

Pipeline Water Crossing & Depth of Cover Inspections

Regulatory and Compliance Reference Handbook



Alberta Energy Regulator

- **The Alberta Energy Regulator requires licensees to develop and implement integrity management programs to identify and mitigate risks associated with each particular pipeline, including monitoring all risk factors, such as pipeline water crossings. There are thousands of water crossings throughout Alberta's pipeline inventory of over 415,000kms. Compiled below are extracts from relevant pipeline regulations, codes and practices.**

AER Bulletin 2014

- AER Bulletin 2014-12 April 10, 2014
- Enhanced Monitoring of Pipeline Water Crossings With springtime melt rapidly approaching, the Alberta Energy Regulator (AER) hereby reminds pipeline licensees of their responsibility to take appropriate precautions to prevent damage to, and to minimize the potential of a release from, all pipelines subject to being affected by high streamflow or flooding conditions. To fulfill this responsibility and understand the potential risks to its pipelines, the licensee must be aware of the potential for pipeline damage resulting from high streamflow conditions and physically inspect and assess any pipeline water crossings that might have previously been or have the potential to be affected by high streamflow conditions. High streamflow and flooding conditions can rapidly scour away riverbeds, cause bank instability, and wash out pipeline crossings at creeks, streams, and rivers, as well as at areas that might not normally experience water flow. Flooding can cause channel avulsion and create new water crossings where pipelines were not originally designed as a crossing. Flooding can also cause significant displacement of rock and debris, which can impinge on exposed pipelines and create high stresses or damage. Assessments should be conducted by competent professionals and include geotechnical and hydrological hazard evaluation, which typically include depth of cover, bed stability, bank stability, channel characteristics, and potential watercourse energy evaluations. If the pipeline may have been previously exposed, then the potential for coating or structural damage from high stresses should also be evaluated. If assessments indicate that a pipeline is currently in distress, the pipeline should be purged and shut in. If assessments indicate potential risk, the licensee should then prepare procedures to monitor for high streamflow advisories and be prepared to purge and shut in any affected pipelines if necessary. The licensee may also need to remediate the crossing to re-establish safe cover and properly protect the pipeline from potential damage. Licensees are advised to notify the AER of any such situations, and it may be prudent to file a self-disclosure application if the situation is such that a noncompliance would exist. The assessments described in this bulletin should already be part of the licensee's established pipeline integrity management program. Water crossing inspections are to be conducted frequently at intervals appropriate to identify any changes to the crossing environment, as required by the 2 AER Bulletin 2014-12 Canadian Standards Association's CSA Z662-11: Oil and Gas Pipeline Systems. The Alberta Pipeline Rules also require that all pipeline water crossings be inspected at least annually.

CSA Z662-11

- The Canadian Standards Association (CSA) Document Z662 (2011 ed.) is intended to establish essential requirements and minimum standards for the design, construction, operation, and maintenance of oil and gas industry pipeline systems. The Standard is broken down into many of the same categories of design, construction, operation, and maintenance with the addition of numerous appendices; and each of which include some facet of watercourse crossings.

CSA Z662-11

Design (Section 4)

4.3.1.2 Designers shall provide adequate protection to prevent unacceptable damage to the piping from unusual or special external conditions.

4.11.1 The cover requirements for buried pipelines shall be as given in Table 4.9, except that where underground structures or adverse conditions prevent installation with such cover, buried pipelines may be installed with less cover, provided that they are appropriately protected against anticipated external loads.

Location	Type of pipeline	Class location	Cover for buried pipelines, minimum, m	
			Normal excavation	Rock excavation requiring blasting or removal by comparable means
General (other than as indicated below)	LVP or gas	Any	0.60	0.60
	HVP or CO ₂	1	0.90	0.60
	HVP or CO ₂	2, 3, or 4	1.20	0.60
Right-of-way (road or railway)	Any	Any	0.75	0.75
Below travelled surface (road)*	Any	Any	1.20	1.20
Below base of rail (railway)†				
— Cased	Any	Any	1.20	1.20
— Uncased	Any	Any	2.00	2.00
Water crossing	Any	Any	1.20‡	0.60
Drainage or irrigation ditch invert	Any	Any	0.75	0.60

‡Reduced cover, but not less than 0.6 m, may be used if analysis demonstrates that the potential for erosion is minimal.

CSA Z662-11

- 4.3.1.2 Designers shall provide adequate protection to prevent unacceptable damage to the piping from unusual or special external conditions.
- 4.12.4.1 The wall thickness of pipe shall be determined as specified in Clauses 4.2, 4.3, and 4.6 to 4.10. Special attention shall be given to the physical characteristics of crossings, such as composition and stability of the bed and banks, waves, currents, scouring, flooding, type and density of water-borne traffic, and other features that can cause adverse effects. Weight-coatings, river weights, screw anchors, or other means shall be used to maintain the position of pipelines under anticipated conditions of buoyancy and water motion.

CSA Z662-11

- 10.6.1.1 Operating companies shall periodically patrol their pipelines in order to observe conditions and activities on and adjacent to their rights-of-way that can affect the safety and operation of the pipelines. Particular attention shall be given to the following:
 - Construction activity;
 - Dredging operations;
 - Erosion;
 - Ice effects;
 - Scour;
 - Seismic activity;
 - Soil slides;
 - Subsidence;
 - Loss of cover; and
 - Evidence of leaks.
- 10.6.4.2 Underwater crossings shall be inspected periodically for adequacy of cover, accumulation of debris, and other conditions that can affect the safety or integrity of the crossing.

Alberta Government Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body

- Under the Alberta Water Act and Water (Ministerial) Regulation, the Alberta Ministry of Environment, has produced a Code of Practice specific to crossings of a water body. This Code of Practice covers all aspects of works related to installation of new pipelines as well as repair and replacement of existing pipelines.
 - 6.1 At least 14 days before work is carried out, an owner must prepare a plan for the works that contains or incorporates the following:
 - In addition to any monitoring measures contained in the written specifications and recommendations of a professional engineer, owner or qualified aquatic environment specialist,
 - Specifications of the monitoring measures that will, during the anticipated life of the pipeline crossing or telecommunication line crossing, meet the requirement of this Code of Practice
- 1 (c) All pipes for pipeline crossings must be installed at an elevation that is below the one in fifty year bed scour depth of the water body except for pipes under clause (d);
- 1 (d) All pipes for pipeline crossings that will carry a substance that causes or may cause adverse effect on the aquatic environment, including fish habitat, must be installed at an elevation that is below the one in one hundred year bed scour depth of the water body;

Guidelines for Pipeline System Integrity Management Programs (Annex N)

N.10.4 The options that may be used to reduce the frequency of failure and damage incidents associated with natural hazards include the following, as applicable:

- Inspection and evaluation of areas subject to washout erosion, freeze-thaw, settlement due to construction or undermining, earthquake, or slope movement;
- Increase frequency of right-of-way inspections and patrols;
- Programs to monitor the pipeline system or soil movement (e.g., inspections using in-line geometry tools, survey techniques and slope inclinometers);

Alberta Water Act

- 1(1) All definitions in the Water (Ministerial) Regulation and in section 1 of the Water Act apply except where expressly defined in this Code of Practice. (2) In this Code of Practice, (a) "active channel" means those parts of the bed and banks of a water body that are without terrestrial vegetation;
- (bb) "water body" means, for the purpose of this Code of Practice, a water body **with defined bed and banks**, whether or not water is 6 continuously present, but does not include fish bearing lakes; (cc) "watercourse crossing" means a crossing or temporary crossing and any associated permanent or temporary structures that are or will be constructed to provide access over or through a water body.

Alberta Pipeline Rules and Regulations

- Right of way inspection
- 43(1) The licensee of a pipeline that crosses water or unstable ground shall at least once annually inspect the pipeline right of way to assess
 - (a) the surface conditions on and adjacent to the right of way,
 - (b) indications of any leak in the pipeline,
 - (c) any construction activity performed by others,
 - (d) any encroachment or development near the pipeline right of way, or
 - (e) any other condition affecting the operation of the pipeline