American Gas Association

AGA White Paper:

Pipeline Construction Inspection Practices

A Publication for Members

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AGA Engineering and Construction Operations Technical Committees

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Abstract

This document may serve as a resource for natural gas operators to facilitate management, training, field practices and documentation for inspection of distribution and transmission pipeline construction projects. The white paper covers four sections including inspection resources, certification, field tasks, and records management. Each section provides an overview of the current state of the industry followed by guidance to effectively utilize inspection resources to aid in meeting regulatory requirements and industry specifications for the regulatory purpose of safe and reliable pipeline construction.

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Introduction

Inspection serves a fundamental quality assurance function for the installation of distribution and transmission gas pipelines. In spring of 2016, the AGA Engineering Committee conducted a survey to assess how companies are managing the pipeline construction inspection process and determine practices that could benefit AGA member companies. Several papers have been written by AGA committees and other natural gas focused associations addressing various components of the inspection process. The goal of this whitepaper is to provide a document that complements previous efforts. Reference papers submitted previously include:

AGA Committee Whitepapers

- *AGA Guidelines for Oversight of Construction for Transmission Pipeline, Distribution Mains and Services* – Published in April 2013
- *Developing and Implementing a Quality Assurance Program for Natural Gas Operations* – Published in November 2015
- *Contractor Construction Quality Management Guide*- Published in November 2016

Other Associations

INGAA (Interstate Natural Gas Association of America), CEPA (Canadian Energy Pipeline Association), and API (American Petroleum Institute) have also proactively made efforts towards establishing guidelines and job requirements/certifications

- A Practical Guide For Pipeline Construction Inspectors – March 2016
- API 1169 Pipeline Inspector Certification Program – July 2013

Membership Survey

Survey questions were comprised of five categories:

1. Inspection Resources
2. Inspection Certification
3. Inspection Tasks
4. Decision Making and Accountability
5. Inspection Records Management

There were a total of 62 questions submitted to AGA member companies. The results varied significantly based on what type of natural gas system each company operated and each company's individual experiences. Companies performing solely services or distribution work generally incorporated less restrictive practices adopting a high-level approach towards inspection. Companies involved in more high profile, gas transmission projects had more regimented inspection programs.

The purpose of this white paper is to summarize for AGA member companies:

1. Pipeline inspection processes and the role of the inspector to provide effective oversight
2. Inspection resources to consider based on project type and complexity
3. Consideration of certification requirements/resources and typical skillsets/guidelines to properly assess field situations and help meet compliance requirements
4. Typical tasks involved that an inspector may perform to properly conduct the role
5. Suggested documentation to collect as asset records during construction milestones

Inspection for pipeline construction involves the examination, checking, observation, investigation, and recognition of a nonconformance compared to company specifications. The expectation of each function is subject to the discretion of an individual or company's interpretation. Inspectors can provide oversight on the culmination of these activities to yield a quality end product, ultimately enhancing safety to the

natural gas industry. Safety resides with those involved in the construction and maintenance process and ultimately the natural gas operator.

Quality originates at the conceptual stages of a pipeline project through design and engineering, onto construction and testing and later throughout the operating life. Assets designed to provide decades of continuous service with safe and reliable operation can benefit from a thorough inspection plan during construction.

The inspector serves a key role for verifying a quality product is delivered according to industry, regulatory and company requirements. As requirements change and increase, so does the need for trained and experienced subject matter experts. Depending on the design complexity and industry regulations a project may require multiple resources to effectively implement a safe and reliable natural gas system. Materials used during Distribution and Transmission construction vary, thus creating risk factors that vary among the types of pipeline projects. Managing and monitoring key tasks requires a different strategy, level of oversight and skillset. Having the right amount of inspection resources with the proper skill sets is important in managing a pipeline system.

At a high-level, inspectors are expected to monitor job safety and standards and environmental compliance, observe and document construction activities and create/complete documentation for company records, validate materials, interact with the public, and validate contractor daily logs. When discrepancies arise during a project, differences in interpretation to scope can be resolved between the inspector and the construction leadership. When issues are not readily reconciled, inspectors should have a defined escalation process. An escalation process can require the inspector to report unresolved issues to their supervisor, for purposes of reviewing and providing guidance to move the job forward. Escalation processes should include notifications whenever there are inquiries from public officials or members of the media. An inspector notifying a supervisor of public engagement allows appropriate members of management or public relations to represent the Operator during construction process. The range of authority varies among companies but in general when safety is concerned, inspectors shall have authority to stop work on a job to address any unsafe work practices. The Operator has ultimate responsibility for compliance to the Operator's standards and scope of work. But it is the primary role of the inspector to provide the necessary oversight to make sure this happens. To prevent work stoppages, a clear line of communication between the construction leadership and the inspector regarding work plans and activities should be encouraged.

Inspectors should have an appropriate level of training or experience with the requisite knowledge, skills and abilities to complete assigned inspection tasks. Training may include: on-the-job training, classroom instruction, demonstrations or company specific Operator Qualification certification. An effective inspection program can facilitate knowledge transfer from highly experienced to less experienced field crews while providing adherence to company standards in areas such as welding, coating, tapping pipe, pipe installation and strength testing.

In addition, the natural gas industry has experienced a number of events that make new pipeline construction challenging such as:

- Regional shortages of qualified resources within companies and within local demographics.
- Increased demand for resources in workforce development.
- Limited experience within available resource labor pools

- Increased regulatory requirements emphasizing records documentation, environmental management and safety.
- Increased demand of pipeline construction for new design and distribution replacement projects.

Inspection Resources

AGA member companies surveyed at the outset of this effort stated their preference is to fill general inspection positions internally. However, due to the lack of adequate resources for specialized inspection skill sets these positions are often contracted through a third party. An example of the Inspection areas where companies have found success in managing the quality of the process and the end product are the following:

- Chief Inspector: Leader of inspection team. Knowledgeable of all aspects of the construction process. Provides oversight and coordinates activities of other inspectors on the project.
- General Utility Inspector: Pipeline inspection, and ROW expertise on the installation of large transmission lines. Inspectors certified with API 1169.
- Material Inspector: Receiving and issuing materials to the contractor. Addressing defects before field receipt and verifying pipe MTR's (Mill Test Reports).
- Welding Inspector: Weld Inspection utilizing knowledge of API 1104 including certification with the American Welding Society (AWS) as a Certified Welding Inspector (CWI).
- Coating Inspector: Checking pipe surface profiles. Observing the application processes and verifying the mill thickness of the coating on joints.
- Electrical Inspector: Knowledge and management of potential critical locations that can cause electrical interference with a pipeline and knowledge of proper electrical code compliance on the installation of aboveground facilities. Knowledge of Arc Flash Studies.
- Structural Engineer: Inspection of deep trench shoring in urban environments.
- Drilling Inspector: Drilling inspection including river crossings, water ways, bore profiles, pipe stress analysis.
- Environmental Inspector: Knowledge when entering sensitive wetlands, water and silt management, ROW and permit control.

Onboarding Inspection Resources

Successful implementation of an inspection program takes a collaborative approach from multiple departments such as Sourcing (Procurement, Contracts, and Purchasing) to issue contracts and Operations and/or Engineering (Design, Construction) to specify requirements and set expectations.

Inspection roles can be filled through different approaches. In a staff augmentation approach the company hires a third party to provide candidates managed under the daily direction and oversight of the company. Another approach is to hire a third party to provide inspection where the inspectors are managed by the third party company ensuring performance and deliverables as defined in the contract requirements.

For example, when an Operator chooses to use a third party for inspection a request for proposal (RFP) is typically issued to third party contractors. The RFP will include defined roles and responsibilities created from Operations and/or Engineering. Upon award of a contract the third Party contracting company would screen resumes to match candidate's skills against the stated requirements. Resumes would be provided for technical positions and filled with specialized skilled employees based on the defined roles. Included in the review process would be evaluation of employee qualifications, certifications, experience and references on previous project performance. Finally, when onboarding personnel it is important to

match skillset and capabilities to project needs. This can be a quick review of the resume with a phone interview to additional onsite interviews with key internal stakeholders to ensure the candidate can perform in the capacity the company requires. Factors to consider include the complexity and risk level of the project, previous knowledge and experience of the candidate and the reputation of the third party contracting company.

The majority of the companies (60%) that responded to the AGA member survey do not utilize project engineers for inspection. Engineers are instead utilized in project management roles focusing on schedule tracking and financial aspects of the project creating a separation of duties and responsibilities. Company expectations for inspection vary based on the complexity of the job. Fundamental expectations of inspectors included:

a. Tracking material installed against the bill of materials specified for proper receipt and material records validation.
b. Holding the general contractor and various sub-contractors accountable to company standards and specifications defined in the scope of work.
    i. Includes validating contractor OQ certification prior to work commencing
c. Track project status and record daily progress against tasks.
d. Daily time keeping or construction unit tracking.
e. Review and verify the accuracy of as-built drawings.

Inspection Resource Levels

The average ratio of projects to inspectors from the committee survey results was 2.6:1. The majority of the companies responded that their preferred ratio was 1:1 implying a dedicated inspector for every project. However, complex projects may validate the need to assign multiple inspectors covering different disciplines to mitigate the risk of quality defects going unnoticed.

The need for Inspection resources is influenced by the experience, knowledge and quality of the pipeline contractor, the proximity of projects located nearby, the complexity of the installation and the scope (pipe diameter and length) of the projects. Large gas transmission projects, for example, may require specialized inspection resources for welding, coating, boring, deep trenching and environmental management in addition to assigning a chief inspector to manage the inspection team.

Smaller scale construction projects such as small diameter PE main or PE service installations may only require one inspector to cover multiple projects at a time if they are located geographically near each other and the contractor has a proven history of quality performance and conforming to company specifications.

Inspection Team

The ideal team is one that can effectively manage the oversight of a project to implement installation in a safe, reliable, quality manner, under company specifications and regulatory compliance, along with managing project finances properly. Inspection team composition should be scalable for distribution projects to more complex transmission projects. A department may have several utility inspectors that have a well-rounded background in natural gas operations. One inspector may watch multiple crews simultaneously. Project scope is straightforward consisting of smaller main installations and/or services with a relatively low degree of risk. Inspector training is managed internally thru training and OQ

qualification programs. The utility inspector and the projects are supported by other departments within the company.

For example, a distribution team can involve multiple inspectors depending on factors such as:

- Environment (urban vs rural). Additional inspection may be required for cross bores, directional boring, deep congested trenching etc.
- Project scope and number of contracting crews involved simultaneously.
- Company requirements for direct observation and oversight (i.e. inspectors observing fusions, inspectors to review utility crossings to prevent cross bores, inspectors to review excavation depth and slope, inspectors to observe safe tie-in activity, etc.)

Typical Inspection Organization Chart – Roles and areas of expertise scale with scope of project

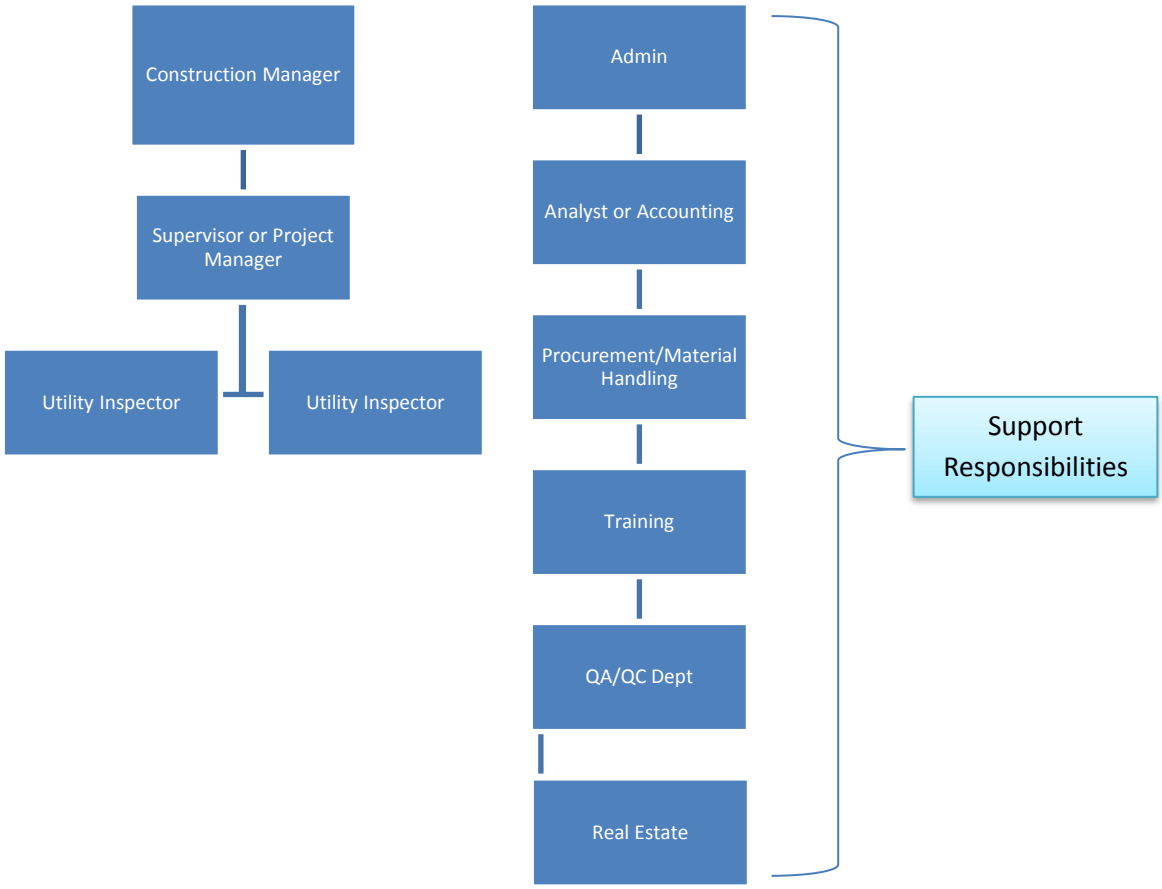


Figure 1: Typical Distribution Project - Natural Gas Inspection Team

A gas transmission inspection team may be comprised of multiple job classifications as shown below. A Chief Inspector can provide value in managing the inspection process. The certification requirements are greater and much more specific to the role and responsibility each inspector has. There could be inspectors for welding, coating, civil/environmental, material, general, boring, any other required specialist inspection that the Construction Manager determines is appropriate.

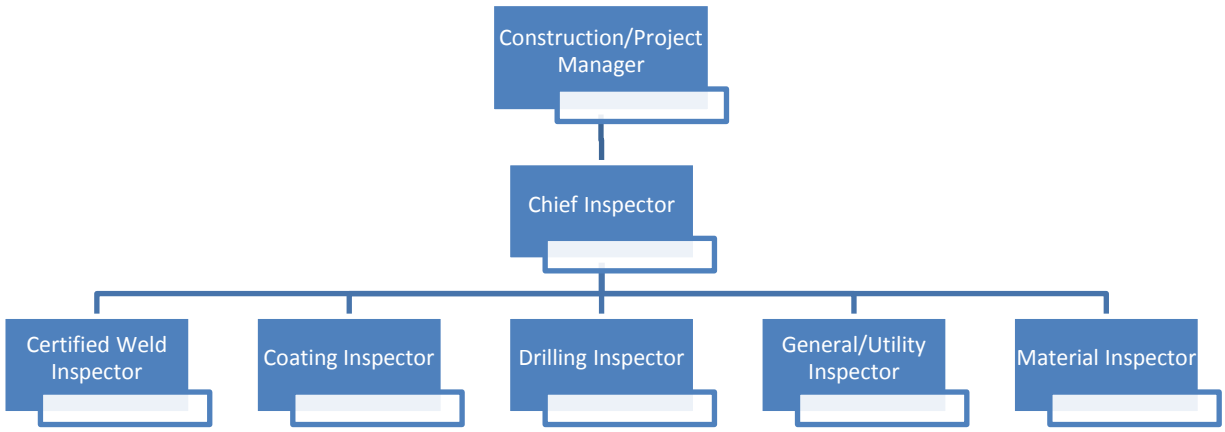


Figure 2: Example Construction Project Requiring Multiple Inspection Disciplines

Inspection Certification

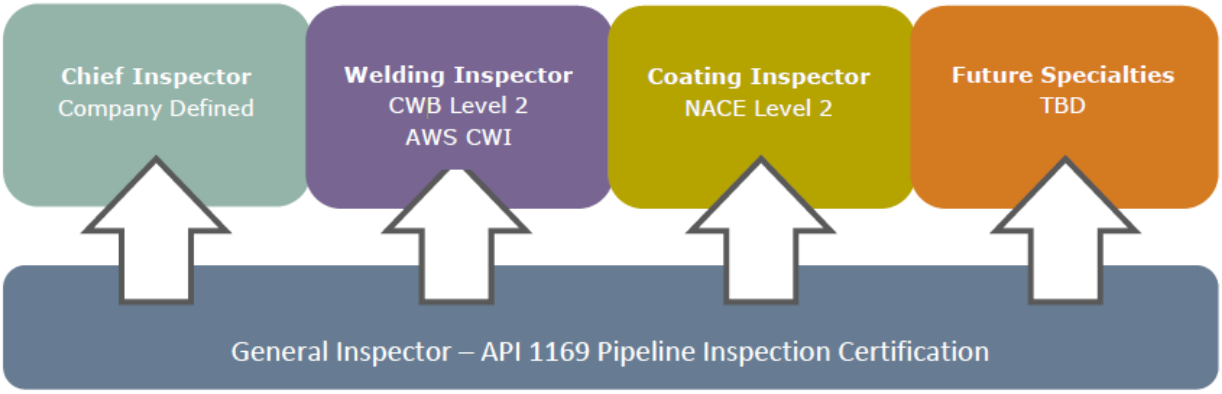
The establishment of pipeline inspector experience, qualification and certification requirements is ultimately the choice of each pipeline operator. In some cases these requirements may be established by a Regulator. As revealed from the AGA survey, expectations differ broadly across the gas industry from one operator to another. Some operators prefer inspectors have extensive years of experience, some specify inspectors have Operator Qualification tests; others require internationally recognized and standardized professional qualifications (API, AWS, NACE etc.). Some operators have an internal inspection workforce, some utilize primarily contract inspection services and others use a mixed model. Considerations presented in this white paper cover both internal and external inspector qualifications.

The industry recognizes that standardization in experience requirements, competency, qualifications and certifications of inspectors across the natural gas operations can ultimately improve the quality of construction, integrity, reliability and longevity of constructed gas assets as well as the safety of workers and members of the public who live and work near these assets. The extent of adopting industry certifications versus company practices and training for inspection is ultimately the choice of the operator. An overview of industry certifications is provided for consideration but is not intended to imply a mandate.

Natural Gas Industry Inspection Certifications

Below is a list of certifications that have been recognized within the natural gas pipeline and related industries for eligible journey level pipeline craft inspectors. These internationally recognized competency certifications are administered by Independent Standards and Certifications bodies.

Figure 3: Recognized Certifications for Multiple Inspector Types: [1]



- API 1169 Certification for pipeline inspectors including Chiefs, Leads, Specialty, Distribution and other craft Inspectors
- American Welding Society - Certified Welding Inspector Certification (AWS CWI) (in addition to API 1169) for Welding Inspectors is a recommended certification although many Operators have Welding Inspectors certified by experience or by company OQ.
- National Association of Corrosion Engineers Coating Inspection Program (NACE CIP) Level 2 (in addition to API 1169) for all journey level coating inspectors.

API RP1169 Pipeline Construction Inspector– Content, Recommend Practice & Body of Knowledge

Pipeline Construction Inspectors certified by API RP 1169 standards *should have a broad knowledge base relating to construction of new onshore pipeline. This knowledge base, at a minimum, includes such topics as inspector responsibilities, personnel and general pipeline safety, environmental and pollution control, and general pipeline construction inspection. The API RP 1169 Pipeline Construction Inspector Certification Examination is designed to determine if applicants have such knowledge*[2].

To qualify for the recommended practice 100-question multiple choice certification exam, candidates are required to have previous work experience, education and/or other related industry certifications. Candidates generally can take the exam with just 2 years of pipeline related experience; additional experience may be warranted if non-pipeline related[3].

[1]The INGAA and CEPA Foundations *Pipeline Inspector Certification Programs* https://www.cepa.com/wp-content/uploads/2014/01/Program-description-Inspector-Certification-final-3-15-16.pdf

[2] API, Body of Knowledge API-1169 Pipeline Construction Inspector Certification Examination. Retrieved February 26, 2018 from http://www.api.org/~/media/Files/Certification/ICP/ICP-Certification-Programs/1169_EffectivitySheets_and_BOKs/1169_BOK_Apr-Dec-2017_final-011117.pdf

[3] API, API 1169 Pipeline Construction Inspector Certification Fact Sheet. Retrieved February 26, 2018 from http://www.api.org/~/media/Files/Certification/ICP/ICP-Certification-Programs/1169_EffectivitySheets_and_BOKs/1169_PipelineInspector_FactSheet_September-2016.pdf

The API 1169 certification examination is based on content coming from a Body of Knowledge[2] (BOK) made up of the following reference documents. Inspectors are expected to have good working knowledge of materials contained in the reference documents in whole or strictly the specific relevant sections listed in the body of knowledge.

The API Recommended Practice (RP) 1169 contains the following topics:

1. General Quality Principles
2. Pipeline Construction Inspection
3. Pipeline Construction Safety
4. Pipeline Construction Environmental Protection

National Association of Corrosion Engineers Coating Inspector Program (NACE CIP) Level 1 Content[4]:

The NACE CIP Level 1 certification covers the technical and practical fundamentals of coating inspection work. Students will be prepared to perform basic coating inspections using non-destructive techniques and instrumentation. The certification consists of a five-day course followed by one day of testing. No prior pre-requisites are required to qualify for CIP 1, however industry knowledge on coatings is recommended to be successful in obtaining this certification.

CIP level 1 certification course covers the following learning objectives:

- Give examples of corrosion fundamentals such as properties of a coating, coating classification and modes of protection
- Recognize coating types and curing mechanisms
- Recall coating specifications including service environments and coating life cycle
- Differentiate surface preparation equipment, methods, and standards for abrasive blasting, solvent cleaning, and power and manual tool cleaning
- Differentiate coating application by type, including brush, roller, mitt, and conventional and airless spray
- Demonstrate inspection procedures
- Describe the role of the inspector –as it applies to safety, ethics, conflict prevention, and decision making
- Test for environmental or ambient conditions and nonvisible contaminants
- Utilize non-destructive test instruments such as wet-film and dry-film thickness gauges and low and high voltage holiday detectors
- Measure surface profile using replica tape and anvil micrometers, surface profile comparators, and digital surface profile gauges
- Identify quality control issues, recognizing design and fabrication defects and coating failure modes
- Utilize Safety Data Sheets (SDS) and product technical data sheets
- Demonstrate the purpose and content of Logbook and report documentation

[4] NACE Course Coating Inspection Program Level 1. Retrieved February 26, 2018, from https://www.nace.org/cstm/Education/Course.aspx?id=ad9ac603-ad11-db11-953d-001438c08dca

NACE CIP Level 2 Content[5]:

The NACE CIP Level 2 focuses on advanced inspection techniques and specialized application methods for both steel and non-steel substrates, including concrete using both nondestructive and destructive techniques. Surface preparation, coating types, inspection criteria, lab testing, and failure modes for various coatings, including specialized coatings and linings are also covered. The NACE program consists of a five-day training course followed by one day of testing. There is a practical test administered as well as a separate computer based 100 question multiple choice test. Pre-requisites are two years coating experience as well as the NACE CIP 1 certification.

The CIP level 2 certification course covers the following learning objectives:

- Explain advanced corrosion theory as it applies to the role of cathodic protection when used with coatings
- Identify types of environmental controls, and inspection concerns associated with the use of digital electronic hygrometers, data loggers and wind speed monitors
- Identify standards, methods of use, and inspection concerns for centrifugal blast cleaning and water-jetting equipment
- Recognize the importance of surface preparation, application, and inspection of liquid-applied and thick barrier linings
- Utilize destructive coating inspection equipment, such as adhesion and hardness testers, pH meters and ultrasonic thickness and eddy-current dry film thickness gauges
- Recognize the methods of use, standards and inspection concerns for specialized application equipment including plural-component, electrostatic and centrifugal, and hot spray systems
- Recall concrete coating techniques, concerns and test instruments used for inspection
- Identify specialized coating techniques and application of non-liquid coatings including powdered coatings, spray metalizing, hot-dip galvanizing and automated coatings application
- Distinguish between different coating survey techniques, procedures and common coating failure modes
- Describe maintenance coating operations, as well as health and safety concerns in relations to the inspector's work conditions

AWS CWI Content[6]:

American Welding Society (AWS) Certified Welding Inspector (CWI) Program *is a certification achieved by satisfying the combination of defined education, experience, and/or examination requirements. Certification is not an assurance of future competence or ability*. *The certification of visual welding inspectors requires documentation of experience, satisfactory completion of an examination, and proof of*

[5] NACE Course Coating Inspection Program Level 2. Retrieved February 26, 2018, from https://www.nace.org/cstm/Education/Course.aspx?id=dda01bae-b011-db11-953d-001438c08dca&utm_source=print&utm_medium=postcard&utm_campaign=CIP2Ed

[6] American Welding Society Certified Welding Inspector Program https://www.aws.org/certification/inspectorprogram

visual acuity. The examination tests the inspector's knowledge of welding processes, welding procedures, destructive tests, terms, definitions, symbols, reports, safety, and responsibilities[7].

Applicants of certification must pass a vision test and have a combination of qualifying education and work experience, with supporting documentation[8].

The Body of Knowledge for the CWI exams[9] as it applies to pipeline inspection is as follows:

-Part A: Fundamentals

- Welding Processes
- Heat Control & Metallurgy (carbon and low-alloy steel)
- Weld Examination
- Welding Performance
- Definitions and Terminology
- Symbols – Welding and NDE
- Test Methods – Non-Destructive Evaluation (NDE)
- Reports and Records
- Duties and Responsibilities
- Safety Destructive Tests
- Cutting
- Brazing
- Soldering

-Part B: Practical

- Procedure and Welder Qualifications
- Mechanical Test and Properties
- Welding Inspection and Flaws
- NDE
- Utilization of Specification and Drawings

-Part C: Code Book Applications

- Materials and Design
- Fabrication
- Inspection
- Qualification

CEPA Foundation/INGAA Foundation –A Practical Guide for Pipeline Construction Inspectors

[7] American Welding Society, Specification for AWS Certification of Welding Inspectors. Retrieved February 26, 2018, from https://www.aws.org/library/doclib/QC1-2016.pdf

[8] American Welding Society, Certified Welding Inspector. Retrieved February 26, 2018, from https://www.aws.org/certification/page/certified-welding-inspector-2

[9] American Welding Society, Body of Knowledge. Retrieved February 26, 2018, from https://www.aws.org/library/doclib/BodyOfKnowledge.pdf

In addition to the established recommended practices and certifications, the CEPA Foundation/INGAA Foundation, has written *A Practical Guide for Pipeline Construction Inspectors*[10]containing practical information and checklists on the following topics that all level of inspectors can use when performing inspection duties:

- Pipeline Construction Inspector – Foundational Information
  - Authority
  - Code of Conduct
  - Worker, Site, and Construction Safety
  - Quality, Deficiencies, and Non-conformance Procedures
    - Escalation Processes
    - Personal Violations
  - Environmental Considerations
  - Execution of Work
  - Administration of Contractual Obligations
  - Records Management
  - Personnel Qualifications and Certifications
  - Equipment Calibration
  - Incident Reporting

In addition, *A Practical Guide for Pipeline Construction Inspectors* provides content on typical Input requirements, recommended practice Items & typical outputs for the inspector in each of the following project activities:

- Survey
- Clearing and Grading
- Stockpiling and Stringing
- Field Bending
- Ditching and Excavation
- Welding
- Coating on
- Lowering-in
- Backfilling
- Cathodic Protection
- Hydrostatic Testing
- Clean-up and Restoration

[10] Canadian Energy Pipeline Association, CEPA and INGAA Foundations A Practical Guide for Pipeline Construction Inspectors March 2016. Retrieved February 26, 2018 from https://www.cepa.com/wp-content/uploads/2016/11/A-Practical-Guide-for-Pipeline-Construction-Inspectors-16Mar2016-FIN...1.pdf

Inspection Certification Implementation Process

Figure 4: 3 Year Certification Implementation Goals

For a company considering implementation of a certified inspectors program, this whitepaper suggests implementing over three-years. A three-year implementation period is consistent with other pipeline trade organizations in North America such as INGAA & CEPA. A three-year implementation period is recommended to allow sufficient time for operators to build their programs and for inspection candidates to apply what they have learned to relevant projects. Some operators may require more than three years to achieve 100% certification due to company size and number of jurisdictions.

During the first year, operators would strive to have 10% to 30% of their inspectors thru certification. For year 2, this goal increases to 40% to 60% of the inspector workforce being certified and by end of year 3, 100% of inspectors become certified. Beyond the implementation period, operators can continue to employ trainee level inspectors who are accumulating the required work experience and working towards their certifications while under a progressive span of control as determined by the operator.

Industry Practices that Assist in Building Consistency among Inspectors

Transitioning to an inspection program requiring certification can assist the industry in building a consistent pool of inspector resources. In addition, inspectors in the labor market may be motivated to obtain certifications. Activities that a company can include while building the program include:

- Include certification requirements in inspection contracts & Master Service Agreement terms and conditions. Include a job description and job classification to union contracts in cases where the operator inspector workforce is unionized. Provide reimbursement financial incentives for internal inspectors to pursue certifications.
- Make certification a priority when interviewing and hiring inspectors. Certified inspectors should be first selected from contract inspection firms.
- For internal inspection personnel, reimburse training and certifications program expenses.
- Tie Compensation to Certification, e.g., compensate Inspector trainees (inspectors without the recommended certifications) at a lesser level than Journey Level Inspectors who possess the recommended certifications.

Inspection Certification Training Resource

Numerous training sources exist for inspectors and candidates who seek to obtain skill sets relevant to natural gas inspection. This includes training on the fundamentals of welding, pipeline coatings, safety,

specialized training and/or onboarding on what each operator expects of their inspectors. Operator onboard training includes company specific inspection forms and processes, defined inspector roles, responsibilities, and company specific inspection standards and procedures. In addition to fundamental training and operator specific training, training may also include preparation to pass the standard inspection certifications for AWS CWI, NACE CIP 1 & 2, and API 1169.

In the case of CWI and CIP certifications, training towards these certifications can be obtained directly from AWS & NACE as well as from private training companies and institutions. In the case of API 1169, training is not offered directly by API but is widely available by a number of private training companies, institutions, operators and in some cases inspection contractors. In all three certifications, the test is always administered by the certification body (AWS, NACE, and API) and their agent test centers.

Many operators and inspection contractors offer either full or partial reimbursement to their regular employees upon successful completion of the certifications. Free agent contract inspectors generally fund the training and testing themselves, however those who possess the certifications generally can benefit by preference for the work as more operators make these certifications mandatory. Those who possess the certifications are generally requested first for inspection jobs over those who do not. This makes inspectors who possess all three certifications highly sought after.

Sample Inspector Experience and Certifications

This section summarizes how one of the author member companies structures their inspection titles and job requirements. It is intended to provide readers a guideline for a comprehensive inspection program that can be scaled accordingly depending upon project scope.

Consider including inspector certifications and experience requirements for inspector job descriptions, inspector job classification descriptions and/or external inspection contractors, Master Service Agreements and/or supply contracts. The inspector certification and experience requirements for pipeline construction can be both more variable and flexible to address the wider range of materials and job scopes encountered in that industry segment.

Specialty and craft inspectors will generally meet the experience and qualification requirements contained in Annex A to E of API 1169, including but not limited to, the general certifications and qualifications listed below:

- **Chief/ Lead Inspector (Transmission)**
  - API 1169 - Pipeline Construction Inspection Certification Including working knowledge of all codes, standards and reference materials in API 1169 Body of Knowledge
  - AWS CWI if welding is performed on the job
  - NACE CIP-2 (Preferred)
  - Recommended 7 years of Industrial/ Gas Transmission Pipeline Construction Experience with minimum 5 years inspection/supervisory management experience
  - Knowledge of codes and standards including API 1104, API 1110, ASME B31.8, NACE and SSPC

- **Welding Inspector**
  - API 1169 - Pipeline Construction Inspection Certification Including working knowledge of all codes, standards and reference materials in API 1169 Body of Knowledge

- AWS CWI
- Recommended 3 to 5 years of welding inspection and/or welding experience, preferably on Gas Transmission pipeline
- Knowledge of codes and standards including API 1104, ASME B31.8, NACE and SSPC
- Knowledge of and familiarity with API 1104, API 1110 and ASME B31.8

- **Coating Inspector**
  - API 1169 - Pipeline Construction Inspection Certification Including working knowledge of all codes, standards and reference materials in API 1169 Body of Knowledge
  - NACE CIP level 1 & 2
  - Recommended 3 to 5 years of coating inspection and/or coating experience, preferably on Gas Transmission pipeline
  - Knowledge of applicable codes and standards including NACE and SSPC

- **Utility/ Trench Inspector**
  - API 1169 - Pipeline Construction Inspection Certification including working knowledge of all codes, standards and reference materials in API 1169 Body of Knowledge
  - 5 years of Industrial/Pipeline Construction Craft Experience with minimum 3 years inspection experience or successful completion of contractor supported utility inspector training such a as a sponsored technical college program.
  - Knowledge of applicable codes and standards including specifically INGAA/CEPA Foundation A Practical Guide for Pipeline Construction Inspectors.

- **Chief/Lead Inspector - Distribution**
  - API 1169 - Pipeline Construction Inspection Certification Including working knowledge of all codes, standards and reference materials in API 1169 Body of Knowledge
  - Recommended 5 years of Distribution inspection and/or construction craft experience with a minimum of 2 years steel pipeline coating (if steel is installed on the job) or welding inspection (if welding is performed on the job)
  - NACE CIP level 1 & 2 (if steel is installed on the job)
  - PE Fusion and Fusion Inspection Operator Qualification with a minimum 2 years inspection experience (if fusion of plastic is performed on the job)
  - AWS CWI (if welding is performed on the job)
  - ASNT – SNT – TC-1A Level II (optional but desired for projects involving steel pipe installation)
  - Knowledge of and familiarity with API 1104, API 1110 and ASME B31.8 (if welding is performed on the job).
  - Knowledge of INGAA/CEPA Foundation A Practical Guide for Pipeline Construction Inspectors.

- **Specialty**
  - API 1169 - Pipeline Construction Inspection Certification including working knowledge of all codes, standards and reference materials in API 1169 Body of Knowledge
  - Recommended 5 years of experience in particular area of expertise
  - Other technical Certifications as industry required e.g., ASNT, SNT-TC-1A,

- **Inspector Trainee**

- Three (3) years of industrial or pipeline construction or inspection experience or Associates degree in technical discipline
- Possess Company Operator Qualifications and/or NACE CIP level 1 and/or AWS/CWI.
- Actively learning & training towards getting certified in AWS API 1169 and possibly one other specialty certification AWS or NACE.
- Working knowledge of Pipeline Construction Inspection including working knowledge of all codes, standards and reference materials in API 1169 Body of Knowledge

Verifying Inspection Skills and Certifications

Operators hiring Inspection services through employer services or contract firms should include clear language for inspector requirements:

- Reference Checks: In addition to DOT drug testing and background check requirements[11], Inspection Contractors should perform reference checks on all Inspectors assigned to operator, which may include, but are not limited to criminal conviction investigations for crimes related to the performance of job requirements, current and past 3-year employment verifications with work history dates validated. The same requirements apply when operators are hiring Inspectors directly as employees.

- Skill Verification and Pre-Approvals: Inspection employers should verify the skills and qualifications of Inspectors prior to assigning inspection work. It is recommended that in addition to obtaining and maintaining copies of individual inspector certifications, the employer will contact the certification organization directly to verify validity of the actual certification record. API, AWS & NACE all provide this service free of charge and encourage customers to use it. Inspection employers should obtain written evidence of college degree(s), certifications, professional license(s), identification, employment eligibility, trade specific certificate(s) of completion, previous work history, and other pertinent information as applicable.

- Training, Onboarding, OQ, and Quality Assurance: Employers should provide required training, onboarding information and OQ certification ensuring inspection personnel are qualified and trained to perform work as specified by the operator including industry standards such as API 1169 where applicable. The Inspection contract agency should have an internal quality assurance program in place to conduct job site audits of their Inspection personnel for items relevant to project tasks completed in accordance to applicable standards.

- API 1169: Inspection Contractor Personnel should comply with all applicable Operator Standards and Work Procedures and in conjunction with *API 1169 Recommended Practice for Basic Inspection Requirements-New Pipeline Construction.*

- Additional Requirements: Inspection contract agency should verify that Inspectors assigned to the operator meet the required minimum technical skills, or their equivalent, and possess industry knowledge and experience as applicable to the assigned position:
    - Required API 1169, NACE CIP level 2 or AWS CWI as a requirement for each specialty described above

[11] 49 C.F.R Part 40 Procedures for Transportation Workplace Drug and Alcohol Testing Programs

- Responsible for adhering to, understanding and enforcing all safety standards and for obeying safety rules and regulations to promote a positive safety first culture.
- Ensure personnel have completed Operator onboarding, maintain required Operator Qualifications and accreditation to perform covered work tasks.
- Ensure personnel are qualified by training and experience to perform the work described in the Statement of Work.
- Ability to maintain working relationships, including but not limited to all internal and external stake holders.
- Familiar with DOT 49 CFR 192, FERC and OSHA regulations.
- Ability to read, understand and interpret all facets of construction, alignment and engineering drawings.
- Pass a pre-employment background check and a DOT drug screening and any additional operator's specific requirements.

Inspection Tasks – General Inspector Responsibilities

This section reviews the significant tasks that an inspector should conduct at a construction site. While this document does not attempt to establish a comprehensive list of all tasks that could be conducted at a construction site, it does provide a discussion of the more significant tasks that have been shown to be important based on gas industry inspector personnel experiences at numerous job sites. In addition, included with this section are appendices A-F at the end of the paper that provide detailed background behind some of the task responsibilities, such as a detailed description of the permitting process by which a typical gas transmission pipeline construction project will follow depending upon scope. The intent is to be comprehensive where items that do not apply can be omitted. The significant inspector tasks listed below are roughly in order of sequence of the construction activities for typical project sites.

The inspection tasks discussed below are broken into three broad categories:

Figure 5: Inspection Tasks Categories

I. Pre-Construction Tasks:

1. **Become familiar with the permits required and/or acquired for the pipeline construction project.**
   Typically a pipeline construction inspector is not required to acquire the permits necessary to construct a pipeline. However, the inspector should review the permits to make sure he/she is acquainted with all the permitting requirements and ensure that permits are to be kept onsite at all times and are accessible, if needed.

   There are a number of Federal, State, and local government agencies as well as other utilities and entities (e.g. railroads) that may issue permits for the construction of a pipeline. Appendix A, "Regulatory Agencies and Institutions that may be involved in permitting a natural gas pipeline construction project", lists and describes the various agencies and institutions that may be involved or influence permitting a natural gas pipeline construction project.

2. **Become familiar with company specific policies and procedures.**
   Prior to commencing construction at a project site, the inspector must become familiarized with the pipeline company's personnel and pipeline safety policies and procedures. The inspector should be knowledgeable in conducting a Job Safety Analysis (JSA), also known as a Job Hazard Analysis (JHA) to ensure that the site is safe for construction crews to conduct the type of work required for the project. The inspector should enforce the occurrence of a discussion of hazards/risks with workers before work begins, have them acknowledge that they are aware of and understand the risks, and agree to follow the outlined policies to eliminate or mitigate risk. Locates should be reviewed as part of the JSA.

3. **Possess copies of all the permits that are required to go to construction.**
   A proposed pipeline project may need to obtain numerous local, state, federal permits and clearances prior to construction. The permits address all natural resources — land, air, water, vegetation, and wildlife — as well as the interests of the general public. Although typically

companies choose to obtain the permits independently of the inspector, they may decide to involve the inspector in the determination and acquisition of needed permits. Often, permits can take months, and sometimes even years to obtain. Either way, the inspector must be familiar with the acquired permit requirements.

The following is a summary of the types of permits that are typically required in the United States, prior to construction. A detailed description of the permitting process and the major permit requirements is included for reference in Appendix B, "Natural Gas Pipeline – Local, State and Federal permit details." Details regarding non-regulatory easements and agreements may be found in Appendix D, "Private Property Easements, Utility Right of Ways, and Utility Encroachment Agreements." Note that not all of the permits listed below may be needed for a pipeline construction project, and there may be additional permits not listed.

Requirements generally include:

• *Federal*
- Wetlands preservation and crossings (U.S. Army Corps of Engineers [USACE])
- Streams and rivers (USACE)
- Threatened and endangered species (U.S. Fish and Wildlife Service)
- Air emissions (EPA)
- Environmental resource reports
- Noise (FERC)
- Highway permits (FHWA) as well as private company owner permits

• *State*
- Land (Erosion and Sedimentation Permit)
- Water (Hydrostatic Test water Acquisition and Discharge Permit, Stormwater Discharge Permit)
- Stream and river crossings (State Environmental Agency)
- Cultural resources preservation (State Historic Preservation Office)
- Threatened and endangered species preservation (State Fish and Wildlife Agency)
- Air emissions (State Environmental Agency)
- Highway permits (Federal Highway Administration)

• *Local*
- Building permits
- Road-crossing permits
- Forest Preservations permits (See Appendix C, "Forest Preservations Permits")
- Easement requirements
- Electric and other utility right of ways and encroachment agreements

4. Check design drawings to ensure they are in compliance with permit requirements.

Once the inspector has become familiar with permits required for a given construction project, the owner should verify that the construction drawings are in agreement with all appropriate code and permit requirements. The project owner company should provide the inspector with copies of all of the permits that will be required to conduct the necessary construction activities. If there is any discrepancy between the permits and the construction drawings, the inspector will need clarification on understanding the discrepancies, prior to

allowing construction activities. Additionally, the inspector should review all the permits to determine whether all required permits have been obtained and that they are all current. If any permit has expired, the inspector should contact the jurisdiction having authority and take the necessary steps to have the permit reinstated. It is also the responsibility of the inspector to check the drawings for any potential/future problems or issues that may arise during construction.

All permit, license, ordinance and easement conditions must be satisfied exactly as stated and agreed upon.

5. **Verify that all public utility commission notifications have been appropriately communicated based on the construction activities that will be taking place.**

   Based on the scope of the project, Public Utility Commissions (PUC) or Public Service Commissions (PSC) typically have to be notified ahead of time that a construction activity will be taking place. Generally, the determination of whether a commission needs to be notified is frequently based either on the linear footage of pipeline installed or the cost of the project. The more linear footage of pipe installed or the more expensive the project, the more likely the commission requires notification. The inspector should verify when notifications need to be made, and determine whether the company has made those notifications in the proper allotment of time required.

   If a commission or any other regulatory agency visit or inspect the construction site, who, when, and what was discussed should be documented. A sample form that could be used to document this interaction is included in Appendix E, "Example of form to fill out when an outside agency visits or inspects a construction site."

   After an agency visits a site, often a letter from the agency to the company will follow that describes any compliance violations with the terms of a permit.

6. **Determine whether owners of other utilities and local agencies have been notified before construction activities commence.**

   The inspector also performs the role of a company public relations representative. The role requires the overall responsibility of maintaining good relationships with landowners, various governmental agencies, company Operating and Construction Department personnel, and with outside contractors. An inspector maintains cooperation between public, field and office personnel by maintaining good public relations through coordination of construction work with local authorities, fire, police and street or highway departments.

II. Inspection tasks during construction:

Field check the Project Site

Once the inspector has reviewed the permit and easement requirements and verified that the construction drawings are in compliance, he/she will inspect the job site. The entire job will be checked prior to the start of construction to determine the safety of the job site, location of underground facilities, and to note items relating to special conditions of easement, changes

in routing of main, railroad crossings, waterway crossings and highway crossings. The inspector will:

1. **Inspect construction site for safety compliance – Personnel and Pipeline**

   The inspector will evaluate tasks and provide oversight on the safety of construction crews at a job site. For example, if the inspector is aware of what Personal Protective Equipment (PPE) is required for the various tasks during the project's construction, the inspector verifies that construction crews are wearing the appropriate level of PPE. Inspectors should stop work and correct unsafe work practices. The inspector also verifies that personnel are located a safe distance away from any pipeline and/or associated facilities undergoing pressure testing in accordance with the pipeline company's requirements.

   Inspectors are also well versed with OSHA and the operator's confined space entry and ditch safety requirements and regulatory requirements. For example, all construction workers required to enter confined or enclosed spaces must receive and pass appropriate confined space training, be informed of the hazards involved, the necessary precautions to take, and the use of appropriate personal protective equipment (PPE) and emergency equipment needed before entering the space. Examples of confined or enclosed spaces may include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces where the walls are more than 4 feet tall, such as pits, tubs, vaults, and vessels[12].

   The construction inspector must verify that the construction contractor complies with any specific operator and/or government regulations that apply to work in dangerous or potentially dangerous areas. In addition to confined space entry regulations, typical operator safety policies and procedures include but are not limited to Hydrogen Sulfide (H2S) safety, working alone, fall protection, restricted work areas, hearing protection, manual lifting and carrying, lockout / tag-out, vehicle and equipment safety, drug and alcohol, and job safety analysis.
   Verification that the appropriate Traffic Control Plan has been selected and the construction site has the necessary orange blaze, construction cones or barrels, or concrete barriers, as required in accordance with Traffic Control Plan (TCP). The inspector also verifys that the construction site is secure based on its location, and that appropriate security measures are in place to prevent vandalism to the site and theft from occurring at the facility during non-working hours.

   In addition to safety checks, the inspector will review the Personnel Qualification or Operator Qualification (OQ) requirements of the construction crew. Inspections also verify that the construction crew can provide documentation demonstrating that they are OQ qualified to perform the construction.

2. **Know and enforce special conditions of right-of-way (ROW), easements, licenses or permits.**

   The inspector determines whether all legal conditions required by easement such as performance bonds, special construction conditions, and all other notifications to be

[12] For more information on confined spaces in construction sites see OSHA 29 CFR §1926.21(b)(i)-(ii).

communicated to responsible construction and contractor personnel and property owners.

The inspector verifies that the ROW has been surveyed and that the surveyor has visually designated the limits of disturbance using visual reference points and markers (e.g., stakes, pins, lath, and hubs). These will be used to guide the construction of the pipeline and necessary appurtenances in the ROW according to the Issued for Construction (IFC) drawings. The references also mark the safe limits of ROW work areas.

If the area for the approved pipeline route is forested, construction surveyors are commonly the first to arrive to flag trees so they can be removed assisting in the establishment of the ROW. The inspector may be the technical liaison for survey information between the operator's project engineer and construction manager, the surveyor, and other on-site contractors.

Before construction begins in the ROW, the inspector is responsible for making sure the one-call notification has been made, the time frame of the one-call ticket is valid and that underground utilities in the in the ROW are accurately and clearly marked (call 811 before you dig). If there is insufficient information to provide accurate locations of the utilities, the inspector may recommend to the operator and/or contractor, that the utilities be exposed (pot-holed) to find their exact location.

The inspector will verify that all construction debris (e.g.. rags, oil cans, etc.), hazardous waste, and garbage is collected and disposed of safely and properly in an approved facility off of the right of way.

3. Inspect site environment controls and issues that may impact the environment

The inspector will verify that the soil erosion and sediment control measures (e.g.. silt fencing, erosion control blankets, filter socks, etc.) along the ROW are installed in accordance with permitted and approved soil erosion and sediment control (SESC) construction drawings Inspecting for permit compliance and SESC can help prevent site soil erosion and control the invasion of harmful sediments on construction sites.

The inspector helps prevent site contamination by verifying that the construction practices avoid discharge of materials that are buoyant, flammable, explosive, or pollutive and promptly cleans up any spills of such materials. Solid and liquid waste disposal is primarily regulated by the rules of the State Pollution Control Board as enforced by the State EPA. Report spills of such hazardous material to your supervisor and/or the project manager.

4. Inspect excavations

All trenches and/or excavations are backfilled as rapidly as conditions permit. All excavations in ditches and backslopes are backfilled in such a manner as to maintain the original ditch line and ground line (mounding and crowning on excavations are normally not permitted)[13].

[13] Trench backfill and how to measure the compaction of the backfill, shall conform to all state specifications and OSHA 2226-10R, 2015 or latest edition.

All excavations made in pavements and shoulders are enclosed the same day the excavation is made unless specifically stated otherwise in the permit. In any case, no more than 50 feet of trench should normally be left open overnight.

Openings in concrete pavement should be made at construction joints wherever possible. Inspection will verify that all excavated materials related to the construction work are kept off the pavement to avoid creating a hazardous condition. If this condition is not complied with, all construction operations in conjunction with the permit can be stopped by the State.

5. **Inspect crossings encountered on the construction site**

There are numerous types of roadway, waterway, railway and utility crossings that may be involved in a given pipeline construction site. The construction inspector should be aware of the following potential crossings during pipeline construction and must make sure that the project follows any applicable requirements, which may include:

Highway Crossings: There are four types of highways crossings, (1) state highway, (2) interstate, (3) expressway and (4) freeway. The inspector must be aware of:

a. which entity has legal jurisdiction of road - some state roads do not come under the jurisdiction or maintenance of the State. Verify which jurisdiction the road belongs to.

b. the construction permits and have a copy of the permits on the job site any time construction work is in progress.

c. special permit conditions - bring those conditions to the construction manager's attention. Many times, the construction manager does not see anything other than the construction prints, especially when construction is outsourced. Conditions other than those shown on construction prints are found on the permit application.

If pavement repairs are involved, the paving manager should have a copy of the permit or, at a minimum, the permit number.

County and municipal roads: County and municipal road permit requirements vary greatly by jurisdiction and thus it is important that the permits be checked carefully. In addition, requirements and controls similar to those of the State usually apply to county and municipal road construction projects involving federal money.

d. Notifications - In most cases, the Highway Department requires a 72-hour notification in advance of construction. Also, a completion notice should be sent to the Highway Department when the job is finished.
e. Expiration Date - A critical item to comply with on any highway permit is the expiration date. If the permit has expired, the inspector may contact the jurisdiction having authority and take the necessary steps to have the permit reinstated.
f. Location of Underground Structures: Before crossing a road, the inspector should make certain that all underground structures, such as telephone and power cables, sewers, water lines, oil or gas pipelines, have been located. It is necessary to call 811 a minimum of 48 hours prior to any construction to verify all utilities are located.

Railroads: Railroad lands and rights-of-way are private property.

Provide adequate notification – many railroads require a minimum of 48 hours notification prior to starting construction. Typically, railroads are very strict with the 48-hour timeframe; the inspector will verify the time window is being followed. Railroads may require flagmen to be on duty during the construction period to verify proper train traffic flow and safety for the construction team.

Most railroad prerequisites will be shown on the final print and permitting paperwork. Since railroad prerequisites vary, it is most important that the inspector double-check the approved prints and the permit paperwork closely.

All special permit conditions should be carefully examined by the inspector and attention given to the following:

g. Whether a casing is required.
h. Whether the same type of protection coating is required for carrier pipe and casing. Railroads may require both casing and carrier pipes within the crossing to be externally coated with the same protective coating as is applied to the carrier pipe adjacent to the crossing.
i. Electrically inspect (jeep) carrier pipe and casing before installation to detect flaws or breaks in its coating.
j. Ensuring the pipeline crosses the railroad properly. If possible, the pipeline should cross the railroad at right angles.
k. Pipeline should not be placed within a culvert or under railway bridges.
l. Depth from base of rail to top of casing should not be less than 5 1/2 feet, unless otherwise specified.
    i. Casing should not be less than three feet below the surface in other portions of the right-of-way, not directly beneath any track.
    ii. Casing should extend outward a distance of 45 feet on each side (measured at right angles to center line of outside track).
m. When specified in the construction drawings and where it is practicable to do so, all crossings should be prominently marked on both sides of the track, at the railway right-of-way line.

Water Crossings and Encroachments:

Rivers, lakes and streams are regulated by the rules and regulations of the Division of Water Resources of the State Department of Transportation, the U.S. EPA, the State EPA, and the U.S. Corps of Engineers. In addition, there are specialized organizations with additional rights to protect their interests, such as the Metropolitan Water Reclamation Districts of various municipalities and local drainage and levee districts.

Normally, a single permit issued by the Water Resources Districts will cover all jurisdictions except the specialized interests. The U.S. Corps of Engineers will also require a permit to protect navigation for major river crossings.

The regulatory requirements, not specifically mentioned in the permit, will be covered in the work order specifications. Occasionally, it is required to dispose of the dredged material off-

site because it is too fine. Disposal will usually be at the construction manager's option. At other times, the operator requires the disposal of the dredged material at a specified secure landfill because it is known to be contaminated.

n. Follow appropriate water crossing procedures.

o. Report spills of hazardous or pollutive material to your supervisor.

p. Verify an emergency spill plan is in place.

q. Minimize the amount and duration of temporary disturbance of the use and functions of the water body and its banks.

6. Inspect materials for damages and verify proper handling during delivery and while on site

The handling of material is a critical aspect of any construction project. It is important that materials are available and on hand at the right time to keep the construction progressing while ensuring that delays do not occur due to lack of material or damaged material.

A majority of the material utilized in pipeline construction projects include valves, pipe and various fittings including elbows, tees, reducers etc. Additionally, many projects utilize specialty equipment such as weld end insulators, stopple fittings, control and relief valves, flanges, and gaskets. It is important that all project stakeholders understand material specifications and how it needs to be handled including storage and use.

The following outlines specifications that provide guidance for the most common materials:

Pipe:

Steel
API 5L – Specification for Line Pipe Standard for Seamless Carbon Steel Pipe
API 1104 – Welding of Pipelines and Related Facilities
API RP 5LT – Recommended Practice for Truck Transportation of Line Pipe

Plastic
PPI Handbook of PE Pipe

Coatings
NACE RP0402-2202-Field Applied Fusion Bonded EpoxyNACE RP0275 – Application of Organic Coatings to the External Surface of Steel Pipe

Valves:

API 6D – Specification for Pipeline and Piping Valves

Flanges / Gaskets:

ASME B16.5 Pipe Flanges & Flanged Fittings – NPS ½ through NPS 24
ASME PCC-1-2013 Guidelines for Pressure Boundary Flange Joint Assembly

Fittings:

ASME B16.9-2012 Factory Mad Wrought Butt-welded Fittings
ASME B16.11-2016 – Forged Fittings Socket Welded & Threaded

Hot Tap and Line Stop Fittings:

As of 2018 there are no governing codes or standards dedicated specifically for the construction of Hot Tap and Line Stop fittings. The fittings are generally constructed in accordance with general ASME standards; however, the specific design parameters of the fittings are proprietary to each manufacturer. In addition, the fittings can be customized to meet specific requirements of the operator. The inspector should become familiar with the manufacturers fitting specifications and any supplemental operator O&M procedures for the installation of Tap and/or Line Stop fittings.

For further information, the contact information for the manufacturers of more widely used Tap and Line Stop fittings.

Material needs to be handled with care. Additionally, the installation needs to follow manufacturers' recommendations and specifications. An Inspector needs to be familiar with the material that will be installed, installation and operating procedures as well as testing requirements. It is imperative that material is installed properly and in systems appropriately rated to verify that system integrity remains intact.

7. Inspect pipeline for proper construction and Installation techniques

a. Inspect pipeline for proper welding for steel pipe
    i. Before beginning the day, review welding specific documentation including the Welding Procedure Specifications (WPS), verify applicable welders are qualified for the WPS. Verify the pipe will be protected from changing weather conditions and accidental ignition, check for proper electrode storage and condition (damp or old) and perform a daily check of welding equipment. Before welding a specific joint, a review of root openings, bevel angles, differences in wall thickness and joint alignment should be completed. Additionally, verify the materials have been properly cleaned to help avoid defects from forming during welding.
    ii. During the welding process, verify the WPS is followed. Items such as cleaning methods, temperature control, travel speed and rod selection should be reviewed.
    iii. Review the operator's procedure manuals to determine what, if any, non-destructive-testing (NDT) is appropriate. Examples include X-ray and mag particle analysis. A visual inspection should be completed to check for defects such as arc burn, porosity, undercut, slag including and low caps. Based on the application, repairs may be allowable in accordance with the procedures. Verify all welder and inspector markings are applied to the weld and documented.
b. Pipeline Coating/ Weld Joint Coating / Coating Inspection
    i. Protective coatings are an integral part of piping system. Much of the pipe installed today comes coated with fusion bonded epoxy (FBE). The inspector

verifies the coating is not damaged and has not been stored outdoors for an extended period, typically less than 2 years[14].

ii. Beyond certain thresholds, prior to lowering in the ditch, coated steel pipe should be jeeped with a holiday detector to identify any anomalies in the pipe coating. Typically, the procedures manual will specify a diameter/length combination when jeeping is required. Damaged coating needs to be repaired.

iii. After welding, verify all girth welds are coated with an appropriate coating, as instructed by the operator's procedure manual. Pipe that will be installed by directional drill, often has a second coating referred to as aro – abrasive resistant overcoat. Weld joints also have an additional sacrificial wrap, which may be an epoxy cured wrap.

iv. When installing coatings or sacrificial wraps, all surfaces must be clean and free of oils, dust, dirt or other contaminates. Be sure to consult the manufacturer's recommendations for installation temperature and cure times.

c. Bending allowances

i. Pipeline bends are used to conform a pipeline to the natural terrain. Bends often must be determined in advance of construction. The pipe section is engineered, fabricated and delivered to the construction site. These prefabricated sections are installed, as necessary, with the rest of the pipeline. If not prefabricated, hydraulic bending machines can be utilized at the installation site. The use of the bending machine helps verify the bend is properly made and that the pipe does not contain any buckles, ripples, or other defects caused during the bending process. Consult with the procedures manual to verify minimum bend allowances established by the operating company and code requirements.

d. Proper connection techniques for plastic pipe

i. Joining plastic pipe can be completed by several methods including heat fusion, electrofusion, compression fittings and "stab-type" fittings. The two most common types of plastic gas pipe in use today are medium density PE2708 (Yellow) and high density PE4710 (Black). If dissimilar types of PE pipe need to be joined, a method other than heat fusion should be used.

ii. The inspector should be familiar with the operator procedures and verify items such as cleaning, facing, heating iron temperature, hold time, cool down/rough handling time and bead size. Weather conditions must be considered during this process to verify that temperature of the heating elements is consistently maintained.

iii. For mechanical connections, the operator procedures and manufacturer procedures must be followed to verify a proper installation. Several items to consider include, but are not limited to, cleaning, beveling, clamping and marking stab depths.

e. Horizontal Directional Drill (HDD)

i. Horizontal directional drilling (HDD) is a trenchless technology that provides an efficient method of installing piping. Typical HDD applications include crossing railroads, wetlands, parkways and streets.

[14] Most FBE coatings deteriorate with sunlight exposure.

ii. Advantages of HDD applications include shorter setup time when compared with traditional open cut installation, less disruption to traffic, lessened impact on the environment, reduced construction time and reduced restoration costs.

iii. All drill machines should be grounded and equipped with an electrical strike detector in the event that the drill rods strike an energized underground utility. Sinking anchor stakes within 2' of any utility should be avoided. The HDD operators performing this activity must wear electrically insulated boots and gloves. Insulated boots must be worn by anyone crossing the bore path to prevent electric shock hazards.

iv. For PE pipe, verify tracer wire is installed during the pullback process. During all HDD installations, a weak link should be used to avoid damage to the carrier pipe.

v. Some disadvantages of HDD applications include the risk of damaging existing utility lines during construction, cross-bores, frac-outs, and a reliance on a locating device to identify where the drill head/pipeline is during installation. These items should be considered during the planning phase of construction and can be mitigated by maintaining proper clearances from foreign utilities[15].

f. Tie-in

i. Review of Tie-in Plan

Consideration shall be given to having a written tie-in plan. Prior to commencing the tie-in operation, a pre-meeting should be held to verify all personnel involved in the tie-in operations understand the tasks to be performed and who is responsible for task completion.

ii. Hot Tapping requirements

Hot tapping is a procedure for connecting a new section of pipe to an existing line while the existing pipeline remains in service. Hot taps can also be made to install small appurtenances such as gauges, vents and bypass fittings. This process can greatly reduce the costs associated with branch connections, line stopping and other maintenance when done properly. Hot tapping should not be done in instances that would result in an unintended ignition. Inspectors should verify pipe specifications (w.t. &SMYS) have been verified using ultrasonic (UT) or other methods, prior to performing the hot tap to verify safe conditions. In order to maintain a safe environment, the operating conditions of the existing pipeline and worksite must be continuously monitored throughout the hot tap procedure. Inspectors will verify that combustible gas indicators (CGI's) or other atmospheric monitoring equipment is used to identify any unexpected release of gas, and a method to control static is used

iii. Purging Requirements and methods

The primary purpose of purging a pipeline is the elimination of safety hazards during commissioning or de-commissioning. The safety hazards occur when flammable gasses or other vapors mix with air. Gas flow can also cause a buildup of static electricity, which must be mitigated, to eliminate a potential ignition source. Purging is usually accomplished by displacement with an inert gas such as nitrogen. For smaller applications, a pipeline may be filled completely with an inert gas prior to filling with natural gas. Larger pipelines will have a slug of nitrogen injected to act as a barrier between the air and natural gas. This

[15] AGA Whitepaper, *Reducing Pipeline Damages from the use of Horizontal Directional Drilling* – published 2016, provides guidance in reducing HDD damages.

determination is pre-engineered as part of the commissioning plan. Factors such as length, diameter and purge velocity are taken into consideration during plan development. In order to maintain a safe environment, the operating conditions and worksite must be continuously monitored throughout the purge procedure. Inspectors will verify that combustible gas indicators (CGI's) or other atmospheric monitoring equipment are being used to identify any unexpected release of gas as well as to monitor the progress of the purge. Specific PPE may need to be worn during purging such as fire-retardant coveralls.

8. Inspect for proper pipeline testing methodologies

a. Hydrostatic / Pneumatic testing requirements

i. Before beginning the tests, inspectors review the testing plan with the contractor. Inspectors verify and document the appropriate personnel are qualified for the test procedure. During strength testing, hydrostatic or pneumatic, it is the operator's responsibility to provide for the safety of all pipeline construction personnel and the general public. Measures may include, but are not limited to, placing warning signs in or near populated areas, restricting access to the immediate area, and prohibiting major pipeline work not directly associated with the test. While the pipeline facilities are being pressurized and during the test, all personnel not required for direct operations are generally restricted from the area where the pipeline is being tested.

ii. Inspectors will review the operator's procedures manual for procedures to verify test pressures. It is common that pipelines are hydrostatically tested to a minimum pressure of 95% of the pipeline's specified minimum yield strength (SMYS) and a maximum test pressure that creates a hoop stress equivalent to 105% of the pipeline's SMYS.

iii. As soon as possible after the test has been accepted by the lead company engineer, pressure is reduced at a limited rate such that no vibrations develop. The operator utilizes extreme caution throughout the depressurizing process. Valves are opened and closed slowly to protect the assembly from shock loading and under no circumstances shall the valve be opened fully to initiate de-pressuring. Prior to commencing any dewatering activities the operator shall verify that all mainline valves have been returned to the full open position.

iv. NDT methodologies

X-Ray, Ultrasonic, Mag Particle, Liquid Dye Penetrant are non-destructive testing requirements that can be utilized to validate pipeline integrity at welds and seams following strength testing. Inspectors should be trained in interpreting the results of these various methods of NDT.

III. Inspector tasks post construction

Inspect project for proper documentation

Prior to commencing construction, the inspector should obtain the contact information of the customer who will receive the project construction documentation and verify who is responsible for delivering the information to the customer (either the construction manager or the inspector). Either way, the inspector reviews every piece of documentation related to the construction of the pipeline

and assists in the information being traceable, verifiable, and complete[16]. A good resource for the type of documentation needed can be found in the AGA Material Tracking & Traceability Whitepaper published in 2017.

Final inspection to verify pipeline is ready for commissioning

a. Pipeline cleaning

After installation and testing is completed the pipeline must be cleaned and any remaining water removed before commissioning. In addition to ensuring product quality, removing excess water reduces the risk of corrosion to the pipeline. Pigs are pushed through the line with air. The pigs mechanically remove excess water and the flow of air through the pipeline absorbs any remaining moisture. A desiccant dryer may also be used to achieve appropriate moisture levels after pigging.

b. Odorization and odorant monitoring requirements

During commissioning, when required, the pipeline must be prepared to maintain proper odorant levels. Natural gas is odorized (commonly with methyl mercaptan) which must be detectable by a person with a normal sense of smell at 20% of the lower explosive limit, or 1% of gas in air. To maintain these levels, new pipelines are "pickled". Pickling is the process of injecting excess odorant into the pipeline. This excess odorant is absorbed by the pipeline allowing normal operation in the future. Various techniques can be used to pickle a pipeline. Common methods include slugging, continuous injection and commissioning with highly odorized gas. Pickling must be monitored as many factors will affect this process including variations in pipe material, installation length, internal coatings and pipeline diameter.

c. Verify certain features are in proper working condition prior to leaving job site

Prior to the contractor leaving the job site permanently, consideration should be given to verifying that the following components are in working order.

i. Verify that the pipeline facility can be located by the use of attaching a pipe locator to the tracer wire and verify the pipeline that was constructed can be located. Have deficiencies repaired by the applicable contractor.
ii. Verify that all valve boxes, including curb boxes are cleaned out and the valves are operable.
iii. When required by the company's procedures a coating effectiveness survey after installation will verify that all coating anomalies of concern to the operator are not present. If coating anomalies as defined by the operator are present, the coating damage is to be repaired.

d. Site restoration and clean up requirements

Site restoration cannot be overlooked. Pipeline right-of-way should be restored to its original condition including cleaning streets, smoothing grade, sodding/seeding and repairing other damage caused during construction. Areas that have been disturbed should have erosion and sediment control in place. Areas anticipating high water flow may require additional stabilization features.

[16] AGA Material Tracking & Traceability Whitepaper published in 2017

Inspection Records Management

Role of the Inspector in Field Data Gathering

Inspectors play a vital role in gathering data during construction. Of the companies surveyed, the majority assign work to inspectors based upon the type of work and the inspector knowledge and expertise. Inspection work is often divided between distribution and transmission, and/or steel and plastic or capital and O&M.

When determining the best approach to inspector assignments, several factors should be considered including, but not limited to, the following:

- Size of the company
- Number of inspectors and reporting locations (centralized model vs. distributed model)
- Geographical territory and layout of assets (overlapping distribution and transmission vs. concentrated distribution and cross-country transmission)
- Ability to source and manage qualified contracted inspectors to supplement the base workload and/or to help with peak-shaving or specialty inspection work
- Operator Qualification requirements for various tasks and the ability to effectively train and re-qualify employees
- Contract considerations for union employees (e.g. job descriptions, ability to contract work)
- Portfolio of project work including typical project types, sizes and durations
- Short-term (current year) and longer-term (3-5 year) outlook
- Role of the Inspector (construction oversight only or also data gathering)
- Other options for data gathering (e.g. designer, as-built specialist, pipeline contractor, contracted inspector)

An important consideration is the role of the inspector in data gathering. Most companies surveyed rely on the inspector as the primary source to gather data in the field. Some companies utilize an as-built specialist/drafter to gather information, and some use a combination of resources. As technology, data requirements, and data gathering techniques evolve, the role of the inspector must keep pace if inspectors are the primary source of asset data gathering for the company. Job requirements including knowledge, skills, and abilities should be evaluated to verify companies are recruiting the necessary skills for the position.

Traceable, Verifiable, and Complete (TVC) Records

The vast majority of companies surveyed utilize checklists to establish data gathering requirements and to verify procedures are followed. Most companies also differentiate the checklists by distribution vs. transmission, plastic vs. steel, or by pressure. In addition, 85% of companies noted they have a procedure in place to verify records collected are adequate to maintain compliance.

While tracking and traceability are important to companies, over half of the companies surveyed do not currently use the technology currently available for this purpose. GPS is used by some companies but primarily for transmission lines and welds. A recent whitepaper published by AGA's Engineering Committee reviews current state of industry tracking and traceability[17].

[17] AGA Material Tracking & Traceability Whitepaper published in 2017

Checklists and forms can be helpful to guide inspectors in the collection of field data, however, checklists should not be used to define the asset data that is important to the company. The checklist can be a tool for quality assurance after asset data requirements are defined. Providing training to inspectors on the use of asset data will also help to reinforce the importance of data collection.

Integrity is driving all companies toward TVC records and an improved records management process. More importantly, companies should be exploring asset data management as a broader strategy.

Quality Assurance

There are several opportunities in a project lifecycle for QA to be performed including pre-construction, construction, and post-construction phases. Of the companies surveyed, only about half have a QA program to identify discrepancies in asset data. Predominantly the burden is a manual process performed by the inspector. When asked about methods of QA, most companies responded with checklists and verification digs[18].

As companies move toward fully integrated data gathering and asset management, the need for checklists and manual QA will be eliminated in favor of electronic methods to accomplish the same. In the interim, companies should consider adding QA steps in the project lifecycle beyond checklists and verification digs. Post construction review of records can identify missing attributes and/or incorrect attributes that can be corrected before records are filed away. This can be accomplished through manual records checks by the construction team, the records/fixed assets team, and the GIS team. In addition, the GIS itself can identify missing information through QA during data entry and through exception reporting. Any systemic concerns identified can be used to improve the overall data gathering process during construction.

Records Storage vs. Asset Data Management

Less than 20% of the companies surveyed collect exclusively electronic data, with the majority of companies collecting data via paper or a combination of paper and electronic mediums. Of those collecting electronic data, only some are tied directly to their work management and GIS systems, and the remaining companies leave electronic data in separate, stand-alone systems. The majority of companies store asset information as a combination of GIS and other electronic and manual systems. In the survey results, no companies emerged as having a holistic strategy to asset data management.

Although many companies are making strides toward improved data gathering and records management, the strides are often times piecemeal and without integration. Following are considerations for companies who may be interested in launching an Asset Data Initiative:

- Complete a Feasibility/Capability Assessment
    - Engage consultant expertise as needed
    - Assess current capabilities
    - Consider industry trends and benchmarking

[18]*Developing and Implementing a Quality Assurance Program for Natural Gas Operations* – Published in November 2015 by AGA provides a resource for companies considering developing a formal QA program.

    - Establish the long-term vision and roadmap
    - Perform a gap analysis between current capabilities and the long-term strategy
    - Consider initiatives already underway and how they fit into the broader plan
    - Evaluate high-level costs, benefits and resource requirements for the strategic plan
    - Establish milestone deliverables to make the process manageable
- Source a firm specialized in providing technical guidance and project management services
- Establish a full-time team (it can be small) with a network of available subject matter expertise
- Develop an Asset Data Governance structure with a charter and committee. Identify roles and responsibilities and representation from across the business to verify data governance objectives are met. Verify asset data requirements are defined and a process is established to respond to a dynamic regulatory environment and emerging technologies.
- Develop a comprehensive asset data model that covers all critical assets' attributes, location, installation and condition information. There should be only one asset data repository with no competing sources of asset information. Verify compliance, maintenance, and GIS systems are fully integrated with the data model.
- Data Capture – leverage mobile data collection technology to provide electronic input of construction and compliance information that will flow to the asset registry. Inspectors will be prompted to provide needed information consistently for assets through mobile applications. Evaluate and incorporate GPS, bar code scanning, and other technologies as appropriate.
- Construction Work Flow - Verify that the requirements of the new asset installation process are consistent with the future asset data model. Provide flexibility for future technologies.
- Identify Impacts to Downstream Systems and Reporting - Identify current downstream processes, systems and reporting that rely on current asset data systems.
- Provide regular updates to stakeholders.
- Don't underestimate the need for a formal change management plan

Appendices

Appendix A: Regulatory Agencies involved in permitting a natural gas pipeline construction project

It is important to understand how pipelines are regulated in the United States to fully understand the permitting process. In order for the an inspector to become familiar with the permits that will be required for a natural gas pipeline construction site, he/she should be knowledgeable of the various governmental agencies that regulate pipeline construction and the ensuing permits that are required as a result of these regulations. The following is a list of federal and state agencies that have developed standards and regulate facilities associated with natural gas pipelines:

• ***U.S. Department of Transportation (DOT)*** **-** Natural gas pipelines and facilities are governed by Title 49, Part 192, of the *Code of Federal Regulations* (CFR), "Transportation of Natural and other Gas by Pipeline – Minimum Federal Safety Standards." This part prescribes minimum safety requirements for pipeline facilities and the transport of gas, including pipeline facilities and the transport of gas within the limits of the outer continental shelf, as defined in the Outer Continental Shelf Lands Act (43 USC 1331). In addition, 49 CFR Part 192 Sub-Part N, "Operator Qualification and Certification," is followed for the training and certification of personnel who construct, operate, and maintain the natural gas system. DOT has the responsibility and authority to promulgate and interpret safety standards, inspect companies' adherence to the

standards, and enforce these standards through the U.S. Department of Justice or local public utility commissions.

• ***Federal Energy Regulatory Commission (FERC)*** **-** The FERC is an independent agency that regulates the interstate transmission of natural gas, oil, and electricity. FERC also regulates natural gas and hydropower projects.

As part of that responsibility, FERC:

- Regulates the transmission and sale of natural gas for resale in interstate commerce;
- Regulates the transmission of oil by pipeline in interstate commerce;
- Regulates the transmission and wholesale sale of electricity in interstate commerce;
- Licenses and inspects private, municipal, and state hydroelectric projects;
- Approves the siting and abandonment of interstate natural gas facilities, including pipelines, storage, and liquefied natural gas (LNG);
- Oversees environmental matters related to natural gas and hydroelectricity projects and major electricity policy initiatives; and
- Administers accounting and financial reporting regulations and the conduct of regulated companies.

• ***Office of Pipeline Safety (OPS)*** **-** The OPS is managed under DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) and is one of the 2 safety offices within PHMSA. The OPS is responsible for promoting the safe and environmentally sound operation of natural gas and hazardous liquid pipeline systems. OPS issues and enforces pipeline safety regulations and provides state inspectors and the industry with training and technical assistance. Two statutes provide the primary legal framework for the federal pipeline safety program. The Natural Gas Pipeline Safety Act of 1968, as amended, authorizes DOT to regulate pipeline transport of various gases, including natural gas and LNG. OPS safety jurisdiction over pipelines covers more than 3,000 gathering, transmission, and distribution operators and about 52,000 master meter and LNG operators who own and/or operate approximately 1.6 million miles of gas pipelines, in addition to more than 200 operators and an estimated 155,000 miles of hazardous liquid pipelines. OPS maintains a reporting system for compiling accident- and safety-related condition reports submitted by gas and hazardous liquid pipeline operators, as well as annual reports submitted by gas pipeline operators.

• ***National Transportation Safety Board (NTSB)*** **-** The NTSB is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in the other modes of transportation, including railroad, highway, marine, and pipeline. The NTSB also issues safety recommendations aimed at preventing future accidents. The NTSB determines the probable cause of:

- Pipeline accidents involving a fatality or substantial property damage,
- Releases of hazardous materials in all forms of transportation, and
- Selected transportation accidents that involve problems of a recurring nature.

• ***Public Utility Commission (PUC)*** **-** In addition to the above regulatory agencies, state PUCs have standards and regulations regarding infrastructure within their states. In general, the PUCs are responsible for ensuring safe, efficient, reliable, and uninterrupted utility service at reasonable prices; regulating the financial organization of utility companies so that they

provide such services; and providing utility companies with the opportunity to earn a reasonable rate of return.

• ***State and Local Fire Departments*** **-** The natural gas industry as a whole normally relies on local fire departments as well as the state fire marshal's office for assistance during an emergency and for planning for emergency procedures.

• Other agencies or organizations that affect the industry are the U.S. Environmental Protection Agency (EPA), U.S. Department of Labor's Occupational Safety and Health Administration (OSHA), ASTM International (originally known as the American Society for Testing and Materials [ASTM]), American Petroleum Institute (API), and NACE International (originally known as the National Association of Corrosion Engineers).

When developing construction plans, permit approval is necessary from numerous stakeholders depending upon the pipeline design whether it is an "interstate" or "intrastate" facility. This will dictate the project owner to follow a State or Federal permitting process. Additionally, local permits may be required for construction through highways, roads and railroads, which may necessitate interaction with the Federal, State Highway Administrations, the State Department of Transportation and private land owners and railroad companies.

Additionally, when different pipeline operators cross each other, coordination, and perhaps a permit, is required to ensure that the new facility doesn't interfere with the original installation design.

Appendix B: Natural Gas Pipeline – Local, State and Federal permit details

Permitting at the Local Level

- LOCAL GOVERNMENTAL REQUIREMENTS
    i. This normally includes township or municipal permits which are acquired by the project engineer. Each permit will likely contain certain special conditions which must be fulfilled.
    ii. After a contract has been awarded, but prior to starting construction, the company representative should arrange a pre-construction meeting with the governmental officials and the contractor's representative to discuss all conditions and specifications of the permit.
    iii. Many communities or other local governments have special requirements for construction activities within their jurisdiction.

This local government permit is considered the simplest permitting process. Application for a permit usually requires submittal of a plan outlining the project. The local municipality reviews the plans and verifies that there are no or minimal conflicts with the local roads, sewers and other municipal infrastructure. The agency also ensures that local codes are met.
Local inspectors may or may not require an inspection of the facilities prior to placing the installation in service. Local governments may require an inspection if the pipeline is expected to cross municipal critical infrastructure or if the facility included a building that required an occupancy permit.

The time it takes the municipality to review and approve the plans varies considerably depending upon the location and the complexity of the project. However, the permitting process usually takes 1 to 2 months to complete.

Permitting at the State or Regional Level
State and regional permitting is a slightly more complex than local permitting. Applications usually require the submittal of a plan outlining the project and identifying the project stakeholders. Typically, a National Pollutant Discharge Elimination System (NPDES) Permit is required for larger projects (> 1 acre disturbance). The NPDES Permit requirement was created from a national EPA program under Section 402 of the Clean Water Act. The regulation seeks to reduce discharges of pollutants to point sources to waters of the United States. Discharges are illegal unless authorized by an NPDES permit. This includes erosion control measures to ensure run-off water from spoil piles due to rain-water do not drastically effect the local environment.

Any stream or river crossings require permits from the applicable state environmental agency. Additionally, large projects require an environmental assessment to outline endangered species and wetland impacts. If the pipeline crosses a state highway, a permit is also required. This is similar to roads governed by local municipalities.

The time it takes the state agencies to review and approve the plans varies considerably depending upon the location and the complexity of the project. However, the permitting process usually takes 6 to 12 months to complete.
Permitting at the Federal Level

Federal reviews of projects are completed at the national level and are utilized for "interstate" pipelines. These facilities are typically more critical in nature and have many stakeholders involved including various states, environmental and multiple municipal participants.
The following is an outline for permitting pipeline projects at the federal level.

A company must apply to the Federal Energy Regulatory Commission (FERC) to obtain a certificate of public convenience and necessity pursuant to section 7(c) of the Natural Gas Act (NGA) to construct, acquire, alter, abandon, or operate jurisdictional gas facilities or to provide jurisdictional gas services. Typically the certificate applicant will request: (i) a blanket certificate authorization to provide transportation service under Part 284 of FERC's open access regulations to qualifying customers; and (ii) blanket certificate authorization under Part 157 of FERC's regulations to construct, acquire, alter, or abandon certain types of facilities without the need for further case-by-case certificate authorization for each particular project. The FERC certificate process application requirements are set forth in FERC's regulations at 18 C.F.R. 157.14. A large portion of the application consists of the required environmental documents. The process also includes consulting with stakeholders, identifying the route and environmental issues through scoping. The National Environmental Policy Act of 1969 (NEPA) requires FERC and resource agency staff to analyze environmental impacts on proposed projects and alternatives to be considered and to provide appropriate mitigation measures.As performing this review, FERC staff will prepare an Environmental Assessment (EA) or Environmental Impact Statement (EIS).

An EIS is usually prepared for significant pipeline projects. The NEPA standard is for an EIS to be prepared if a proposed major federal action is determined to significantly affect the quality of the environment. An EIS is an extensive document that describes the effects of proposed activities on the environment, including: land, water, air, structures, living organisms, environmental values at the site, and the social, cultural, and economic aspects. An EIS describes impacts, as well as ways to manage impacts. Managing impacts means lessening or removing negative impacts. Federal laws and regulations require the federal government to evaluate the effects of its actions on the environment and to consider alternative courses of action. This study could take close to 24 months to complete depending upon how large the project is. For example, this process may involve looking at the effects the project has on migration of the monarch butterfly. This could take two seasons for a biologist to fully understand.

An EA is typically prepared for smaller, lesser scale/impact projects, such as compressor stations where the issues are largely related to noise and air. The NEPA standard is for an EA to be prepared when the federal agency determines that no significant impact would result from the project. An EA is a comprehensive and systematic process designed to identify, analyze and evaluate the environmental effects of proposed projects. EA preparation involves the public in an open and participatory manner and allows for the effective integration of environmental considerations and public concerns. The EA process is usually completed in 9-12 months.

Large projects may also include a preliminary determination based on non-environmental considerations. Certificates are issued by FERC order. The certificate order will discuss the environmental review is discussed and usually includes a list of required compliance with specified environmental conditions. Additionally, the certificate order addresses rates, rate

structure and tariff provisions as well as construction and placing the pipeline facilities into service within a specified period of years from the date of the order.

The typical certificate process has three parts:

A. Applicant's Planning Process
B. Application Process
C. Construction Process

The first step in a project is the Planning Process:

A. Planning Process for Natural Gas Certificates

Applicant's Planning Process:

1. Hold open season to determine market needs
2. Select proposed pipeline route
3. Identify landowners
4. Start easement negotiations
5. Hold public meetings
6. Start surveys, complete resource reports
7. File certificate application at FERC

The second step in the process is the Application Process:

B. Application Process for Natural Gas Certificates

Application Process:

1. Receives formal application from applicant
2. Notice of application issued
3. Conduct scoping to determine environmental issues
4. Review application and issue data request(s) if needed
5. Commission may issue preliminary determination of need based on non-environmental factors

	EIS	**EA**
6.	Provides preliminary draft EIS to cooperating agencies for review.	Provides preliminary draft EIS to cooperating agencies for review.
7.	Issues draft EIS and opens comment period.	Issues EA and opens comment period.
8.	Holds meeting(s) in the project area to hear public comments on the draft EIS.	Responds to comments received on EA in commission order.
9.	Responds to comments and revises the draft EIS.	FERC approves or denies project.
10.	Issues final EIS.	Commission issues order approving or denying project.

11.	Commission issues order approving of denying project.	
	If the project is approved	**If the project is denied**
12.	If the project is approved, applicant may construct and operate the project, only after obtaining Clean Water Act, Coastal Zone Management Act, and Clean Air Act permits.	If the project is denied, applicant and/or public can ask FERC to rehear case or refer to FERC administrative law judge.
		Applicant and/or parties can take FERC to court.

The third and final step in the permitting process is the construction phase:

C. Construction Process for Natural Gas Pipeline

1. Finalize project design
2. File plans, surveys, and information required prior to construction by FERC order
3. Complete right-of-way acquisition
4. Pipeline construction
5. Right-of-way restoration
6. PROJECT IN SERVICE
7. Department of Transportation Office of Pipeline Safety

PRE-FILING PROCESS:

In some situations, it may be advantageous to follow a pre-filing process. This allows project stakeholders a chance to review the project design prior to the project owner spending considerable amount of capital designing the project and completing design plans. This process is used to expedite projects while still going through the rigorous analysis and public commenting period.

PRE-FILING PROCESS OF NATURAL GAS CERTIFICATE

A pre-filing process allows FERC staff to become involved with scoping of environmental issues before the applicant files its application. So, the applicant's planning process overlaps and is combined with the FERC process:

Pre-Filing Process

EIS Pre-Filing Environmental Review Process:

1. Applicant assesses market need and considers project feasibility.
2. Applicant requests use of FERC's Pre-Filing Process.
3. FERC receives applicant's request to conduct its review of the project within FERC's NEPA Pre-Filing Process.
4. FERC formally approves Pre-Filing Process and issues PF Docket No. to applicant.
5. Applicant studies potential site locations.
6. Applicant identifies stakeholders.
7. Applicant holds open house to discuss project.

8. FERC participates in applicant's open house.
9. FERC issues Notice of Intent for preparation of an EIS opening the scoping period to seek public comments.
10. Applicant conducts route studies and field surveys. Develops application.
11. FERC holds public scoping meeting(s) and site visits in the project area. Consults with interested stakeholders.
12. Applicant files formal application with the FERC.
13. FERC issues Notice of Application.
14. FERC analyzes data and prepares draft EIS.
15. FERC issues draft EIS and opens comment period.
16. FERC holds public comment meetings on the draft EIS in the project area.
17. FERC responds to comments and revises the draft EIS.
18. FERC issues final EIS.
19. **FERC issues certificate order**.
20. Parties can request FERC to rehear decision.
21. Applicant submits outstanding information to satisfy conditions of FERC's order.
22. FERC issues Notice to Proceed with construction.

EA Pre-Filing Environmental Review Process:

1. Applicant assesses market need and considers project feasibility.
2. Applicant requests use of FERC's Pre-Filing Process.
3. FERC receives applicant's request to conduct its review of the project within FERC's NEPA Pre-Filing Process.
4. FERC formally approves pre-filing process and issues PF Docket No. to applicant.
5. Applicant studies potential site locations.
6. Applicant identifies stakeholders.
7. Applicant holds open house to discuss project.
8. FERC participates in applicant's open house.
9. FERC issues Notice of Intent for preparation of an EA opening the scoping period to seek public comments.
10. FERC may hold public scoping meeting(s) and site visits in the project area. Consults with interested stakeholders.
11. Applicant conducts route studies and field surveys. Develops application.
12. Applicant files formal application with the FERC.
13. FERC issues Notice of Application.
14. FERC analyzes data and prepares EA.
15. FERC - If no scoping comments are received, EA is placed directly into eLibrary. If substantive comments are received, EA is mailed out for public comment.
16. FERC responds to comments.
17. FERC issues certificate order.
18. Parties can request FERC to rehear decision.
19. Applicant submits outstanding information to satisfy conditions of FERC’s order.
20. FERC issues Notice to Proceed with construction.

Appendix C: Forest Preservation Permits:

FOREST PRESERVES

1. Preconstruction Meeting

   After the contract has been bid, but before work has started, a pre-construction meeting is usually held with the Forest Preserve representative, the contractor's representative, and the inspector to discuss and agree upon all working conditions.

2. Special Conditions

   Forest preserve permits contain special conditions and specifications that must be fulfilled to the satisfaction of the Forest Preserve representative. The inspector should make certain that the contractor is aware of the following special conditions that are normally required by forest preserve districts:

   - Forty-eight hours advance notice must be given to the Forest Preserve representative prior to the start of construction.

   - Tree Removal and Protection - No trees, shrubs or forest growth should be disturbed, cut, trimmed or removed without the permission of the Forest Preserve representative. Only trees marked with paint should be removed, all other trees within the work construction area should be properly protected.

   - All construction operations, movement of equipment and storage of equipment and materials should be confined to cleared areas away from the trees or as otherwise indicated.

   - All surplus excavated material, tree stumps or other debris resulting from construction activity should be disposed of off the district property.

   - Immediately after construction operations have been completed, all areas disturbed by construction operations should be graded as nearly as possible to their original contours, except for the trench area, which should be neatly crowned over to allow for settlement. Crowning the trenches is just the opposite of that required by the Highway Department.

Appendix D: Private Property Easements, Utility Right of Ways, and Utility Encroachment Agreements

PRIVATE PROPERTY EASEMENTS

- Secure Easements

  Before the contractor can enter upon private property, an easement must be secured from the property owner. This is usually a signed agreement. Besides the normal terms and conditions of the Easement Agreement, there may be a list of special conditions that must be honored.

ELECTRIC RIGHT OF WAY

- Obtain Permission

  Permission to work on electric company land is usually obtained through a formal agreement if property is privately owned.

- Operator Responsibilities

  The operator will like have to abide by the following conditions and restrictions.

  - ♦ No changes from the plans and specifications may be made without notification and written approval from Electric Company.
  - ♦ Except in cases of emergency, a 48 hour notification must be given before entering upon Electric Company's property.
  - ♦ The construction project is subject to inspection by Electric Company representatives.
  - ♦ No blasting is allowed and use of equipment over 15 feet in height is not permitted.
  - ♦ Pipeline markers shall be installed.
  - ♦ Electric Company shall be furnished an as-built print.

OTHER UTILITIES – Encroachment agreements

- Properly documented property rights are necessary for all property to be used including property owned by other utilities.
- Forty-eight hours' notice is usually required before any work can be done on the property.

Appendix E: Example of form to fill out when an outside agency visits or inspects a construction site

Outside Agency Construction Site Visit Form

Date/time of visit/inspection:

Name and telephone number of employee /contractor representative completing this form:

Agency on Site (Check all that apply)

- ☐ [*PSC name1*]
- ☐ [*PSC name1*]
- ☐ [*PSC name1*]
- ☐ Other Outside Agency (OSHA, DHS, DEQ, County Agencies, etc.)

When an outside agency representative visits a [*company name*] work site or facility, immediately notify the [*company name*] Supervisor or Manager responsible for the work site via phone. In addition to telephonic notification to the Supervisor or Manager, this form should be completed and sent to the Manager of DOT Pipeline Safety Compliance at [*company address*] the same or next business day of the agency visit. If a [*company name*] representative is not on site, this form should be completed and submitted by the on-site [*company name*] Contractor.

[*company name*] construction sites, plant facilities, or maintenance sites visited/inspected (list project and/or address):

All [*company name*] representative(s), name(s), department(s) on site:

Contractor performing work (if applicable):

Names of commission or other agency representative(s) on site:

Purpose of visit (Check One):

- ☐ Routine Inspection
- ☐ Other (state purpose) :

Specific records reviewed, or activity observed, by this outside agency:

(Were pictures taken?) ☐ Yes ☐ No

Specific comments, questions or concerns from agency representative(s):

Did the agency representative inform you of a probable violation? Yes ☐ No ☐

If yes, what specific parts of the Federal Code, State Code, or WG Policy/Procedure were cited by the agency representative?

Attach additional sheets as needed – Are additional sheets attached? Yes ☐ No ☐

Additional Comments:

Appendix F: Pipeline Construction Documentation checklist

PROJECT DOCUMENTATION CHECKLIST

Description of Work: _____

Job Number: _____

Location: _____

Project Engineer: _____

☐ MTRs (pipes, valves, fittings & etc)

☐ Pressure Test Reports

☐ Purchase Orders

☐ Purchase Requisitions

☐ Bill of Materials (BOM)/Stock Materials (ASP)

☐ X-Ray Reports

☐ As-Built Drawings

☐ Completion Notices

☐Material Testing Form Filled Out (existing pipe cut-out) (electronic copy only)