimuth to ensure the vertical and horizontal positioning, including the drilled length, depth of cover, and entry/exit angles required by the owner/operator specifications. Inspectors should also assess if the exit location is within limits set forth by the specifications.

C.2.6 Pipe Installation

C.2.6.1 General

HDD inspectors should review the pipe installation operation to ensure owner/operator specifications are met, including the following.

C.2.6.2 Pull Section

HDD inspectors should ensure that the welds, pipe, and joint coating of the carrier pipe string to be pulled into the drilled crossing have been properly inspected and the pull section is ready for placement.

C.2.6.3 Reaming

HDD inspectors should be knowledgeable of the equipment and its appurtenances used to enlarge the drill hole to accommodate the pullback operation and be able to assess the effectiveness of this operation.

C.2.6.4 Pull Section Handling

HDD inspectors should monitor and assess the adequacy of support of the pull section during pull back. Roller stands or other support mechanisms as well as the lifting equipment should be checked to ensure satisfactory movement of the pipe string into its drilled crossing.

C.2.6.5 Buoyancy Control

HDD inspectors should be knowledgeable of buoyancy control processes that may be used to lessen pulling loads.

C.2.6.6 Pipe Coating

HDD inspectors should ensure the pipe coating is inspected with a properly calibrated holiday detector just prior to the pipe entering the reamed drill hole and that any needed coating repairs meet owner/operator specifications.

C.2.7 Drilling Fluid

HDD inspectors should be familiar with types of drilling mud and its proper use, monitor the ROW for potential drilling mud migration or intrusion, and ensure the containment and disposal of the drilling fluids follow accepted procedures. Site-specific or regulatory requirements for drilling fluid disposal should be clearly communicated by the owner/operator to the inspector.

C.2.8 Documentation

HDD inspectors should understand requirements established by the owner/operator and any permitting agencies and complete needed documentation in a timely and complete manner.

Requirements from permitting agencies should be clearly communicated by the owner/operator to the inspector.
Annex D
(normative)

Welding Inspector

D.1 Scope

Individuals assigned as welding inspectors shall be qualified as welding inspectors to ensure the inspection of this critical activity is carried out in strict accordance with codes, regulations, and owner/operator specifications. Qualification and certification in this function requires additional schooling and usually a significant amount of on the job experience. Welding inspectors report to the chief inspector and may function as backup for the chief.

D.2 Qualifications

D.2.1 General

Welding inspectors should be knowledgeable of the basic requirements included in API 1169, have completed training in API 1104, AWS, or other industry welding schooling, and be skilled in the following areas related to pipeline welding.

D.2.2 Certification and Qualification Verification

The welding inspectors should be familiar with both welder and NDT technician qualification and certification documentation provided by the contractor or individual and be capable of verifying the documents’ authenticity. Any AWS certifications should be carefully reviewed to ensure they cover pipeline welding and not an unrelated type welding such as structural steel welding.

D.2.3 Testing Welders

All mainline pipeline welding strictly follows owner/operator approved and qualified welding procedures, which consistently produces sound welds with correct mechanical properties and meet the requirements of API 1104. Every welder, welding on the pipeline, should be tested and qualified by making an acceptable weld using the approved/qualified procedure to be used in the construction. The welding inspectors should be capable of monitoring and assessing these tests and the determining acceptability of the welds by visual examination, NDT, and destructive testing using the standards of acceptability in API 1104. Inspectors ensure that each welder passing the qualification test is issued and uses an identification number to identify his welds during construction.

D.2.4 Welding Equipment

Welding inspectors check the following for compliance with welding procedures and specifications:

— suitability of welding machines (minimum 200-amp NEMA rating), electrode holders, grounding clamps, and cables and their proper use;
— welding rod, including AWS classification and size;
— storage/handling procedures for welding rod and other welding supplies;
— other equipment, such as cutting/beveling machines, any preheat equipment, brushes, and grinders.

D.2.5 Alignment of Pipe for Welding

Welding inspectors monitor the following pipe gang and line up activities.

— Swabbing of the pipe before fitting up to remove foreign debris and/or wildlife.
— Pipe gang proficiency to ensure proper handling, fit up, and bevel alignment.
— Clamping procedures and proper support of pipe during and after welding, including padded skids for coated pipe.
— Clamp Holding time—100 % of stringer bead for internal line up clamps (larger than 6 in. O.D. pipe). Check specifications for permissible use of external line up clamps and holding times on smaller diameter pipe and at tie-ins.

— Seam alignment, if any, to ensure pipe seams are rolled off top center per specifications,

— Potential magnetism [near high voltage alternating current (HVAC) lines or where there is evidence of residual magnetism] that could adversely affect welding (arc blow) and take steps to degauss the pipe. (If the pipe is being laid under HVAC lines, verify that the pipe section is grounded.)

D.2.6 Welding Inspection

Welding inspectors should carry out their responsibilities in the areas below to ensure compliance with specifications and standards (see AWS manual, API 1104, and ASME B31.4 Section 434.8). Inspectors should:

— have a copy of the qualified welding procedure readily available and the qualification papers of qualified welders and verify that proper welding procedures are being consistently followed;

— visually inspect each weld and observe welder technique/performance including smoothness of metal application, rod travel speed, starts/stops, and welder identification;

— verify that the NDT contractor has provided written NDT procedures for all processes and performs in accordance with those procedures, and verify NDT of welds is in accordance with industry standards and regulations (Regulations require 10 % coverage, but generally, owner/operators inspect 100 % of all welds with suitable NDT.);

— evaluate weld quality by reviewing NDT results; noting defective welds, rejection rates, and repairable/ nonrepairable (cutouts) welds versus standards of acceptability contained in API 1104 and owner/operator specifications; marking any unacceptable welds for repair or cutout, and noting which welder or welders made the unacceptable welds.

D.2.7 Weld Repairs/Replacement

Welding inspectors inspect any repairs in the same manner and intensity as production welds and conduct the following.

— Ensure the cylinder of pipe cutout and the replacement pipe piece meet length restrictions for the diameter of pipe involved and ensure any weld repairs follow API 1104 and the qualified welding procedure that was used on the initial weld.

— Check proper beveling, fit up, weld quality, and NDT results versus standards. (If owner/operator allows more than one repair in a previously repaired area, verify that the repair is in accordance with a qualified weld repair procedure per 49 CFR 195.230.)

D.2.8 Tie-ins

Welding inspectors should inspect tie-in operations for proper alignment, beveling, welding, coating repair, and pipe placement and ensure pipe is properly supported when placed in the ditch (see ASME B31.4 Section 434.9).

D.2.9 Documentation

Welding inspectors complete in a timely manner all required records of welding operations, including but not limited to: number of welds, NDT records, rejection rates, repairs, and other documentation as specified by the owner/operator.
Annex E
(normative)

Corrosion Control Inspector

E.1 Scope
Individuals assigned as corrosion control inspectors (or coating inspectors) should be qualified and certified in corrosion control. Qualification and certification requires specialized schooling, usually under the auspices of NACE.

E.2 Qualifications
E.2.1 General
Corrosion control inspectors should be knowledgeable in the basic requirements included herein, have completed the NACE Coating Inspector Program (CIP), Level 1, and be capable of carrying out the inspection duties below.

E.2.2 Pipe Coating Requirements
Corrosion control inspectors should be knowledgeable about proper aboveground/belowground coating application techniques, including surface preparation, priming, type and method of application, curing time, application limitations, atmospheric condition restrictions, and integrity testing (see NACE RP0169-06 and SSPC Volume 1).

E.2.3 Mill Applied Coating
Corrosion control inspectors should be capable of inspecting, marking, and following repairs in accordance with specifications and manufacturer's recommended repair criteria for any observed coating damage beginning with when the pipe arrives on the job to lowering in.

E.2.4 Over the Ditch Coating
Corrosion control inspectors should inspect, assess, and note corrective action needed in the following areas:
— coating machine condition, suitability for the work, correct operation, and operator performance of his/her duties;
— ensure surface preparation meets specifications;
    — check that correct primer is used, it is correctly applied at the specified thickness and drying time is within specification;
— verify correct coating is being applied at the proper rate, travel speed, tension, and overlap;
— verify proper lifting/placement techniques are used and coating protection is provided on lower in.

E.2.5 Field Joint Coating
Field joint coating and application methods are typically used on mill applied coating and all tie-ins. Corrosion control inspectors should check the following to ensure coated field joints meet specifications:
— monitor contract personnel doing this work to ensure specified procedures are followed;
    — ensure surface preparation meets specifications and manufacturer's requirements/recommendations are followed;
— ensure correct primer is used, properly applied at the right thickness, and drying time is within specified limits;
    — ensure coating is the correct type, applied per specifications and manufacturer's recommendations, and proper curing time is observed before movement of the pipe;
— check that coated pipe is properly handled and protected awaiting lower in.

E.2.6 Coating Repairs
Corrosion control inspectors should ensure that removal of damaged coating follows manufacturer's recommendations and/or owner/operator specifications and damage to the pipe surface is avoided. Corrosion control inspectors should check that repair of damaged coating on either mill applied or over the ditch coating follows the specified steps in surface preparation, priming, coating application, and curing.

E.2.7 Cathodic Protection Requirements
New pipelines require installation of corrosion control testing facilities, rectifier units, and ground beds. Inspectors should be knowledgeable about the proper installation and testing of these devices.

— Test leads for corrosion control monitoring should be checked by the inspectors to ensure they were installed properly.

— Rectifier units and ground beds should be checked by the corrosion control inspectors to ensure proper installation per specifications and that they operate properly. Inspectors should complete owner/operator required documentation for these installations.

E.2.8 Foreign Pipeline Bonding Requirements
Corrosion control inspectors should be knowledgeable on these installations, including the wiring, test station, and wire terminations and ensure they are tested and operate properly.

E.2.9 Cathodic Protection Testing and Measurement Requirements
Corrosion control inspectors should ensure all rectifiers are read, calibrated where needed, and pipe to soil potentials are taken at test stations and measure any cased crossings for electrical shorts to ensure all installations meet specifications.
Annex F
(informative)

Regulation in North America

F.1 Pipeline Regulation in the United States and Canada

The United States & Canada both have extensive Federal level regulations and regulatory guidelines which directly concern or impact pipeline construction and maintenance activities. This annex is designed to assist the pipeline industry in identifying these pieces of legislation in the two countries. It does not cover local regulation and is not intended to be entirely comprehensive of all federal-level regulation in the USA & Canada which may impact pipeline construction and maintenance.

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12 American Society for Nondestructive Testing, 1711 Arlingate Lane, Columbus, OH 43228; www.asnt.org
13 American Society of Mechanical Engineers International, Two Park Avenue, New York, NY 10016-5990; www.asme.org
14 American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166-6672; www.aws.org
15 Common Ground Alliance, 707 Prince Street, Alexandria, VA 22314; www.commongroundalliance.com
16 Compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA 20151; www.cganet.com
17 Federal Highway Administration, 1200 New Jersey Avenue, SW, Washington, DC 20590; www.fhwa.dot.gov
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