Subject Matter Study Report

**Inadequate Pipeline Personnel Qualifications**

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By

Royce Don Deaver, P.E.

DEATECH Consulting Company

203 Sarasota Circle South

Montgomery, Texas 77356

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**Inadequate Pipeline Personnel Qualifications**

**Executive Summary**

Prior to the mid 198’s to the early 2000s, pipeline affiliates of major oil companies and the major gas transmission had sizeable engineering staffs. However, because of the low oil and gas developments and construction in the mid-1980s through the 1990s, pipeline companies reduced their engineering staffs dramatically. This was also true of the upstream and downstream functions of the major oil companies. The mergers and acquisitions made during this time also resulted in a further reduction in engineering staffs of pipeline companies. I have heard from more than one source that the estimated number of jobs lost in the oil and gas industry during this period was about half a million. These losses included many experienced non-engineering people. Not only were major job cuts made by the oil and gas operating companies, but many more jobs were lost in contract companies that provided construction, materials, drilling, maintenance, design, and operating services to the industry.

Prior to the mid-1980s, major petroleum companies, including their pipeline affiliates, and some of the gas transmission companies believed that anticipated energy growth opportunities would require a strong technical capability in addition to a strong management capability. Many companies created professional technical progression ladders for engineers and scientists that were equal to those of middle management, but short of the executive levels of the companies. However, because of the low level of energy opportunities and extremely low profits of oil and gas operations, during the 1980s and 1990s, energy companies were desperate to cut costs “at all costs” including loss of technical competency. Technical staffs were cut dramatically and technical expertise was lost and many became incompetent.

Most of these reductions in engineering staffs involved senior engineering personnel that provided the technical leadership for pipeline activities. Many of these senior engineering professionals were provided early retirement packages and many gladly left their jobs, because of the tension between management and technical employees to control the activities of pipeline companies. Not only was the number of engineers reduced, but the experience of the remaining staffs was cut dramatically. The technical, operating, and integrity capabilities of pipeline companies were typically cut up to 90 percent.

Because of the loss in knowledge and skilled pipeline personnel in the pipeline operating companies and emphasis on cost control, not quality of the activity, all pipeline companies have shifted to contractors to perform the majority of the compliance activities required in 49 CFR Parts 192 and 195. Contractors are used for:

1. Pipeline facility design,
2. Material and equipment specifications and procurement,
3. Construction specifications,
4. Construction,
5. Materials transportation,
6. Coatings,
7. Welding,
8. Construction inspection,
9. OSHA compliance,
10. Records creation,
11. Pressure testing,
12. Construction project management,
13. Pressure testing,
14. Corrosion control,
15. Pipeline operating control design,
16. Design of compressor and pump stations,
17. Pipeline patrols,
18. Pipeline leak testing,
19. Piping inspection,
20. Nondestructive testing of pipe and pipeline component,
21. Training of pipeline personnel, and
22. Other activities.

Contractors can only maintain a staff of employees that is consistent with their work load. Contractors can perform minimum training of their employees, because pipeline operating companies solicit work based on low bids to do the work with consultants and contracts, the knowhow and quality of work performed is high variable and uncertain creating self-imposed risks to the pipeline operator.

This reduction in expertise among pipeline companies has also affected the quality of technical support provided to the U.S. DOT by the industry. This is very critical, because the U.S. DOT has always relied heavily on the pipeline industry to provide standards and recommended practices along with support of technical studies on issues perceived to be important to the U.S. DOT.

R. D. Deaver, P.E.

DEATECH Consulting Company

rddeaver.com

**Inadequate Pipeline Personnel Qualifications**

**Introduction**

Prior to the mid-1980s to the early 2000s, pipeline affiliates of major oil companies and the major gas transmission had sizeable engineering staffs. However, because of the low oil and gas developments and construction in the mid-1980s through the 1990s, pipeline companies reduced their engineering staffs dramatically. This was also true of the upstream and downstream functions of the major oil companies. The mergers and acquisitions made during this time also resulted in a further reduction in engineering staffs of pipeline companies. I have heard from more than one source that the estimated number of jobs lost in the oil and gas industry during this period was about half a million. These losses included many experienced non-engineering people. Not only were major job cuts made by the oil and gas operating companies, but many more jobs were lost in contract companies that provided construction, materials, drilling, maintenance, design, and operating services to the industry.

During the 1980s, the business aspects of the natural gas industry including pipelines were deregulated after years of excessive and failed regulation by the Federal Power Commission. The gas pipeline industry became very competitive. Companies’ survival was based on cost cutting, not performance. Many engineering and technical support jobs were eliminated. The American Gas Association Pipeline Research Program was disbanded.

Prior to the mid-1980s, major petroleum companies, including their pipeline affiliates, and some of the gas transmission companies believed that anticipated energy growth opportunities would require a strong technical capability in addition to a strong management capability. Many companies created professional technical progression ladders for engineers and scientists that were equal to those of middle management, but short of the executive levels of the companies. However, because of the low level of energy opportunities and extremely low profits of oil and gas operations, during the 1980s and 1990s, energy companies were desperate to cut costs “at all costs” including loss of technical competency. Technical staffs were cut dramatically and technical expertise was lost and many became incompetent.

Most of these reductions in engineering staffs involved senior engineering personnel that provided the technical leadership for pipeline activities. Many of these senior engineering professionals were provided early retirement packages and many gladly left their jobs, because of the tension between management and technical employees to control the activities of pipeline companies. Not only was the number of engineers reduced, but the experience of the remaining staffs was cut dramatically. The technical, operating, and integrity capabilities of pipeline companies were typically cut up to 90 percent.

Technical work was placed in the hands of young engineers, non-engineering personnel, and business management personnel. Much of the design, construction, and technical activities were shifted to contract companies.

This experienced “backbone” of senior engineers and technical personnel began to work for pipelines prior to the 1970’s at a time when pipeline companies designed, purchased, constructed, inspected, operated, maintained, and managed the integrity of its pipelines. These experienced technical personnel and engineers had a significant amount of practical and proven knowledge in pipeline engineering. Many gas pipelines and petroleum pipelines of the major companies had been conducting research, testing, and technology development on a single or collective basis. These senior technical people knew how to solve and avoid problems. These included the pipeline industry’s subject matter experts. Today, new engineering hires are assigned as project or facilities coordinators or managers with little background and understanding of what they are doing. Their responsibilities are far greater than their competence.

Another “fall out” of this oil and gas industry depression was the loss of technical expertise due to mergers and acquisitions. Most so-called mergers were actually acquisitions where one company dominated another company. The technical staffs of “conquered” companies were always cut, usually dramatically. The safety of pipelines of “conquered” companies were usually compromised.

Even if administrative and technical staffs were not included in an acquisition, the previous owner(s) of the divested facility cut staffs in the belief the remainder of the company may need less administrative and technical support. This was true in some cases, but many of these programs went “overboard” on cuts. In some cases, early retirement and departure incentive programs were offered and there were “wholesale” departures from companies. This in particular occurred with Amoco and Arco, according to their former employees.

During this depression of low or no profits, some oil and gas companies discontinued raises and promotions. New hiring was cut back. The lack of opportunity for the oil and gas companies and low to no profits was like a “cancer” eating away the technical staff of pipeline companies.

In addition to cutbacks in engineering and technical support, pipelines changed from craft based job responsibilities such as operators, mechanics, corrosion control, welders, electricians, gaugers, and inspectors to pipeline operations technicians. Rather than focusing on the skills required to proficiently perform jobs, the industry grossly diluted the skill sets of pipeline operations and maintenance personnel. Pipeline operating technicians were expected to perform the tasks formerly performed by three or four crafts. The effect was a predicted loss in performance, but the pipeline companies used this practice to reduce the number of operation and maintenance employees. Both costs and competence were cut.

Also eliminated were the small pipeline labor groups that performed small facility revisions, pipeline maintenance, painting, and other small projects. These small labor groups called pipeline “gangs” consisted mainly of entry level pipeline operating and maintenance personnel who worked under comprehensive supervision. These groups provided an opportunity for entry level personnel to learn the pipeline business from the grass roots level before they progressed to more responsible and demanding operating and maintenance jobs.

The disappearance of these small labor groups involved the transfer of jobs to contractors. Lost was this on-the-job grass roots training that had successfully developed many proficient operating and maintenance pipeline employees. With the abolishment of these grass roots pipeline operating and maintenance groups there was also a reduction in pipeline maintenance activities. Aboveground pipeline facilities were not being painted. Pipeline rights-of-way were not being cleared and mowed. Pipeline markers were not being maintained, just to mention a few items of reduced maintenance.

Another outfall of the energy crisis of the 1980s and 1990s was the sale of old, high maintenance, low profitability pipelines to “upstart” energy companies. These companies bought pipeline properties at a fraction of their replacement cost and turned a profit by cutting costs “to the bone” and hiring many inexperienced, low cost employees.

The sales of these pipeline properties created a “cut throat” competition with some of the pipeline affiliates of the major petroleum companies resulting in shoddy operating practices by the pipeline affiliates of the major oil companies.

During the 1970s, the newly passed U.S. DOT pipeline safety regulations had placed fear in the “hearts” of pipeline operations management, because of the criminal and civil penalty provisions of the regulations. However, by the mid to late 1970s, pipeline companies discovered the U.S. DOT was much more “bark than bite”. Few penalties were being assessed. Many pipeline companies also found out during the 1980s and 1990s that profits could be enhanced and promotions made internally by cutting corners on pipeline safety compliance activities. The question changed from the early 1970s on what can be done to please government regulators to what can be done to deceive the regulators. Cutting pipeline safety activities and expenditures became an unpleasant part of managing pipeline operations.

Many pipelines soon learned the most profitable way to deal with pipeline safety regulators was to create paperwork that impressed agencies and wait for agencies to force significant compliance actions and expenditures. Some pipelines learned that passive pipeline safety will increase profits. Proactive pipeline safety will cost you money in the short term. After all, short term planning had become the norm for the day. Compliance accountability was low.

Unfortunately, many of these lessons on how to dodge regulators and cut cost to increase profits were passed on to younger pipeline employees who now manage pipeline companies. This trend saddens me, because I remember a day when pipeline companies considered public safety as a priority.

The performance-based pipeline safety regulations of the U.S. DOT provided an “umbrella” for pipelines to cut corners. Most regulations were so vague that considerable room was available to cut corners. For some illogical reason, the U.S. DOT has not required widespread compliance with numerous industry standards. The industry standards generally provide methods to perform compliance activities. The gross lack of substantial penalties against pipeline companies created an environment of “catch me if you can”.

**Engineering Requirements**

The U.S. DOT pipeline safety regulations do not cover qualification requirements for pipeline engineers. However, all states have practice of engineering laws and regulations. For the purposes of this exercise, the requirements for the State of Texas will be covered as an example of these requirements. Readers should read the regulations for their state.

The legislative intent of the Title 6, Subtitle A, Chapter 1001 on engineering is stated as:

1. To protect the public health, safety, and welfare;
2. Enable the state and the public to identify persons authorized to practice engineering in this state;
3. Fix responsibility for work done or services or acts performed in the practice of engineering; and
4. The privilege of engineering be entrusted only to a person licensed and practicing under this chapter.

The State of Texas and most other states, define the practice of engineering to include:

1. Consultation, investigation, evaluation, analysis, planning, or engineering for program management;
2. Engineering for testing or evaluating materials for construction or other engineering use;
3. Mapping;
4. Design, conceptual design, conceptual design coordination of engineering works or systems;
5. Development or optimization of plans and specifications for engineering works or systems;
6. Planning the use or alteration of land or water or the design or analysis of works or systems for the use or alteration of land or water;
7. Performing an engineering survey or study;
8. Engineering for construction, alteration, or repair of real property;
9. Preparation of an operating or maintenance manual;
10. Review of the construction or installation of engineered works to monitor compliance with drawings or specifications;
11. A service, design, analysis, or other work performed for a public or private entity in connection with a utility, structure, building, machine, equipment, process, system, work, project, or industrial or consumer product or equipment of a mechanical, electrical, electronic, chemical, hydraulic, pneumatic, geotechnical, or thermal nature; or
12. Any other professional service necessary for the planning, progress, or completion of an engineering service.

As shown above, the practice of Engineering is broadly defined and applies to many pipeline safety activities including, but not limited to:

1. All pipeline design functions;
2. All pipeline material specifications;
3. Pipeline materials inspection;
4. Pipeline route selection;
5. Coordination and supervision of work by other non-engineers;
6. Pipeline construction specifications;
7. Pipeline construction oversight;
8. Pressure testing procedures and specifications;
9. Land and water alteration plans, designs, and specifications for pipeline construction;
10. Preparation of pipeline operating plans, instructions, and procedures;
11. Preparation of pipeline maintenance plans and procedures;
12. Development and coordination of pipeline integrity programs; and
13. Development of corrosion control plan and procedures.

Unfortunately, certain exemptions are allowed the State of Texas in Subchapter B. The exemptions are based on the nature of the work and the shortage of engineers are:

1. A person who is an employee or subordinate of a licensed engineer is exempt from the licensing requirements of this person’s practice or activities do not include responsible charge of design or supervision. (Responsible charge means direct supervision.)
2. Public works electrical or mechanical work of $8,000 or less and other Public Works of $20,000 or less.
3. An officer or employee of the United States.
4. Meteorologist, seismologist, geologist, chemist, geochemist, physicist, or geophysicist.
5. A scientist engaged with scientific research and investigation of the physical or natural sciences.
6. An employer of a private corporation or business entity that is under the direct supervision and control of the business entity in connection with activities related only to the research, design, fabrication, production, assembly, integration, or service of products manufactured by the entity. “Products manufactured by the entity” also include the production, exploration, and transportation of oil and gas and related products.

About 10 years ago, the above exemption listed as 6. was more restrictive than currently allowed. Earlier, this exemption applied to services on or in connection with property owned or leased by the business entity, its affiliates, or other business entity that had an interest in the property. The exemption was limited to employees not having the final authority for approval of, and the ultimate responsibility for designs, plans or specifications pertaining to such property or to products which are incorporated into fixed works, systems, or facilities on the properties of others or which are made available to the general public.

The blanket exemption currently allowed for production and transportation of oil and gas and related products, especially in populated areas is contrary to the legislative intent of this chapter where the purpose is to “protect the public health, safety and welfare”. The above exemption should not be allowed for populated and other high consequence areas.

Fortunately, the exemption for transportation and production of oil, gas, and related products does not apply to persons who are not employees of an oil and gas production or transportation company. All practice of engineering activities are broadly defined apply to all persons employed by contractors of oil and gas production and transportation companies, including pipeline companies involved with gathering, storage, transmission or distribution of oil, gas, and related products.

**Industry Standards**

For many years, ANSI/ASME B31.8 for *Gas Transmission and Distribution Piping System* has contained the following statements:

The Code sets forth engineering requirements deemed necessary for the safe design and construction of pressure piping. Although safety is the basic consideration, this factor alone will not necessarily govern the final specifications of any piping system. The designer is cautioned that the Code is not a design handbook; it does not eliminate the need for the competent engineering judgment.

In Chapter IV of ANSI/ASME B31.8, Section 840.1 contains the following statements:

The design requirements of this Code are intended to be adequate for public safety under all conditions encountered in the gas industry. Conditions that may cause additional stress in any part of a line or its appurtenances shall be provided for, using sound engineering practice.

For many years ANSI/ASME B31.4 for *Pipeline Transportation Systems for Liquids and Slurries* has contained the following statements.

1. The requirements of this Code are adequate for safety under conditions normally encountered in the operation of liquid pipeline systems.
2. Requirements for all abnormal or unusual conditions are not specifically provided for, nor are all the details of engineering and construction prescribed.
3. The primary purpose of this Code is to establish requirements for safe design, construction, inspection, testing, operations, and maintenance of liquid pipeline systems for:
   1. Protection of the general public,
   2. Protection of pipeline operating personnel,
   3. Reasonable protection of the piping system against vandalism and accidentally by others, and
   4. Reasonable protection of the environment.
4. The Code does not do away with the need for competent engineering judgment.
5. The specific design requirements of the Code usually revolve around a simple engineering approach to a subject. It is intended that a designer capable of applying more complete and rigorous analysis to special or unusual analysis problems shall have latitude in the development of such designs and the evaluation of complex or combined stresses.

On large pipeline projects, contract design companies usually have competent engineers to design pipeline facilities. The weak link in this design contracting relationship is the guidance provided by pipeline liaison that are usually inadequately experienced and prepared to provide proper guidance.

**U.S. DOT Operator Qualification Regulations**

The U.S. DOT in their incident reports, investigations, and incident summaries have long believed that pipeline incidents have been mainly caused by:

1. Corrosion,
2. Damage by outside forces,
3. Construction or material defect, or
4. Other.

Other has included malfunction of control or relief equipment, incorrect operation, and unknown. Transportation Research Board of the National Research Council in Special Report 219 reported through 1986, the causes of liquids and gas pipeline failures (excluding gas distribution lines) were:

1. Corrosion, 21.4 percent;
2. Outside forces, 42.9 percent;
3. Defects, 18.6 percent; and
4. Other, 17.1 percent.

However, a significant number of incidents and accidents were caused by human error all the way from the highest levels of management to the lowest level of field operating and maintenance personnel. Many of the pipeline incidents were caused by failure to rigorously follow industry practices and the U.S. DOT pipeline safety regulations.

Incidents classified as corrosion caused are usually caused by failures of pipeline operators to comply with standards and recommended practices of the National Association of Corrosion Engineers, ASME B31.4 and ASME B31.8. U.S. DOT regulations that pipeline companies failed to comply with were in the areas of:

1. External coating,
2. Cathodic protection,
3. Internal corrosion monitoring,
4. Internal corrosion control,
5. Operating and maintenance procedures,
6. Failure investigations,
7. Continuing surveillance,
8. Training,
9. Record keeping,
10. Operator qualifications, and
11. Safety related condition detection and reporting.

Outside force incidents are frequently caused by failure of pipeline operators to comply with industry standards and U.S. DOT regulations in the areas of:

1. Operating and maintenance procedures,
2. Pipeline cover maintenance,
3. Pipeline patrols,
4. Pipeline rights-of-way maintenance,
5. Pipeline markers,
6. Public education and awareness,
7. Damage prevention programs,
8. Pipeline mapping,
9. Pipeline records,
10. Pipeline location procedures,
11. Pipeline inspection,
12. Failure analysis, and
13. Operator qualifications.

Incidents classified as construction and material defects are usually caused by failures of pipeline companies in the following areas:

1. Inspection procedures,
2. Number of inspectors,
3. Training,
4. Construction specifications,
5. Material specifications,
6. Welding qualifications,
7. Record keeping,
8. Failure investigations,
9. Operator qualifications, and
10. Operating and maintenance procedures.

Incidents classified as other causes are usually caused by failures of pipeline companies in the following areas:

1. Operating and maintenance procedures,
2. Number of employees,
3. Failure investigations,
4. Operator qualifications,
5. Training, and
6. Record keeping.

In 1987, the U.S. DOT National Transportation Safety Board made explicit recommendations for the training, testing, and qualifications of pipeline employees. In 1987, the U.S. DOT Office of Pipeline Safety issued a notice inviting comments on the need for additional regulations or a certification program for qualification of personnel who design, construct, operate, and maintain gas and hazardous liquid pipelines. Shortly thereafter, work began in the U.S. Congress to amend the pipeline safety laws to include operator qualification requirements.

The Pipeline Safety Act of 1992 included language requiring personnel responsible for the operation and maintenance of pipelines be tested for qualification and certified to operate and maintain the pipelines. The U.S. DOT published a notice of proposed rulemaking in 1994 to establish training requirements for qualification of pipeline workers. The pipeline industry submitted a petition for withdrawal of this Notice of Proposed Rulemaking.

In 1996, Congress amended the 1992 law with the Pipeline Safety Improvement Act of 1996 requiring individuals who operate, maintain, and respond to abnormal conditions be qualified. In 1996, the U.S. DOT withdrew the 1994 Notice of Proposed Rulemaking and issued a notice to form a negotiated rulemaking committee to develop a final rule. The final rule was issued on August 27, 1999.

The final rule delineated the essential elements of a qualification program and limited the scope of the rule with a four part test for covered tasks. The test for covered tasks included:

1. Task is performed on a pipeline facility,
2. Task is an operations or maintenance activity,
3. Task is performed as a requirement of 49 CFR Part 192 for gas pipelines or 49 CFR Part 195 for hazardous liquid pipelines, and
4. Task affects the operation or integrity of the pipeline.

The troubling covered task issue involves the poorly worded test question number one involving the terminology “on a pipeline facility”. Some pipeline operators interpret this to mean physically on piping. However, 49 CFR Part 192 broadly defines pipeline facility as:

New and existing pipelines, rights-of-way and any equipment, facility, or building used in the transportation of gas or in the treatment of gas during the course of transportation.

U.S. DOT regulations for hazardous pipeline facilities have a similar definition for pipeline facility. If the direct on piping interpretation is allowed, the following critical operating and maintenance activities would be excluded:

1. Record keeping,
2. Cathodic protection surveys,
3. Cathodic protection interference testing,
4. Emergency response,
5. Continuing surveillance,
6. Emergency planning,
7. Investigation of failures,
8. Control of pipeline operations,
9. Leakage surveys,
10. Leakage investigations and grading,
11. Pipeline markers,
12. Pipeline patrols, and
13. Prevention of accidental ignition.

The final rule was not prescriptive and the resulting flexibility in the performance-based rule made it difficult to measure operators’ compliance with the rule according to the foreword in ASME B31Q. The pipeline industry and the U.S. DOT could not agree on compliance protocols covering implementation, inspection, and enforcement of the rule. In an effort to resolve these issues, the U.S. DOT and the U.S. pipeline industry committed to develop a national consensus standard on operator qualifications.

The B31Q project team included federal and state regulators, contractors, industry associations, labor, local gas distribution operators, gas transmission operators, and hazardous liquid operators. The project team first met in August 2003. Over 100 people were involved with the project. The standard was approved on July 10, 2006.

**Requirements in 49 CFR Parts 192 and 195**

Requirements on operator qualification for hazardous liquid pipelines are found in Subpart G of 49 CFR Part 195. Requirements on operator qualification for gas pipelines are found in Subpart N of 49 CFR Part 192. The two subsections are identical.

A covered task to be covered by an operator’s written qualification program is an activity that:

1. Is performed on a pipeline facility,
2. Is an operations and maintenance task,
3. Is performed as a requirement of this part, and
4. Affects the operation or integrity of the pipeline.

Each operator shall have and follow a written qualification program that includes provisions to:

1. Identify covered tasks;
2. Ensure through evaluation that individuals performing covered tasks are qualified;
3. Allow individuals that are not qualified pursuant to this subpart to perform a task if directed and observed by an individual that is qualified;
4. Evaluate an individual if the operator has reason to believe that the individual’s performance of a covered task contributed to an incident;
5. Evaluate an individual if the operator has reason to believe that the individual is no longer qualified to perform a covered task;
6. Communicate changes that affect covered tasks to individuals performing those covered tasks;
7. Identify those covered tasks and the intervals at which evaluation of the individual’s qualifications is needed;
8. After December 16, 2004, provide training, as appropriate, to ensure that individuals performing covered tasks have the necessary knowledge and skills to perform the tasks in a manner that ensures the safe operation of pipeline facilities; and
9. After December 16, 2004, notify the U.S. DOT or appropriate state agency if the operator significantly modifies the program after the U.S. DOT or state agency has verified that it complies with this section.

The term “evaluate” was defined as a process, established and documented by the operator to determine an individual’s ability to perform a covered task by any of the following:

1. Written examination,
2. Oral examination,
3. Work performance history review,
4. Observation during:
   1. Performance on the job,
   2. On-the-job training, and
   3. Simulations.
5. Other forms of assessment.

Record keeping requirements included:

1. Qualification records including:
   1. Identification of individuals,
   2. Identification of covered tasks the individual is qualified to perform,
   3. Dates of current qualification, and
   4. Qualification methods.
2. Records supporting an individual’s current qualification shall be maintained while the person is performing the covered tasks.
3. Records of prior qualification and records of individuals no longer performing covered tasks shall be retained for a period of five years.

Operators were required to have a written qualification program by April 27, 2001. Operators were required to complete the qualification of individuals performing covered tasks by October 28, 2002. After October 28, 2002, work performance history may not be used as a sole evaluation method. After December 16, 2004, observation of on-the-job performance may not be used as the sole method of evaluation.

Other sections of 49 CFR Part 192 that address qualification requirements include:

1. Section 192.463 requires the corrosion control procedures required by 192.605(b)(2), including those for the design, installation, operation, and maintenance of cathodic protection systems, must be carried out by or under the direction of a person qualified in pipeline corrosion control methods.
2. Section 192.915 on knowledge and training personnel have to carry out on integrity management program requires:
   1. Each supervisor whose responsibilities relate to the integrity management program must possess and maintain a thorough knowledge of the integrity management program and of the elements for which the supervisor is responsible. The program must provide that any person who qualifies as a supervisor for the integrity management program has appropriate training or experience in the area for which the person is responsible.
   2. The integrity management program must provide criteria for the qualification of any person who:
      1. Conducts an integrity assessment allowed under this subpart,
      2. Reviews and analyzes the results from an integrity assessment and evaluation, and
      3. Makes decisions on actions to be taken based on these assessments.
   3. The integrity management program must provide criteria for the qualification of any person who:
      1. Implements preventative and mitigative measures and
      2. Directly supervises excavation work carried out in conjunction with an integrity assessment.

Unfortunately, 49 CFR Part 195 does not address qualifications of individuals involved with integrity management programs. For corrosion control in Subpart H, Section 195.555 on qualification of supervisors requires:

You must require and verify that supervisors maintain a thorough knowledge of that portion of corrosion control procedures established under 195.402(c)(3) for which they are responsible for insuring compliance.

Section 195.403 of 49 CFR Part 195 on emergency response training requires:

1. Each operator shall establish and conduct a continuing training program to instruct emergency response employees.
2. At intervals not exceeding 15 months, but at least once each calendar year, each operator shall review with personnel their performance in meeting the objectives of the emergency response training program.
3. Each operator shall require and verify that its supervisors maintain a thorough knowledge of that portion of the emergency response procedures for which they are responsible to ensure compliance.

Section 192.615 in 49 CFR Part 192 on emergency plans requires the operator to:

Train appropriate operating personnel to assure that they are knowledgeable of the emergency procedures and verify that the training is effective.

**ASME B31.Q**

Neither 49 CFR Part 192 nor 49 CFR Part 195 incorporates by reference ASME B31Q. This is puzzling since ASME B31Q in its forward indicated the U.S. DOT committed to jointly develop a consensus standard similar to ASME B31Q.

The introduction section of ASME B31Q on scope indicates this standard applies to tasks that impact the safety or integrity of pipelines except:

1. Design and engineering tasks and
2. Tasks primarily designed to ensure personnel safety.

The B31Q project team assumed that design and engineering tasks would be performed by appropriately educated and experienced individuals using guidelines and procedures for the performance of design and engineering work. This may be true for pipeline operators and pipeline design companies with large, well established engineering design groups. However, a significant amount of design work is done without proper engineering involvement, especially with modifications to existing facilities and small facility addition projects. Few pipeline companies have rigorous design standards and guidelines on how to perform design and other engineering functions. Examples of existing facilities are often used as the basis for new facility design.

The B31Q project team also assumed the quality of design and engineering work product is confirmed by field inspection and testing of the design as required by the applicable ASME B31.4 or B31.8 codes. The B31Q project team either did not understand the nature of field inspection and testing or the project team was looking for rationale to not address a subject they were not prepared to handle.

The main body of the standard starts with section 4 and continues through section 13. The Appendices to B31Q include suggested or non-mandatory task lists with:

1. Task description,
2. Potential applicability of task,
3. Difficulty to perform the task,
4. Importance of task,
5. Qualification evaluation methods, and
6. Span of control ratio of qualified to nonqualified individual.

A total of 163 tasks are listed in the Appendices. Some tasks are very broadly defined and are broken up into many subtasks. For example, to perform a one-call line locate and inspect a pipeline to be crossed will involve at least the following tasks:

1. Task 0151, Visual Inspection of Buried Pipe and Components when Exposed;
2. Task 0171, Measure External Corrosion;
3. Task 0201, Visual Inspection of Installed Pipe and Components for Mechanical Damage;
4. Task 0211, Measure and Characterize Mechanical Damage on Installed Pipe and Components;
5. Task 1291, Locate Underground Pipelines;
6. Task 1301, Install and Maintain Pipeline Markers;
7. Task 1311, Inspect Pipeline Surface Conditions;
8. Task 1321, Damage Prevention During Excavation Activities by or on Behalf of the Operator;
9. Task 1331, Damage Prevention Inspection During Third Party Excavation on Encroachment Activities as Deemed Necessary by the Operator;
10. Task 1341, Provide or Assure Adequate Pipeline Support During Operator Initiated Excavation Activities;
11. Task 1411, Indirect Examination Techniques; and
12. Task 1421, Direct Examination Techniques.

The numerous tasks listed above do not include also the tasks involved with responding to a one-call line locate request. What happens if an individual does not pass the requirements for several of the above listed tasks? Is this person able to partially respond to one-call requests? Partial performance of one-call requests would create critical confusion and would not allow full compliance of damage prevention requirements in regulations. Therefore, an individual should be disqualified from performing all one-call responses if the individual is not qualified to fulfill all the one-call line locate responses.

The most important task of responding to a one-call locate request involves contacting the one-call requester to determine the scope, nature, timing and duration of construction and excavation activities, and the precise location of each excavation. This task is not included. It is also necessary to determine if the one-call responder knows how to read maps and use GPS since excavation location information is often given as GPS coordinates.

Requirements in ASME B31Q for each pipeline operator’s written operator qualification program should include:

1. Introduction covering business units, scope, and purpose of the operator qualification program.
2. Description of processes used to identify covered tasks including:
   1. Subject matter experts,
   2. Fault tree processes, and
   3. List of identified tasks.
3. Description of when and how training requirements are determined for each individual.
4. Description of how operator qualification evaluators and proctors are selected.
5. Evaluation method for each covered task.
6. Identification of persons responsible for various operator qualification activities.
7. Description for assigning qualified individuals to perform covered tasks during an emergency response.
8. Description of process for performance of covered tasks by non-qualified individuals working under the direction and evaluation of a qualified person.
9. Description of processes to evaluate the effectiveness of the operator qualification program.
10. Description of record keeping requirements and processes.

**Industry Compliance with U.S. DOT and ASME B31Q**

Some pipeline operators have few subject matter experts needed to develop effective operator qualification programs. Many of the training coordinators or managers of pipeline companies have little knowledge and experience of pipeline operating and maintenance activities.

Operator qualification training is often based on computer training modules developed by outside parties that provide a generic or “one-size-fits-all” approach training. This type of training seldom is based on operating and maintenance procedures and practices of specific pipeline operating companies.

Some and perhaps many pipeline operators offer little supplemental training other than the computer modules. The computer modules are cheap, provide testing, and keep records of the module’s training activities. Most of the training is on-the-job training by a field supervisor that is sometimes haphazard and insufficient. Field supervisors often have eight to fifteen employees reporting to them. Many employees have to be qualified in 15 to 30 tasks. The field supervisors work load due to the operation qualification program is significant, especially since the field supervisors are usually the qualification evaluator for individuals that report to them.

Field pipeline technicians often have numerous operating and maintenance tasks that may cover an area of 500 to 1,500 square miles. The area of responsibility for a field supervisor can be 5,000 to 25,000 square miles. Most field supervisors have some pipeline facilities in high consequence areas involving numerous pipeline integrity management program activities. The net result of these responsibilities is that supervisors are overloaded and unable to perform their supervisor duties on monitoring the activities of their field technicians to ensure their work is being performed and being performed properly. Many pipeline field operation units are understaffed.

One very large pipeline company experiences about 450,000 one-call request a year. Even small pipeline companies receive thousands of one-call requests a year. As earlier discussed, the process to properly respond to a one-call line locate request takes considerable time to gather information on the scope of the one-callers activities, determine if the construction and excavation activities may be near or crossing a pipeline, locate, and mark the line, provide requirements to third parties, enforce requirements, inspect the pipeline, and perform record keeping requirements. Some one-calls may take 5 to 60 minutes to clear, but some activities may require 50-to-250-man hours of time to handle properly.

The one-call screening processes employed by some companies are based on one day, single excavations. However, many projects involve multiple excavation and heavy equipment movements taking up to a year to complete at one location. See the Olympic Bellingham, Washington case study on how pipelines mishandle long lasting construction projects.

A major problem on screening one-call line locate requests involves the inaccuracies in pipeline maps. Pipeline maps have been found to have errors of 200 to 500 feet on the location of pipeline facilities. Even when precise information and data are available on construction and excavation locations, the pipeline location errors require pipeline operators to use a broad error band around its pipeline locations on maps when screening one-call line locate requests. By the way, ASME B31Q does not include this one-call line locate request screening as a qualified task. Since the majority of one-call line locate requests are closed as “no conflict”, this is one of the most important activity in mechanical damage prevention programs.

The weakest part of pipeline operator qualification program involves the monitoring of each qualified individual’s performance to determine if each individual is performing tasks according to company operating and maintenance procedures. Many tasks are being performed with little or no supervisory monitoring and record keeping on performing each task is minimal or nonexistent.

The U.S. DOT regulations and ASME B31Q do not explicitly address this issue with specific compliance requirements and little documentation is available in this area. However, this issue on performance monitoring and evaluation goes way beyond operator qualification issues. This issue affects all compliance activities, because most operators only perform documentation requirement demanded by regulatory agencies. Since most of the regulations are performance based and not prescriptive, regulatory auditors and investigators are at a disadvantage in enforcing all elements of compliance with U.S. DOT regulations.

In Texas alone between January 1, 2007 to September 8, 2010, one major pipeline operator was charged with being noncompliant on 134 issues during Texas Railroad Commission audits. The 134 areas of noncompliance are likely the “tip of the iceberg”. The reported areas of noncompliance were:

1. Operating and maintenance plans or record keeping were inadequate: 48 violations.
2. Cathodic protection was inadequate or facilities were not maintained: 18 violations.
3. Overpressure relief was inadequate or equipment not maintained: 27 violations.
4. Line markers and line patrols were inadequate: 15 violations.
5. Valving inadequate: 6 violations.
6. Inadequate pipeline design and operating pressure: 8 violations.
7. Inadequate inspection: 3 violations.
8. Operator qualification: 1 violation.

As shown above only one operator qualification violation was found, but 133 other violations were found mainly due to unqualified employees. Clearly, the operator qualification requirements are not covering “all bases”.

**Reliance on Consultants and Contractors**

Because of the loss in knowledge and skilled pipeline personnel in the pipeline operating companies and emphasis on cost control, not quality of the activity, all pipeline companies have shifted to contractors to perform the majority of the compliance activities required in 49 CFR Parts 192 and 195. Contractors are used for:

1. Pipeline facility design,
2. Material and equipment specifications and procurement,
3. Construction specifications,
4. Construction,
5. Materials transportation,
6. Coatings,
7. Welding,
8. Construction inspection,
9. OSHA compliance,
10. Records creation,
11. Pressure testing,
12. Construction project management,
13. Pressure testing,
14. Corrosion control,
15. Pipeline operating control design,
16. Design of compressor and pump stations,
17. Pipeline patrols,
18. Pipeline leak testing,
19. Piping inspection,
20. Nondestructive testing of pipe and pipeline component,
21. Training of pipeline personnel, and
22. Other activities.

Contractors can only maintain a staff of employees that is consistent with their work load. Contractors can perform minimum training of their employees, because pipeline operating companies solicit work based on low bids to do the work with consultants and contractors; the knowhow and quality of work performed is highly variable and uncertain creating self-imposed risks to the pipeline operator and the public and environment.

This reduction in expertise among pipeline companies has also affected the quality of technical support provided to the U.S. DOT by the industry. This is very critical, because the U.S. DOT has always relied heavily on the pipeline industry to provide standards and recommended practices along with support of technical studies on issues perceived to be important to the U.S. DOT.

**U.S. DOT Personnel Qualifications**

The competency of the U.S.A. pipeline industry is “driven” by the competency of technical personnel and the number of technically competent in the U.S. DOT. This has been one of the primary issues that impede the progress of the U.S. DOT to address various pipeline safety acts and enforcement. Another primary issue is impeding the U.S. DOT’s progress has been the unnecessary bureaucratic procedures the U.S. DOT has imposed on itself.

The U.S. DOT has few, if any, engineers that had been involved with actual design, construction, testing, inspecting, operating, maintaining, or emergency response on a “real world” pipeline.

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R. D. Deaver, P.E.

DEATECH Consulting Company

rddeaver.com

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