Pipeline Safety in Washington State

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Pipeline Safety Trust

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Introduction

Sumas, WA

Background

In 1999 a pipeline tragedy in Bellingham, Washington that killed three young men playing in a park and destroyed an entire salmon stream, provided a wake up call for the need to increase pipeline safety across the nation. In Washington State two new organizations grew out of that tragedy. The first one was the governor-appointed Citizen Committee on Pipeline Safety (CCOPS), created by the governor and the state legislature "*to advise the state agencies and other appropriate federal and local government agencies and officials on matters relating to hazardous liquid and gas pipeline safety, routing, construction, operation, and maintenance.*" The other was the national Pipeline Safety Trust (PST) a non-profit based out of Bellingham, which was created by the federal courts with four million dollars of the settlement money from the criminal proceedings from that tragedy. The PST was the dream of the parents who lost their children in the pipeline failure, and was to serve as a watchdog group over the pipeline industry and regulators alike to try to ensure that another tragedy like what occurred in Bellingham would not occur again anywhere else. The need for the Pipeline Safety Trust gained written support from then Washington Governor Gary Locke, the Washington State Utilities and Transportation Commission, the Washington State Citizens Committee on Pipeline Safety, state legislators, many local governments, and pipeline safety advocates nationwide.

Since these two groups were formed they have often worked cooperatively to ensure the implementation of better pipeline safety oversight and accident prevention measures. A couple of years ago the chairman of the Washington Utilities and Transportation Commission challenged CCOPS to draft a report reviewing the current status of pipeline safety in Washington State. CCOPS embraced the idea of such a report, but since CCOPS membership is voluntary and they currently only meet four times a year they decided it would be difficult for them as a group to research and draft such a report, so they turned to the PST for independent assistance. CCOPS and PST have worked together to determine the scope of the report, and while the recommendations included are those of the PST, CCOPS will be reviewing them and endorsing those they feel are appropriate.

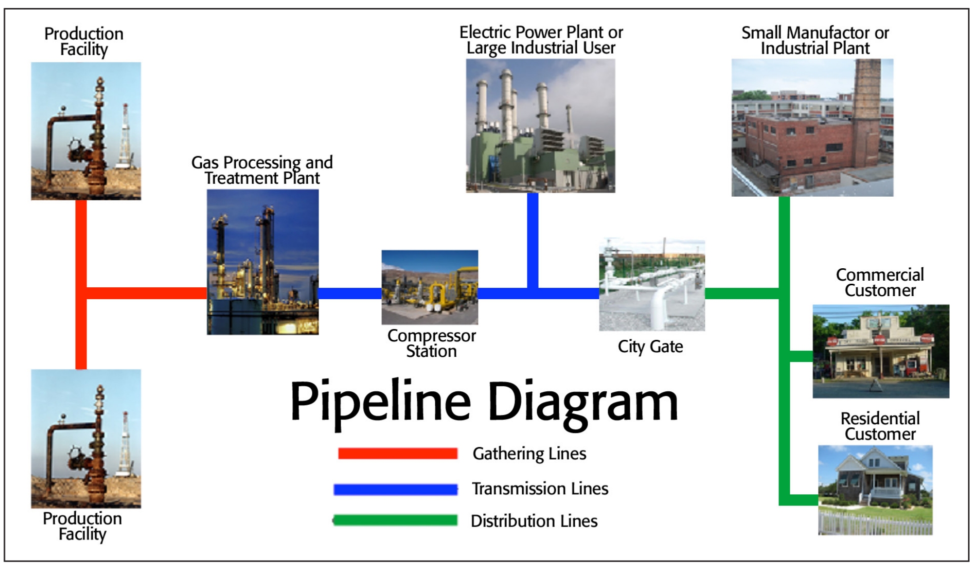
Purpose and scope of report

The purpose of the report is to provide an easy to understand primer of how pipelines are routed, constructed, operated, maintained, regulated, and inspected in Washington state and the shared responsibilities that the pipeline industry, regulators, local government, and citizens have to ensure continued safe operations. The scope is focused on the safe operations of the pipelines themselves and does not get into associated concerns about the impacts from the production or use of the various fuels that the pipelines transport.

Executive Summary of recommendations

Auburn, WA

Pipeline Basics



What kinds of pipelines are in Washington State

There are three main types of pipelines in Washington State: hazardous liquid pipelines, gas transmission pipelines, and gas distribution pipelines. Understanding the different types of pipelines is important because each type of pipeline has different safety considerations and is regulated by different agencies under different rules.

Hazardous Liquid Pipelines: These are the lines that move crude oil to refineries and then move refined products (gasoline, jet fuel, diesel, and by-products) from the refineries to other markets. Highly Volatile Liquids (HVLs) such as propane, butane, etc. that take a gaseous form at normal pressures move through these pressurized hazardous liquid pipelines as liquids.

Gas Transmission Pipelines: These are the relatively larger, higher-pressure pipelines that move gas from storage or post-production processing plants to where the gas is distributed to our homes and businesses. They operate at pressures in the range of 300 to over 1500 pounds per square inch.

Gas Distribution Pipelines: A distribution line is a relatively small, lower pressure pipeline used to supply natural gas directly to our homes and businesses. A distribution line is located in a network of piping located downstream of a natural gas transmission line. The "city gate" is where a transmission system feeds into a lower pressure distribution system. Gas distribution pipelines comprise by far the most mileage of pipes; they carry odorized gas (with the characteristic smell of rotten eggs) throughout urban areas.

Mileage of Regulated Pipelines – U.S. and Washington*

	U.S.	Washington
Gas Transmission	300,318	1,967
Gas Gathering	17,707	0
Gas Distribution Mains	1,286,181	22,854
Gas Distribution Service Lines	923,558	22,385
Crude Oil	75,738	69
Refined Products	62,390	732
HVLs (like propane, butane, etc)	68,834	5
Total	**2,734,726**	**48,011**

* Data from PHMSA as of 9/18/2017

Another important way that pipelines are differentiated is to distinguish between **interstate pipelines** and **intrastate pipelines.** Interstate pipelines are typically longer transmission pipelines that cross state lines; intrastate pipelines are typically transmission pipelines that lie wholly within a single state.

While most pipelines fit into the inter- and intrastate pipeline definition above, there are some instances where pipelines may appear to be an interstate pipeline when it's actually treated as an intrastate pipeline. In other words, crossing a state line is not the sole determinant for categorizing an inter- or intrastate pipeline. For more information see: 49 CFR 195, Appendix A

Where are the pipelines in Washington State?

As of 2016, the United States has more than 2.7 million miles of pipelines. Most of these (approximately 92%) carry gas — predominantly natural gas — and the rest (approximately 8%) carry hazardous liquids. Hazardous liquid and natural gas pipelines are governed by separate regulations. Whether and how pipelines are regulated also depends on what product is carried and where the pipeline is located.

Pipelines in Washington travel east/west through the Columbia River Gorge, between Spokane and Clark counties with spur lines to counties and cities located along the route in eastern and central Washington. Pipelines also travel north/south between Canada and Clark County with hazardous liquid pipeline spurs into Whatcom, Skagit, and Pierce counties for oil refineries and, in the case of gas pipelines, spurs for communities located along the route.

The public may access a more detailed version of this map, on a county-by-county basis through the National Pipeline Mapping System (NPMS) "public viewer" at https://pvnpms.phmsa.dot.gov/PublicViewer/ or slightly more accurate maps from the WUTC at https://www.utc.wa.gov/regulatedIndustries/transportation/pipeline/Pages/pipelineMaps.aspx

Both systems take practice to navigate, but once a person figures it out it is possible to zoom in to get an idea of where these types of pipelines are generally located and some basic information about the pipelines themselves. While these types of maps can provide a general idea of where pipelines are located they should never be used as an indication of where it might be safe to dig. The mandatory One Call system — 811 in Washington State — is the only way to identify the exact location of a pipeline, and is discussed in more detail later in this report.

NOTE: In other reports, we included a section describing each pipeline including things like the products and quantity transported, age, diameter, pressure and purpose of each pipeline in the area… That feels like a lot for this report since we're talking about so many more pipelines, so we haven't included those descriptions. Should We? For all pipelines or just the major systems?

Who regulates pipelines and where do the regulations come from?

Pipeline Safety Regulations

Pipeline and Hazardous Materials Safety Administration (PHMSA)
Ultimately the U.S. Congress has responsibility for setting the framework under which pipeline safety regulations operate in the country through section 49 of the Code of Federal Regulations (CFR) in parts 190, 191, 192, 193, 194, 195, 198 and 199. The U.S. Department of Transportation through the Pipeline and Hazardous Materials Safety Administration (PHMSA) is primarily responsible for issuing and enforcing the minimum pipeline safety regulations. Most of these regulations are performance-based. For example, pipeline operators are required by the federal regulations to operate and repair pipelines in a safe manner so as to prevent damage to persons or property, but the way in which they do so is generally not spelled out prescriptively. This allows pipeline operators to prioritize pipeline inspections and repairs in areas with higher populations or higher risk factors, but it also makes the regulations ambiguous and challenging to enforce.

Washington State Utilities and Trade Commission (UTC)
The federal pipeline safety laws allow for states to accept the responsibility to regulate, inspect, and enforce safety rules over intrastate pipelines within their borders under an annual certification from PHMSA. If a state receives such intrastate authority they can set regulations that are more stringent than those PHMSA sets as long as the state rules do not conflict with the federal regulations. PHMSA also can enter into an agreement with the state pipeline regulator to carry out inspections on interstate pipelines, although only PHMSA regulations can apply and PHMSA remains in charge of any enforcement that may come out of state led inspections. Local governments, such as cities and counties, are not allowed to create rules to regulate the operational safety of pipelines, though they may have involvement in emergency response, routing and siting issues, and franchise or easement agreements.

Washington maintains jurisdiction over both intrastate and interstate hazardous liquid and gas pipelines, which is carried out by the Washington Utilities and Transportation Commission (UTC). Washington is one of only four states (Ariz Regulations and rules related to pipeline safety in Washington State are located in the following sections of Revised Code of Washington (RCW) and Washington Administrative Code (WAC) respectively:

- RCW 19.122: Underground Utilities
- RCW 81.88: Gas and Hazardous Liquid Pipelines
- WAC 480-93: Gas Companies—Safety
- WAC 480-75: Hazardous Liquid Pipelines—Safety

Spill Response Planning and Prevention Regulations

Pipeline and Hazardous Materials Safety Administration (PHMSA)
Under the requirements of the Oil Pollution Act of 1990 regulations and Executive Orders implementing it, pipeline operators are required to submit an Oil Spill Response Plan to PHMSA, showing how operators will prepare for and respond to a worst-case discharge from their on-shore pipelines. These plans must be submitted every five years, unless circumstances warrant a new plan sooner than five years. The plan must include procedures for responding to a spill safely and quickly, and are posted to the PHMSA website "to help federal, state and local officials strengthen and coordinate planning and prevention activities." These plans, however, are posted with redactions including the description of the worst-case scenario.

Washington State Department of Ecology
Department of Ecology is responsible for spill response preparedness within Washington State. Oil pipelines are considered "Class 1" facilities and must submit oil spill prevention plans. According to Ecology, the goal of these plans is to:

- Ensure major oil handling equipment and technology meet or exceed the facility design standards; and
- Evaluate the facility for oil spill risks, and develop a plan to minimize or eliminate those risks.

These plans are the same as those submitted to PHMSA. Plans are made available to the public for a 30-day comment period and they are available via public records request. Unlike PHMSA, Ecology circulates these plans largely un-redacted. The rules for prevention planning reside in WAC Section 173-180 Facility oil handling standards, 173-182 Oil spill contingency plan, and 173-185 Oil movement by rail and pipeline notification.

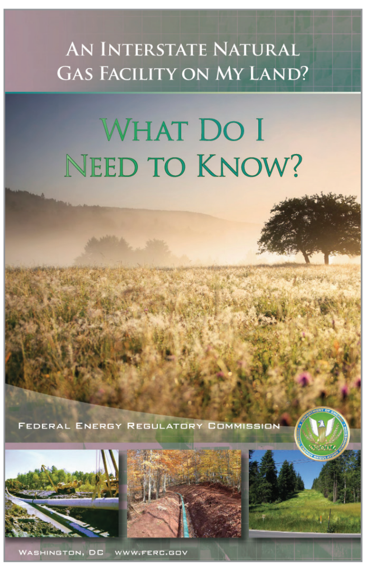
Environmental Protection Agency/U.S. Coast Guard
The EPA is the lead federal response agency for oil spills in inland waters and the U.S. Coast Guard is the lead agency for spills in coastal waters and deepwater ports.

Amending the Clean Water Act, the Oil Pollution Act of 1990 put into place requirements for the prevention of, preparedness for, and response to oil discharges at specific non-transportation-related facilities, with the goal of preventing oil from reaching navigable waters and adjoining shorelines, and to contain these spills. Facilities subject to this rule, including oil pipelines, are required to develop and implement Spill Prevention, Control and Countermeasure (SPCC) Plans. Further, the Facility Response Plan (FRP) Rule, requires facilities that meet the established criteria to prepare and submit an FRP to demonstrate the facility's preparedness to respond to a "worst case oil discharge."

SITING OF NEW PIPELINES

Federal Energy Regulatory Commission (FERC)
For new interstate gas lines, once the pipeline company has a pipeline proposal and route in mind they must apply to the Federal Energy Regulatory Commission (FERC) for approval. That approval comes in the form of a Certificate of Public Convenience and Necessity from FERC. Before that approval is granted, FERC undertakes a complete environmental review that normally includes development of an environmental impact statement.

There is a citizen's guide to the FERC process on its website: http://www.ferc.gov/for-citizens/citizen-guides.asp. The guide describes the FERC process, including when pre-filing occurs, when an application is filed, the deadlines for intervening in the FERC proceeding, and how to find information on the FERC website regarding a particular project.



Energy Facility Site Evaluation Council (EFSEC)
In Washington State, EFSEC is responsible for recommending approval or denial of crude or refined petroleum or liquid petroleum product pipelines larger than 6 inches in diameter and greater than 15 miles in length. They are also responsible for recommending approval or denial of intrastate natural gas, synthetic fuel, gas, or liquefied petroleum gas pipelines larger than 14 inches in diameter and greater than 15 miles in length. EFSEC recommendations are submitted to the Governor. If EFSEC determines that a proposed pipeline under its jurisdiction will produce minimal adverse effects on the environment and meets its construction and operation standards, the board recommends approval of a Site Certification Agreement (SCA).

WHAT IS THE RISK FROM PIPELINES IN WASHINGTON STATE?

Risk is one of those things that one person cannot really define for another, since each person thinks about risks in their own personal way. While some feel that skydiving is a risk worth taking, others won't even go up in the airplane. In other words, it is not possible for us to say whether the pipelines in Washington State are safe enough. All we can do is to try to provide enough information so individuals can make that decision on their own, and then work with others in their community to set policies based on the beliefs of as many people as possible.

Risk is made up of two different factors both of which need to be carefully considered when deciding how risky an activity is. Those factors are the probability that an event will occur (chance a pipeline will rupture or leak), and the possible consequences if it does.

Probability
First let's take a look at some of the publicly available data to try to get a sense of the probability of a pipeline incident occurring in Washington State.

PHMSA maintains a publicly accessible database of reported pipeline incidents.[1] Pipeline operators are required to file an incident report when there is a release that results in any of the following:

1. death or injury requiring hospitalization;
2. estimated property damage exceeding $50,000;
3. an unintentional explosion or fire; or
4. a release of 5 gallons or more off of company property or the pipeline right-of-way or causing water pollution, or a release of 5 barrels (210 gallons) or more confined to company property or pipeline right-of-way and not causing water pollution. [2]

In this report, we focus on "significant incidents" which includes any incident that results in the above, excluding gas pipeline incidents where the primary cause of the incident is "other outside force damage" with a sub-cause of "Nearby Fire/Explosion".

1 See http://www.phmsa.dot.gov/pipeline/library/data-stats for both online pipeline incident data and downloadable files.

2 Significant incidents for natural gas pipelines exclude those incidents that are as a result of a fire or explosion.

Hazardous Liquid Incidents
Since 1997, Washington has had eight significant incidents on hazardous liquid pipelines, resulting in nearly $68 million worth of damage (in 2017 dollars) and almost 6,500 barrels of product lost. The biggest and most costly failure occurred in 1999 when two boys and a young man were killed in a pipeline rupture and explosion in Bellingham.

It is difficult to evaluate how Washington's statistics compare to national averages because PHMSA does not offer data about the mileage of pipeline facilities by year by state before 2010. To have an apples-to-apples comparison, the rate of incidents per mile must be calculated. Since 2010, Washington has had only one significant hazardous liquid pipeline failure on about 800 miles of pipeline operating as of 2015. Since the number of significant incidents is so low, a comparison to national averages for hazardous liquid pipeline failures is somewhat unhelpful. Also, since the only reportable incident — in 2014 — spilled 7 barrels of transmix (a mixture of diesel, jet fuel, and gasoline), it's hardly reasonable to compare these numbers to the national average except to acknowledge that Washington's barrels spilled/mile/year is much lower than the national average.

In Appendix D we have provided a list of all significant incidents on hazardous liquid pipelines in Washington State since 1997, and from a look at that list it is clear that significant incidents are uncommon and the trend is towards fewer and less catastrophic incidents over time.

With only eight significant incidents in the last 20 years, it's difficult to compare the causes of failures at the state level to the national level. The number of incidents is simply too small to really show a trend. In Washington, 38 percent of significant incidents were caused by "all other causes." This category includes miscellaneous causes that aren't covered in the other more common categories. In the case of the three incidents that fall under "all other causes," all three were on the Olympic pipeline and happened in 1997 and 1999. While the National Transportation Safety Board (NTSB) ruled that myriad causes led to the Bellingham incident in 1999, the other two incidents appear to be clearly related to equipment failures but were recorded as "all other causes" in the system.

Nationally, "material/weld/equip(ment) failure" is the highest reported cause of significant hazardous liquid pipeline incidents at 31 percent, followed by corrosion at 25 percent and excavation damage at 13 percent.

Gas Pipelines
Since 1997, Washington has had 31 significant incidents on gas pipelines (all types), resulting in more than $15 million worth of damage (in 2017 dollars), 10 injuries and one fatality.

Since there are more incidents involving gas pipelines, it's easier to draw a comparison between Washington State and the United States. Since 2010, Washington State has had 31 significant pipeline incidents on 47,205 miles of gas pipelines (all types). As you can see in the graphic, Washington's significant incidents per year per mile are often lower than the nationwide average, with the exception of 2011 and 2013.

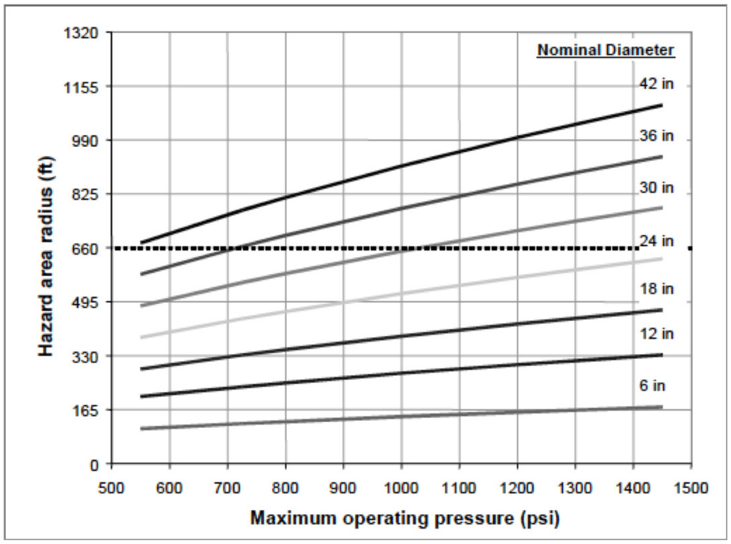
In Appendix E we have provided a list of all significant incidents on gas pipelines in Washington State since 1997. Washington State does not have any gas gathering lines. For purposes of describing the causes of significant pipeline incidents, this narrative treats gas distribution and gas transmission pipelines separately.

The most common cause of significant pipeline incidents in Washington on gas transmission pipelines is Material/Weld/Equip(ment) Failure with 46 percent of incidents, followed by Natural Force Damage with 31 percent of incidents. Nationwide, about 28 percent of significant incidents on gas transmission lines occur as a result of Material/Weld/Equip(ment) Failure, followed by corrosion with 24 percent. For gas distribution lines in Washington, the most common cause of significant incidents is Other Outside Force Damage (39 percent) followed by Excavation Damage (33 percent). Nationwide, Excavation Damage is the most common cause (36 percent) for significant incidents on gas distribution pipelines.

The previous sections should provide some measure of the probability of a pipeline incident happening and some of the consequences if it does. It is fairly clear from the data that the chance of a pipeline failing in any particular spot is very, very small, but of course if you ask the families of any of the 360 people who were killed by pipeline incidents over the past twenty years in United States they would tell you that the consequences are huge. So what are the possible consequences of pipeline failures, and how can they be quantified?

Consequence of failures
For natural gas pipelines, it is fairly easy to predict the impact zone around a pipeline failure that explodes. There is a formula used in the federal regulations, based on the size and pressure of the pipeline that predicts the "potential impact radius," and that radius is then used to define some elements of the regulations.

For hazardous liquid pipelines, predicting the consequence area is much more difficult because of the different products involved and because the products may flow long distances based on the terrain and whether they reach water. While each pipeline operator is required to do an analysis of whether a leak



along any section of the pipeline could affect a high consequence area, that information is not shared with the public. The best that the public can do is to look at their own area and compare that with the consequences of past liquid failures.

The National Transportation Safety Board investigates many of the most significant incidents and the reports of their investigations can be found at: http://www.ntsb.gov/investigations/AccidentReports/Pages/pipeline.aspx.

Past Incidents – should we have a section describing major past incidents? How far back? What is "major"?

How the regulations address varying risks

High Consequence Areas
The criteria defining a "high consequence area" (HCA) for hazardous liquid pipelines are different than that of the criteria for defining HCAs for gas pipelines. HCAs for gas pipelines are based on the built density and occupancy in the area surrounding a pipeline segment as defined by the U.S. Census Bureau as "urbanized areas" or "designated place." 49 Code of Federal Regulations 192.5 identifies four class locations on which HCAs are based:

Class 1 – an offshore area; or any class location unit that has 10 or fewer buildings intended for human occupancy.

Class 2 – any class location unit that has more than 10 but fewer than 46 buildings intended for human occupancy.

Class 3 – any class location unit that has 46 or more buildings intended for human occupancy; or an area where the pipeline lies within 100 yards (91 meters) of either a building or a small, well-defined outside area (such as a playground, recreation area, outdoor theater, or other place of public assembly) that is occupied by 20 or more persons on at least 5 days a week for 10 weeks in any 12-month period.

Class 4 – any class location unit where buildings with four or more stories above ground are prevalent.

For HCAs around hazardous liquid pipelines, built density and occupancy is considered along with drinking water supplies and unusually sensitive ecologic resources.

Class Locations
Operators are required to identify where their lines run through HCAs, but at least at the present, the public does not have access to information about the extent of mapped HCAs, the methods that were chosen to determine them, or the factual basis for their determination. There is also no way for the public to challenge the designations. The 2011 pipeline safety reauthorization bill requires that HCAs be made part of the National Pipeline Mapping System, but since HCA locations are already in the non-public part of the NPMS, it's not clear if the bill will result in any additional public access to HCA designations.

Pipeline Safety Requirements During Design and Construction

Many of the pipelines in place today were constructed before regulations existed for pipelines. Some of the current regulations have to do with ongoing operations and maintenance, and apply to both existing and new lines. Existing "grandfathered" pipelines built prior to 1979 for hazardous liquid pipelines, or prior to 1968 for gas pipelines, may not have been constructed according to the current regulations. What are pipeline operators required to do to maintain safe pipelines? In this section, we go through basic information and dive more deeply into some technical issues that are relevant to Washington State.

Choosing Pipe

Pipe sections are fabricated in steel rolling mills and inspected to assure they meet government and industry safety standards. Generally between 40 and 80 feet in length, they are designed specifically for their intended location in the pipeline. A variety of soil conditions and geographic or population characteristics of the route will dictate different requirements for pipe size, strength, wall thickness and coating material. Not all pipe is steel. Some low pressure gathering, transmission and distribution pipelines use other materials such as other metals, plastic or composites.

Pipe Burial

Mechanical equipment, such as a wheel trencher or backhoe, is used to dig the pipe trench. Occasionally, rock drilling and blasting is required to break rock in a controlled manner. The material that is excavated during trenching operations is temporarily stockpiled on the non-working side of the trench. This material will be used again in the backfill operation. In some limited locations, horizontal directional drilling (HDD) as well as boring is used to place pipe.

Pipeline trenches are dug deep enough to allow for an adequate amount of cover when the pipe is buried. Federal regulations require that hazardous liquid pipelines be buried between 18 and 48 inches below the surface, and that buried gas transmission and regulated gathering lines be between 18 and 36 inches below the surface, depending on location and soil properties. For example, more depth is required in normal soil conditions near residential or developed areas (36 inches) and certain water body crossings (48 inches for liquid lines), and less depth where rock excavation is required. The depth of burial must be according to the regulations at the time of burial, but there is nothing that requires this depth be maintained over time. River scouring and other circumstances that result in reduced depth of cover over time call into question whether obligations to protect pipe are adequately addressed by the current regulations.

Welding of Steel Pipelines

To carry out the welding process, the pipe sections are temporarily supported along the edge of the trench and aligned. The various pipe sections are then welded together into one continuous length, using manual, semiautomatic or automatic welding procedures.

As part of the quality-assurance process, each welder must pass qualification tests to work on a particular pipeline job, and each weld procedure must be approved for use on that job in accordance with federally adopted welding standards. Welder qualification takes place before the project begins. Each welder must complete several welds using the same type of pipe as that to be used in the project. The welds are then evaluated by placing the welded material in a machine and measuring the force required to pull the weld apart. It is interesting to note that a proper weld is actually stronger than the pipe itself.

For higher stress pipelines over 6 inches in diameter, a second level of quality- assurance occurs, wherein qualified technicians sample a certain number of the welds (the sample number varies based on the population near the pipeline) using radiological techniques (i.e., X-ray or ultrasonic inspection) to ensure the completed welds meet federally prescribed quality standards. If the technician detects certain flaws, the weld is repaired or cut out, and a new weld is made. Another method of weld quality inspection employs ultrasonic technology.

Coatings

Several different types of coatings may be used to coat the pipe at the factory and the joints made in the field, with the most common at this time being fusion bond epoxy or polyethylene heat-shrink sleeves. Prior to application, the bare pipe is thoroughly cleaned to remove any dirt, mill scale or debris. The coating is then applied and allowed to dry. After field coating and before the pipe is lowered into the trench, the entire coating of the pipe is inspected to ensure that it is free from defects.

Lowering and Backfilling

Once the pipeline is welded and coated, it is lowered into the trench. Lowering is done with multiple pieces of specialized construction equipment called side- booms. This equipment acts in tandem to lift and lower segments of the assembled pipeline into the trench in a smooth and uniform manner to prevent damaging the pipe.

Once the pipeline is lowered into the ground, the trench is backfilled, to ensure that the pipe and its coating are not damaged. This is generally accomplished with either a backhoe or padding machine depending on the soil makeup.

Care is taken to protect the pipe and coating from sharp rocks and abrasion as the backfill is returned to the trench. In areas where the ground is rocky and coarse, the backfill material is screened to remove rocks or the pipe is covered with a material to protect it from sharp rocks and abrasion. Alternatively, clean fill may be brought in to cover the pipe. Once the pipe is sufficiently covered, the coarser soil and rock can then be used to complete the backfill.

As the backfill operations begin, the excavated material is returned to the trench in reverse order, with the subsoil put back first, followed by the topsoil. This ensures the topsoil is returned to its original position.

Valves and Valve Placement

A valve is a mechanical device installed in a pipeline and used to control the flow of gas. Some valves have to be operated manually by pipeline personnel, some valves can be operated remotely from a control room, and some valves are designed to operate automatically if a certain condition occurs on the pipeline. If a pipeline should fail, how quickly the valves can be closed and the distance between the valves are some of the main determinations for how much fuel is released.

Operating Pressure

Maximum allowable operating pressure (MAOP) for natural gas pipelines, and Maximum operating pressure (MOP) for liquid pipelines, are the maximum internal pressure at which a pipeline or pipeline segment may be continuously operated. These pressures are set at levels meant to ensure safety by requiring that the pressure does not cause undue stress on the pipeline. How this pressure is determined is defined in federal regulations and is based on a number of different factors such as the location of the pipeline, pipe wall thickness, previous pressure tests, and the pressure ratings of various components.

Testing

Generally, but with certain exceptions, all newly constructed transmission pipelines must be hydrostatically tested before they can be placed into service. The purpose of a hydrostatic pressure test is to identify and eliminate any defect that might threaten the pipeline's ability to sustain its maximum operating pressure plus an additional safety margin. A pipeline is designed to a specified strength based on its intended operating pressure. Hydrostatic pressure testing consists of filling the pipeline with water, and raising and sustaining the internal pressure to a specified level above the intended operating pressure. Critical defects that cannot withstand the pressure will fail. Upon detection of such failures, the defects are repaired or the affected section of the pipeline is replaced and the test resumed until the pipeline "passes".

Hydrostatic testing is not the only means for detecting pipe defects. For example, inline inspection (ILI) technologies are used that permit the identification of specific types of defects, such as corrosion. But because not all lines can be inspected with ILI tools and because of the need to find types of imperfections that are not currently detected by ILI technology, hydrostatic testing is an accepted method for demonstrating that a pipe segment is ready to be in service.

Pipeline Safety Requirements During Operations

Corrosion Protection

Unprotected steel pipelines are susceptible to corrosion, and without proper corrosion protection every steel pipeline will eventually deteriorate. Corrosion can weaken the pipeline and make it unsafe. Luckily, technology has been developed to allow corrosion to be controlled in many cases, if applied correctly and maintained consistently.

Here are the three common methods used to control corrosion on pipelines:

- Cathodic protection (CP) is a system that uses direct electrical current to counteract the normal external corrosion of a metal pipeline. CP is used where all or part of a pipeline is buried underground or submerged in water. On new pipelines, CP can help prevent corrosion from starting; on existing pipelines, CP can help stop existing corrosion from getting worse.
- Pipeline coatings and linings are principal tools for defending against corrosion by protecting the bare steel.
- Corrosion inhibitors are substances that can be added to a pipeline to decrease the rate of attack of internal corrosion on the steel since CP cannot protect against internal corrosion.

Supervisory Control and Data Acquisition System (SCADA)

A SCADA is a pipeline computer system designed to gather information such as flow rate through the pipeline, operational status, pressure, and temperature readings. Depending on the pipeline, this information allows pipeline operators to know what is happening along the pipeline, and allows quicker reactions for normal operations, and to equipment malfunctions, failures and releases. Some SCADA systems also incorporate the ability to remotely operate certain equipment, including compressors, pump stations, and valves; allowing operators in a control center to adjust flow rates in the pipeline as well as to isolate certain sections of a pipeline. Many SCADA systems also include leak detection systems based on the pressure and mass balance in the pipelines. Unfortunately, leak detection systems are not yet capable of identifying all leaks; PHMSA data through 2013 shows that only about 11% of hazardous liquid and gas transmission pipeline incidents were initially detected by SCADA or other computerized leak detection.

Right-of-way Patrols

Regulations require regular patrols of pipeline right-of-ways to check for indications of leaks and ensure that no excavation activities are taking place on or near the right-of-way that may com- promise pipeline safety. For transmission pipelines, these patrols are often accomplished by aerial patrols, but federal regulations do not require them to be done by aerial inspection.

Leakage Surveys

Regulations also require regular leakage surveys for all types of natural gas pipelines along the pipeline routes. Personnel walk or drive the route using specialized equipment to determine if any gas is leaking and to then quantify the size of the leak. Very small leaks are a typical part of most gas pipeline systems.

Odorization

All distribution pipelines, and some natural gas transmission and gathering lines (mainly those in highly populated areas), are required to be odorized so leaking gas is readily detectable by a person with a normal sense of smell.

Integrity Management

Integrity Management refers to a set of federal rules that specify how pipeline operators must identify, prioritize, assess, evaluate, repair and validate the integrity of their pipelines. Some form of this requirement for comprehensive analysis through integrity management applies to both transmission and distribution pipelines. Gathering lines are exempt from these requirements. For gas transmission pipelines, integrity management requires lines that are located *within* High Consequence Areas (mainly more populated areas) to be re-inspected by their operators every seven years. For hazardous liquid pipelines, integrity management rules require lines *that could affect* High Consequence Areas (HCAs) to be re-inspected by their operators every five years. Unfortunately, the National Pipeline Mapping System does not yet depict the HCA boundaries used by operators, despite congressional direction that it should. Re-inspection of pipelines is done mainly with internal inspection devices, but may also be done through pressure tests or direct assessment (DA should be used only under circumstances permitted by regulation, most commonly when only external corrosion is suspected). Once inspected, the rules require that operators respond to certain anomalies found on their pipeline in certain ways within certain timeframes. In the first 9 years of this program, these rules required over 53,000 repairs be made to gas and liquid transmission pipelines that fall within High Consequence Areas. Unfortunately, only about 7% of the gas transmission pipelines, and 43% of hazardous liquid pipelines nationwide are required to do these important inspections.

Integrity Management is more than just "Pig and Dig." It means assessing the threats to a section of pipeline, preventing failures, mitigating potential consequences, and integrating data about that section from all operational activities back into the threat assessment. Somewhere along the way, that system is not working properly, because even though many anomalies have been found and repaired as a result of the required inspections and repairs, the number of incidents in areas covered by integrity management has actually risen in the years since IM became the law. While there are clearly opportunities to improve the implementation of IM, the basic theory of risk assessment, inspection, verification, program changes, and re-inspection that should lead to continuous improvement of pipeline safety seems sound. In the future, applying IM beyond HCAs may help lead pipeline operators to their stated goal of zero pipeline incidents.

Pipeline Issues of Importance in Washington State

Oversight of pipeline safety by the WUTC Pipeline Safety Division

What are the annual metrics the Pipeline Safety Division uses to prioritize or evaluate its work?

How is risk evaluated and used to steer inspections (pipeline age, material, environment, location, operator, etc.)?

What were the results and the UTC's response to recent PHMSA audits?

Transparency of information

Where UTC rules exceed federal rules

UTC Enforcement history and comparison with others

Recommendations

Land Use Planning and Pipelines

(very preliminary)

For the siting of nearly all new pipelines, the pipeline company decides on a general route they prefer for their pipeline, and possibly some alternative routes. Once they feel fairly confident with the feasibility of their chosen route, the more formal process with various government agencies begins. That process is not consistent for various types of pipelines, and varies greatly depending on the type of pipeline and where it is to run. As was discussed earlier, companies wishing to construct interstate gas pipelines must apply to the Federal Energy Regulatory Commission (FERC) for construction and route approval. And for all other pipelines — greater than six inches in diameter and 15 miles in length — the Energy Facility Site Evaluation Council (EFSEC) has authority for siting and routing.

Local governments can also coordinate and regulate new development near existing pipelines with their land use authority. Many pipeline existed prior to development, and housing density has increased in many areas near pipelines that once were predominantly undeveloped rural areas. Local governments can enact regulations governing the type of buildings and construction that can occur near existing pipelines, requiring consultation with the pipeline operator, establishing setbacks or enacting a variety of other land use permit requirements.

In 2010, PHMSA published the final report of the Pipelines and Informed Planning Alliance (PIPA), a three-year effort to provide information and recommendations on the types of tools local government can use to regulate new development near existing pipelines. Forty-three recommended practices are contained in the report, and twenty-nine of them speak specifically to local governments about things they can do to encourage safety near transmission pipelines. Recommendation stress: the need to have a relationship with local pipeline operators that includes open communication, incorporating the existence of pipelines into planning process and infrastructure projects, and the importance of safe excavation practices. One example of a specific recommendation is the use of consultation areas or zones that require early consultation among stakeholders when any development is proposed within a specified distance from a transmission pipeline. All recommendations and associated documents can be found through the PIPA link at: http://primis.phmsa.dot.gov/comm/pipa/LandUsePlanning.htm.

County and city government agencies in Washington State also have a role to plan in pipeline safety and oversight. Federal and state regulations generally preclude local governments from adopting any regulations that require a pipeline operator to take any actions regarding the safe operation of a pipeline. That said, pipeline operators might willingly enter into development agreements or mitigation agreements that include additional safety aspects in certain situations, in response to local conditions. There are things that local governments do that are not precluded, such as negotiated rights-of-way agreements, spill and emergency preparations and response, or land use and zoning provisions.

Twenty-eight of the 39 counties in Washington State contain a hazardous liquid and/or gas pipeline system. Some of those systems are very small while some of them contain segments of interstate or international systems. Of the 15 fastest growing counties in Washington State, according to data from the Washington State Office of Financial Management (OFM) for 2010-2016, 14 of them have pipelines. All of these counties have gas pipelines and 10 of them have hazardous liquid pipelines within their jurisdiction. For the purposes of this report, we have analyzed each county's planning and development codes, looking for evidence of rules pertaining to planning near pipelines.

Of the 15 fastest growing counties in Washington State, only three have a section of their code that calls for a consultation zone or something similar — King, Skagit and Whatcom counties. Skagit and Whatcom counties have adopted virtually identical provisions that place a consultation zone around pipelines in their counties, requiring the County to contact the pipeline operator when new subdivisions are planned within a certain distance. King County has adopted a setback system. The flaw with King's approach is that there are many circumstances in which a modified setback may be granted.

Whitman and Benton counties call for pipelines that are near proposed subdivisions to be included in proposed plat maps. Island County only calls for a pipeline to be shown on a map at time of application for a surface mining permit. All of the other fastest growing counties, including three of the five fastest growing, have no reference in their code that is relevant to pipeline safety.

Pipeline Public Awareness, Education, Involvement and Communication Programs

Damage Prevention Programs
What's the problem being addressed?
Federal Requirements and Washington State's Dig Law
Organizations and Programs addressing damage prevention
Washington's Efforts compared to Others
Next Steps and Recommendations

Industry Public Awareness Programs
What's the problem being addressed?
Regulatory Requirements and Standards
Washington Company Efforts and Effectiveness
Next Steps and Recommendations

Transparency of Information
What Pipeline Information is Available to People In Washington State?
Where is it and how easy is it to find?
How this compares to other states
Next Steps and Recommendations

Washington State Citizens Committee on Pipeline Safety
Committee's formation and role
Past efforts
Comparison to other similar committees
Recommendations

Spill and Emergency Response Planning & Prevention

What is required by federal and state law

Department of Ecology's Program and how it fits in the federal system
Contingency Planning
Facility Response Plans
Drills and Exercises

Comparison to Other States

Company outreach for emergency planning
Recommendations