

Pipelines and Facilities Integrity Management Program (IMP) Compliance Assurance Summary

Annual Report 2020



ABOUT THE BC OIL AND GAS COMMISSION

The <u>BC Oil and Gas Commission</u>

(Commission) protects public safety and safeguards the environment through the sound regulation of oil, gas and geothermal activities in B.C.

From exploration through to final reclamation, we work closely with communities, First Nations, and land owners, and confirm industry compliance with provincial legislation.

We are committed to advancing reconciliation and establishing close working relationships with Indigenous peoples throughout the energy life cycle.

With more than 20 years' dedicated service, the Commission is committed to safe and responsible energy resource management for British Columbia.

For general information about the Commission, please visit **bcogc.ca** or phone 250-794-5200.



Vision

Safe and responsible energy resource development for British Columbia.

Mission

We provide British Columbia with regulatory excellence in responsible energy resource development by:

- Protecting public safety,
- Safeguarding the environment, and
- Respecting those who are affected.

Values

Transparency is our commitment to be open and provide clear information on decisions, operations and actions.

Innovation is our commitment to learn, adapt, act and grow.

Integrity is our commitment to the principles of fairness, trust and accountability.

Respect is our commitment to listen, accept and value diverse perspectives.

Responsiveness is our commitment to listening and timely and meaningful action.

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EXECUTIVE SUMMARY

The Commission conducted 20 integrity management program (IMP) audits in 2020 including nine facility IMP audits and 11 pipeline IMP audits. The Commission audits pipeline and facility permit holders within a five-year cycle.

The objective of the audits was to verify IMPs meet the applicable regulatory requirements set out in the Pipeline Regulation, Drilling and Production Regulation, and Liquefied Natural Gas Facility Regulation. The Compliance Assurance Protocol for Integrity Management Programs for Pipelines and the Compliance Assurance Protocol for Integrity Management Programs for Facilities contain guidance on meeting the regulatory requirements.

Due to the COVID-19 pandemic, all 2020 audits were completed remotely. The remote auditing process required completion of an audit workbook and written submissions by the auditees followed by a virtual audit meeting. Permit holders were issued final audit reports outlining audit findings and analysis. The average audit score for 2020 was 88 per cent for pipeline IMPs and 81 per cent for facility IMPs.

High priority audit findings for pipeline IMPs were related to:

Inspection Maintenance and Monitoring (IMM)

- Planning, development, and implementation of processes for inactive pipelines over the 18-month regulatory timelines.
- Mitigation processes for geotechnical and hydrotechnical hazards.
- Meeting CSA Z662 requirements for Stress Corrosion Cracking (SCC) management.

Risk Assessment

• Review and update pipeline inventory, class location and all potential hazards on an ongoing basis.

Training and Competency

• Develop and implement a process for contractor oversight and establish a process to evaluate the effectiveness of training programs.

Incident Investigation and Learning

• Improve the process for investigation, tracking and learning from incidents and near misses.



High priority audit findings for facility IMPs were related to:

General IMP

• Develop, implement, and establish all components of the facility IMP and ensure all equipment that is within the scope of the IMP is included, such as tanks, rotating equipment, flares, instrumentation, and controls.

Risk Assessment

 Understand the role of facility risk assessment and develop and implement a facility and equipment-based risk assessment and management process in accordance with the facility IMP protocol.

Inspection Maintenance and Monitoring (IMM)

• Planning, tracking and management of preventative maintenance and other IMM activities for all equipment within the scope of the facility IMP.

Training and Competency

• Develop and implement a process for contractor oversight and establish a process to evaluate the effectiveness of training programs.

Incident Investigation and Learning:

 Improve the process for investigation, tracking and learning from incidents and near misses.

None of the audit findings posed immediate threats to safety or the environment. Through the corrective action plan oversight process, the Commission ensures permit holders address the audit findings through the development and implementation of corrective action plans (CAPs).

The process includes the classification of the audit findings / CAPs as high, medium, and low priority to establish the required level of oversight. Through its CAP oversight process, the Commission ensures CAPs are completed in a timely manner.

For pipeline IMPs, average audit scores have increased over time. The average audit scores for the nine pipeline permit holders audited between 2011-15 and again between 2016-20, increased by about 20 per cent (from 59 per cent to 80 per cent).

A similar analysis of facility IMPs was not



Average pipeline IMP rates have increased over time.

completed. Facility IMP requirements did not come into effect until 2018 and there are not enough audit results to complete a similar analysis.

Overall, the 2020 audits showed continued improvement, leadership commitment, support for the development of management system principles of Plan-Do-Check-Act, and promotion of positive safety culture.

INTRODUCTION

An Integrity Management Program (IMP) provides a systematic approach for assuring the integrity of pipeline and facility infrastructure. The IMP includes processes to anticipate hazards, and analyze, assess, and manage risks that can adversely affect safety and the environment. IMPs must address the entire lifecycle of pipelines and facilities including planning, design, procurement, construction, operation, maintenance, and decommissioning.

Pipeline integrity management programs (IMPP) have been a regulatory requirement in British Columbia since 1999 when they were introduced in CSA Z662, the national standard for pipeline systems. Facility integrity management programs (IMPF) have been a regulatory requirement in British Columbia since 2018.

The Commission has been auditing IMPs for pipelines since 2011 and facilities

since 2018. Each year, permit holders are selected based on the Commission's inherent risk assessment of permit holder pipeline and facility infrastructure, time since the last audit and other relevant criteria. On average, the Commission audits permit holders every five years. The Commission's selection criteria, scope and expectations are detailed in the Compliance Assurance Protocol for Integrity Management Programs for Pipelines and the Compliance Assurance Protocol for Integrity Management Programs for Facilities.

This report includes a summary and analysis of the pipeline and facility IMPs audit results for 2020. The comparison of audit results of pipeline permit holders from the two audit cycles—Audit Cycle 1 (2011-15) and Audit Cycle 2 (2016-2020) are also presented in this report. During 2020, the Commission completed 11 pipeline IMP audits and nine facility IMP audits.

Due to travel restrictions resulting from the COVID-19 pandemic, the audits were completed by remote auditing. The remote auditing process required completion of an audit workbook and written submissions by the auditees. Following review of the submissions, a virtual audit meeting was scheduled with the permit holder to address any outstanding issues and to present preliminary findings. A final audit report was issued to the auditees outlining the audit findings. The auditees were required to develop and implement corrective actions to address the findings. The Commission reviews and approves corrective action plans and monitors implementation of corrective actions.

Review &

approval of CAPs



AUDIT RESULTS AND ANALYSIS

IMP audits undertaken by the Commission include 18 IMP components:



The Commission used the Integrity Management Program Audit and Knowledge Tool (IMPAKT) for audit scoring. The IMPAKT tool calculates overall audit scores (defined as the percentage of requirements met under each IMP component) for each operator. It also consolidates audit analysis for IMP components in terms of audit score per component by distinguishing between applicable, non-applicable and not-audited indicators of components.

PERMIT HOLDER-BASED ANALYSIS

Audit Score

For pipeline IMPs, the audit score ranged from 75 to 99 per cent for 11 audited permit holders. For facility IMPs, the audit score varied between 47 and 98 per cent for nine audited permit holders. The average audit score for 2020 IMP audits was 88 per cent for pipelines and 81 per cent for facilities. The higher audit score for pipeline IMPs can be attributed to the maturity of the IMP programs and a better understanding of the expectations and requirements by the pipeline operators. Facility IMP requirements are more recent, and some programs are not as mature. Figures 1 and 2 show compliance scores by permit holder for pipelines and facilities.





2020 Pipeline IMP Permit Holder (PH) Audit Score



Performance Classification

To categorize IMP audit performance, the Commission uses the following benchmarks:



Figures 3 and 4 present the 2020 audit results using the above-mentioned performance criteria for pipelines and facilities.

COMPONENT-BASED ANALYSIS

Even though facility IMPs is a more recent requirement, the percentage of permit holders with strong performance is comparable to pipelines (facilities 33 per cent, pipelines 36 per cent). There are more permit holders that have weak facility IMP performance than pipelines (facilities 44 per cent, pipelines 36 per cent) and there was more variation in facility IMP audit scores. One third of facility IMP audit scores were below 75 per cent, the lowest pipeline IMP audit score.

The lowest facility IMP audit scores resulted when the IMP addressed specific pieces of facility equipment such as pressure vessels and piping, instead of the full scope of facility equipment, including but not limited to instrumentation, flare systems and rotating equipment.

When the performance of permit holders with respect to the individual pipeline IMP components is analyzed (Figure 5), permit holders generally have strong programs and processes in place. Inspection, maintenance, and monitoring (IMM) had the highest number of audit findings (10) followed by risk assessment (7), and training and competency (5). With respect to the average audit score of components, risk assessment was the weakest component at 77 per cent, followed by IMM at 81 per cent, goals and KPIs at 85 per cent, records control at 85 per cent, and training and competency at 87 per cent.

Key areas requiring further improvement for pipeline IMPs:

 Planning, documentation and implementation for inspection maintenance and monitoring activities predominantly related to the deactivation of inactive pipelines, geotechnical/hydrotechnical hazards mitigation, and one instance of SCC management.

- Timely revision and update of standard operating procedures (SOPs) for IMM activities.
- Ongoing review of pipeline inventory, class location and potential hazards for risk assessment and management.
- Establishing contractor oversight processes.
- Developing a process to evaluate the effectiveness of training programs.
- Managing changes related to organizational changes and acquisition and divestitures through MOC or a structured corporate process.
- Investigation, tracking and trending of incidents and near misses.
- Developing and implementing meaningful leading and lagging KPIs and a process for tracking and reporting the results for regular performance measurement to evaluate program effectiveness.



Figure 5: Pipeline IMP Average Audit Score by Component and Number of Findings

For facility IMPs, there is a greater variation in compliance scores between individual IMP components when compared to pipeline IMPs. The lower audit scores resulted from IMPs that did not address the full scope of facility equipment.

Permit holders have well-established IMP programs to manage pressure vessels, associated pressure safety valves (PSVs) and associated piping, but equipment such as flare systems, tanks, rotating equipment, and instrumentation and controls are not always addressed in the IMP documentation. The Commission is addressing this gap by requiring permit holders to complete and submit IMP self-assessments. The selfassessments are a tool to communicate IMP requirements to permit holders outside of the audit process. Gaps in IMP scope identified through the audit process are addressed through corrective action plans. Risk assessment had the highest number of audit findings (7) followed by General IMP (6), training and competency (5) and Inspection, Maintenance and Monitoring (5). With respect to the average audit score of components, General IMP was the weakest component at 42 per cent, followed by Risk Assessment at 50 per cent, and Inspection, Maintenance and Monitoring at 64 per cent and Management Review at 71 per cent.

Key areas requiring further improvement for facility IMPs were:

• Develop, implement and establish all components of the facility IMP and ensure that all facility equipment is included, such as tanks, rotating equipment, flares, and instrumentation and controls.



Figure 6: Facility IMP Average Audit Score by Component and Number of Findings

- Understand the role of facility risk ٠ assessment and develop and implement a facility and equipment-based risk assessment and management process.
- Review inspection maintenance and monitoring activities and ensure they are planned, tracked, and managed.
- Review and update standard operating ٠ procedures for IMM activities.
- Develop and implement processes for abnormal events.
- Formalize the contractor oversight •

process.

- Develop a process to evaluate the effectiveness of training programs.
- Investigation, tracking and trending of incidents and near misses.
- Develop and implement meaningful leading and lagging KPIs and a process for tracking and reporting the results for regular performance measurement to evaluate program effectiveness.

MANAGEMENT SYSTEM (MS)-LEVEL: PLAN-DO-CHECK-ACT ANALYSIS

Considering Plan-Do-Check-Act (PDCA) principles are at the core of any management system to achieve continuous assessment and improvement, the overall audit results are analysed for PDCA as shown in Figure 7.

For pipeline IMPs, there was minimal variation between the PDCA phases for the auditees (Figure 7).

For facility IMPs (Figure 7), the Plan and Act phases were the weakest, which means, scope update, risk assessment and processes for management review require systematic actions for formal development and implementation. Through the CAP management process the Commission will ensure that these gaps are fully addressed.



PIPELINE IMP AUDIT SCORE TRENDS

For the purposes of comparing trends in the IMP audit score over time, pipeline IMP audits were separated into two audit cycles. Audit Cycle 1 covers (2011-15) and Audit Cycle 2 covers (2016-20). The audit results and performance from the two cycles were reviewed to evaluate performance of the Commission's IMP audit process and to determine if it is effective in improving performance, including evidence of improvement and maturity of their programs. The audit scores for the nine permit holders with recurring audits in Audit Cycle 1 and 2 are compared in Figure 9. On average, audit scores were higher in Cycle 2, which indicates the audit process is effective in improving performance.

Average annual pipeline IMP audit scores for all audits since 2012 are presented in Figure 9. The audit results from 2011 were excluded because they were not comparable due to auditing process differences.



Figure 8: Pipeline IMP Audit Score Comparison for Repeat Permit Holders (PHs)

In 2016, the Commission revised and expanded pipeline IMP requirements to address the entire lifecycle of pipelines, and many areas previously not examined under performance evaluation, inspection and monitoring, and risk management. Even with the expanded scope, the average annual audit score increased about 20 per cent (from 59 per cent to 80 per cent) during the second audit cycle (Cycle 2) indicating enhanced understanding and implementation of the IMP requirements.

The results from Figures 9 and 10 also highlight the commitment of permit holders to improve the performance of their integrity management programs and the effectiveness of the IMP audit process in driving performance improvements.

A similar analysis of facility IMPs was not completed. Facility IMP requirements did not come into effect until 2018 and there are not enough audit results to complete a similar analysis.



Figure 9: Pipeline IMP Annual Average Audit Score

CORRECTIVE ACTIONS OVERSIGHT AND RESOLUTION OF AUDIT FINDINGS

The issuance of an audit finding triggers the requirement for a permit holder to submit a corrective action plan to the Commission. The CAP identifies corrective actions (CAs), responsibilities and timelines for implementing those actions. The Commission requires CAP submission within 30 days of the permit holder receiving its final audit report.

The Commission has developed a structured approach for prioritizing audit findings and associated CAPs based on the significance, relevance, and relation of the IMP components to the overall integrity of the pipelines and facilities, as shown in Table 1. The IMP Findings and CAP Priority Matrix enables classification of the audit findings/ CAPs as high, medium, and low priority to establish the required level of oversight.

Oversight requirements for high, medium, and low priority CAPs are outlined below:

• High Priority CAPs: Bi-monthly CAP update is required, along with demonstration of completion and submission of evidence of completion by an agreed timeline.

- Medium Priority CAPs: Permit holders are required to demonstrate completion through submission of evidence by a mutually agreed timeline. CAPs with longer timelines may require regular updates.
- Low priority CAPs: CAPs related to administration for all IMP components are low priority and permit holders are only required to notify the Commission when the CAP is completed after CAP approval.

The prioritization of the 47 audit findings/CAPs associated with the 11 pipeline IMP audits completed in 2020 is presented in Figure 10.

The prioritization of 42 audit findings/ CAPs associated with the nine facility IMP audits completed in 2020 is presented in Figure 11.



The Commission reviews and evaluates CAPs to assess whether the proposed CAs and timelines for completion are acceptable. Review of the approved CAPs and proposed actions continues until all findings have been fully addressed by the permit holder.

IMP COMPONENTS / TYPES OF FINDINGS	SCOPE 1	PROCESS 2	EXECUTION 3	RECORDS / DATA 4	DOCU- MENTATION 5	ADMIN 6
GENERAL						
POLICY AND LEADERSHIP COMMITMENT						
GOALS AND OBJECTIVES						
PLANNING						
RISK ASSESSMENT						
ORGANIZATIONAL ROLES AND RESPONSIBILITIES						
COMMUNICATION						
COMPETENCY AND TRAINING						
MANAGING CHANGE						
RECORDS AND DOCUMENT CONTROL						
OPERATIONAL CONTROL						
INSPECTION, MAINTENANCE & MONITORING (IMM)						
EVALUATION OF IMM ACTIVITIES						
MODIFICATION AND REPAIR						
INCIDENT INVESTIGATION AND LEARNING						
INTERNAL AUDIT						
PERFORMANCE MEASUREMENT (KPIs)						
MANAGEMENT REVIEW						
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SAFETY CULTURE ASSESSMENT

The Commission's IMP audit process includes an assessment of safety culture. For this purpose, 12 safety culture attributes are selected and broadly applied to IMP audits.

1.	SAFETY (a core value)
2.	LEADERSHIP AND MANAGEMENT COMMITMENT
3.	GOALS AND KPIS MEASUREMENT
4.	LEGAL AND SYSTEMS COMPLIANCE
5.	COMMUNICATION
6.	SYSTEMIC CONSIDERATION OF RISK
7.	MANAGING CHANGE
8.	TRAINING AND COMPETENCY
9.	LEARNING FROM EVENTS
10.	NON-PUNITIVE REPORTING
11.	EMPOWERMENT AND ACCOUNTABILITY
12.	CONTINUAL IMPROVEMENT

Table 2: Safety Culture Attributes

The safety culture assessment is interpreted through a 10-point scale collectively for a permit holder using the IMP audit results. Values of 8-10 are assigned to most positive responses (strong), 5-7 to moderately positive responses (moderate), and 1-4 to represent the least positive indicators (weak) of safety culture.

The visualization of the overall findings of safety culture attributes from IMP audits is collectively presented through the radar / spider plot (Figure 12).



Figure 12: 2020 Safety Culture Performance

The IMP audits show that safety culture performance is generally positive. Overall, permit holders have adopted safety as a core value, their leadership and management show commitment to safety by enforcing operational policies that prioritize safety over production, demonstrate initiatives in meeting compliance and standard regulations, empower staff to stop unsafe work, encourage non-punitive reporting, and establish effective methods to manage change. To continually nurture safety culture and to avoid complacency, permit holders should promote vigilance through enhancement of risk assessment and contractor oversight; align goals and objectives with KPIs; improve learning from events and external communication practices with industry; and focus on further development and details for continual improvement.

SUMMARY

Integrity Management Programs are documented programs specifying the processes and practices used by permit holders to ensure public safety, environmental protection, and operational reliability through the entire lifecycle of their pipelines and facilities.

Pipeline integrity management programs have been a regulatory requirement in British Columbia since 1999 when they were introduced in CSA Z662, the national standard for pipeline systems. Facility integrity management programs have been a regulatory requirement in British Columbia since 2018. The Commission has been auditing IMPs for pipelines since 2011 and facilities since 2018.

The Commission completed 11 pipeline IMP audits in 2020. Auditee's pipeline IMPs are well established and implemented with an average audit score of 88 per cent. High priority audit findings were related to:

- Inspection maintenance and monitoring: planning, development, and implementation of processes for inactive pipelines over the 18-month regulatory timelines; mitigation processes for geotechnical and hydrotechnical hazards; and meeting CSA Z662 requirements for SCC management.
- Risk assessment: review and update pipeline inventory, class location and all potential hazards on an ongoing basis.
- Training and Competency: develop and implement a process for contractor oversight and establish a process to evaluate the effectiveness of training programs.
- Incident investigation and learning: improve the process for investigation, tracking and learning from incidents and near misses.

The Commission completed nine facility IMP audits in 2020. The overall average audit score for facility IMP audits was 81 per cent. High priority audit findings were related to:

- General IMP: Develop, implement, and establish all components of the facility IMP and ensure that all equipment that is within the scope of the IMP is included, such as tanks, rotating equipment, flares, instrumentation, and controls.
- Risk assessment: Understand the role of facility risk assessment and develop and implement a facility and equipment-based risk assessment and management process in accordance with the facility IMP protocol.
- Inspection maintenance and monitoring: planning, tracking and management of preventative maintenance and other IMM activities for all equipment within the scope of the facility IMP.
- Training and Competency: develop and implement a process for contractor oversight and establish a process to evaluate the effectiveness of training programs.
- Incident investigation and learning: improve the process for investigation, tracking and learning from incidents and near misses.

None of the audit findings posed immediate threats to safety or the environment. Through the corrective action plan oversight process, the Commission ensures permit holders address the audit findings by outlining appropriate actions and implementing them in the specified and agreed timeframe.

Overall, 2020 audit results in this report highlight continued improvement of Integrity Management Programs, positive safety culture, and leadership commitment. The Commission will maintain its compliance oversight of Integrity Management Programs for pipelines and facilities to promote process enhancement and safe operations.

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