

Chapter 14

Technical Safety Authority of Saskatchewan – Boiler and Pressure Vessel Inspection Processes

1.0 MAIN POINTS

The Technical Safety Authority of Saskatchewan (TSASK) is assigned with the responsibility of administering and enforcing *The Boiler and Pressure Vessel Act, 1999* and *The Boiler and Pressure Vessel Regulations* (Regulations). These Regulations require that TSASK perform periodic inspections on boilers and pressure vessels. Regular inspection of boilers and pressure vessels is important to help prevent equipment malfunction because, in the event of a boiler or pressure vessel malfunction, there could be significant harm to facilities, the environment, employees, and the general public.

Our audit for the twelve-month period ended December 31, 2013 found that TSASK had effective processes for inspecting boilers and pressure vessels, except that TSASK needs to:

- › Identify and formally assess risks, and use and periodically re-evaluate a risk-informed strategy for inspection selection
- › Establish written policies and procedures for handling incidents and complaints and for follow up of inspection deficiencies
- › Formalize the process to clear its backlog of outstanding inspections for boilers and pressure vessels within a reasonable amount of time
- › Establish processes to ensure the accuracy and completeness of its electronic inspection records
- › Provide its Board and the Ministry responsible for the Safety Standards Agreement with written analysis of trends for regulated sectors, and measures implemented to monitor trends and mitigate risks
- › Establish processes to track and monitor completion of inspections by Quality Management System operators

We make nine recommendations to help TSASK improve its processes for inspecting boilers and pressure vessels.

2.0 INTRODUCTION

TSASK is a not-for-profit organization established on July 1, 2010 under *The Technical Safety Authority of Saskatchewan Act*. TSASK's objective is to protect public safety by delivering services that lead to the safe manufacture, installation, maintenance, use and operation of technical products, equipment and systems.¹ TSASK administers Saskatchewan's safety program for boilers, pressure vessels, elevating devices and

¹ *Technical Safety Authority of Saskatchewan 2013 Annual Report*, p. 5.



amusement rides on behalf of the Ministry of Government Relations pursuant to a Safety Standards Agreement signed with the Government of Saskatchewan.²

This chapter reports the results of our audit on TSASK's inspection processes for boilers and pressure vessels. For the purpose of this audit, boilers and pressure vessels are defined in accordance with section 2 of *The Boiler and Pressure Vessel Act, 1999*, as follows:

*A **boiler** is a vessel in which steam is or may be generated or hot water produced under pressure, and includes any high pressure boiler or low pressure boiler and any pipe, fitting, prime mover, machinery or other equipment attached to the vessel or used in connection with the vessel (e.g., equipment used to heat buildings or as part of the process to generate power)*

*A **pressure vessel** is a vessel or similar apparatus, other than a boiler, that is or may be used for containing, storing, distributing, transferring, distilling, evaporating, processing or otherwise handling gases, fluids or solids and that is normally operated under pressure, and includes any pipe or fitting that is attached to the vessel or used in connection with the vessel (e.g., large stationary propane tanks, anhydrous ammonia storage tanks, oil refineries, oil separators,³ etc.)*

3.0 BACKGROUND—RESPONSIBILITY FOR INSPECTIONS

Section 25(1) of *The Technical Safety Authority of Saskatchewan Act* and section 5.01 of the Safety Standards Agreement assign TSASK with the responsibility of administering and enforcing *The Boiler and Pressure Vessel Act, 1999 (Act)* and *The Boiler and Pressure Vessel Regulations (Regulations)*.

The Regulations require that TSASK perform inspections on boilers and pressure vessels ranging from annually to every 10 years, depending on the type of boiler or pressure vessel, and whether the equipment owner has a certified Quality Management System (QMS) in place.

Section 28 of the Act provides companies that own or insure boilers or pressure vessels with an opportunity to apply to the Chief Inspector (a person appointed or designated by TSASK) for approval of a QMS. As of June 30, 2013, TSASK had nine companies that each operate under an approved QMS.⁴

As part of a QMS, the applicant company (i.e., operator) establishes a documented inspection program and employs qualified inspection personnel to perform periodic inspections on equipment they own or insure. The Regulations require companies with a QMS to provide the Chief Inspector with reports that detail all inspections made subject to a QMS (section 66), and provide TSASK with the authority to conduct audits to determine whether a company is operating in compliance with an approved QMS (section 81).

² www.tsask.ca/about-us (3 December 2013).

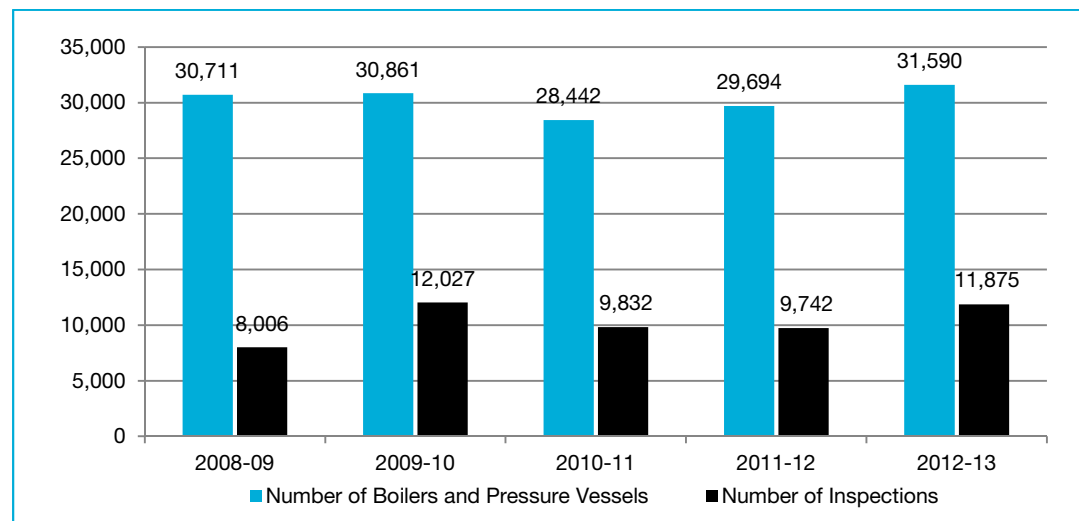
³ An oil separator is a pressure vessel used in the oil field on a producing lease or platform near the wellhead, manifold, or tank battery to separate fluids produced from oil and gas wells into oil and gas or liquid and gas.

⁴ *Technical Safety Authority of Saskatchewan 2013 Annual Report*, p. 7.

Safety of boilers and pressure vessels is a significant component of TSASK's operations. Conducting inspections is necessary for TSASK to fulfill legislative responsibilities. In 2012-13, TSASK earned over \$6 million in boiler and pressure vessel safety revenue (including inspection, examination, certification, design review and licensing-derived revenues), which equates to almost 86% of TSASK's total revenue.⁵ As noted in **Figure 1**, there were 31,590 boilers and pressure vessels in Saskatchewan in 2012-13,⁶ and TSASK conducted 11,875 in-service and installation acceptance inspections (see **Figure 2** for related types of inspections). Also, as reflected in **Figure 1**, over the last five years the inventory of boilers and pressure vessels has grown by almost 3% and the number of inspections has increased by 48%.

At December 31, 2013, TSASK had 17 inspectors responsible for inspections of boilers and pressure vessels.

Figure 1—Inventory of Boilers and Pressure Vessels and Number of Inspections



Source: TSASK inspections database

Figure 2—Types of Inspections

- **Acceptance inspections:** one-time inspections for installation of new or altered equipment, before it is put in use
- **In-service inspections:** periodic inspections that are required for equipment that is in use or operation
- **Incident:** an explosion, serious fire, rupture, serious overheating of equipment, or an accident causing death or serious injury to a person arising from the operation of a boiler or pressure vessel
- **Outstanding inspections:** inspections related to licensed equipment whose periodic inspection interval has exceeded either the inspection intervals as defined within the Regulations, or the inspection intervals as categorized through TSASK policy

Source: Adapted from *Technical Safety Authority of Saskatchewan 2013 Annual Report and the Safety Standards Agreement*

Significant harm to facilities, the environment, employees and the general public could occur in the event of a boiler or pressure vessel malfunction. If boilers and pressure vessels are not properly designed, operated, maintained and inspected, equipment deficiencies (e.g., leaks) could result in fires, explosions or the release of dangerous gases (e.g., steam, propane, anhydrous ammonia). Inspecting boilers and pressure

⁵ *Technical Safety Authority of Saskatchewan 2013 Annual Report*, p. 18.

⁶ *Ibid.*, p. 7.



vessels helps prevent equipment malfunction and is critical for the safety of Saskatchewan citizens.

4.0 AUDIT OBJECTIVE, SCOPE, CRITERIA, AND CONCLUSION

The objective of this audit was to assess whether the Technical Safety Authority of Saskatchewan had effective processes for inspecting boilers and pressure vessels for the twelve-month period ended December 31, 2013.

We examined TSASK's policies and procedures related to the inspection processes for boilers and pressure vessels. We tested a sample of inspections conducted during the audit period, and reviewed TSASK's inspector qualifications, incident and complaint logs, and reports provided to senior management.

To conduct this audit, we followed the standards for assurance engagements published in the *CPA Canada Handbook – Assurance*. To evaluate TSASK's processes, we used criteria based on our related work, reviews of literature including reports of other auditors, and consultations with management. Management agreed with these criteria (see **Figure 3**).

Figure 3—Audit Criteria

To have effective processes to conduct inspections of boilers and pressure vessels, TSASK should:

- 1. Use a risk-informed strategy for the inspection selection**
 - 1.1 Identify legislative requirements for inspections
 - 1.2 Identify key risks of non-compliance
 - 1.3 Develop a strategy to address requirements and risks
 - 1.4 Periodically re-evaluate the strategy
 - 1.5 Set clear policies and procedures to carry out the strategy, including policies for the handling of incidents and complaints
- 2. Carry out inspections in accordance with strategy**
 - 2.1 Use qualified personnel for inspections
 - 2.2 Carry out inspections as planned
 - 2.3 Investigate incidents and complaints
- 3. Monitor compliance with standards**
 - 3.1 Report promptly identified non-compliance to affected parties
 - 3.2 Resolve deficiencies noted in inspections
 - 3.3 Report periodically to senior management, board and Ministry of Government Relations on compliance trends

We concluded that for the twelve-month period ended December 31, 2013, the Technical Safety Authority of Saskatchewan had effective processes to inspect boilers and pressure vessels except it needs to:

- › **Identify and formally assess risks, and use and periodically re-evaluate a risk-informed strategy for inspection selection**
- › **Establish written policies and procedures for handling incidents and complaints and for follow up of inspection deficiencies**
- › **Formalize the process to clear its backlog of outstanding inspections for boilers and pressure vessels within a reasonable amount of time**

- › **Establish processes to ensure the accuracy and completeness of its electronic inspection records**
- › **Provide its Board and the Ministry responsible for the Safety Standards Agreement with written analysis of trends for regulated sectors, and measures implemented to monitor trends and mitigate risks**
- › **Establish processes to track and monitor completion of inspections by Quality Management System operators**

5.0 KEY FINDINGS AND RECOMMENDATIONS

In this section, we describe our key findings and recommendations related to the audit criteria in **Figure 3**.

5.1 Using a Risk-Informed Strategy for Inspection Selection

5.1.1 Risk-Informed Strategy for Inspection Needed

We expected TSASK to identify the legislative requirements for inspections, identify key risks of non-compliance, and develop a strategy to address those requirements and risks – that is, we expected the use of a risk-informed strategy for deciding who and when to inspect. We found that while TSASK had some components of a risk-informed strategy, it had not yet developed an inspection strategy based on a documented risk assessment.

TSASK has a policy that documents inspection frequencies for boilers and pressure vessels. For some types of equipment, this policy requires more frequent inspections than those established in the Regulations. In addition to this policy, TSASK also has an inspection guide for its inspectors that outlines some priority areas for inspections. For example, the top two priority areas that it has identified are acceptance inspections of new boilers and pressure vessels, and outstanding inspections. Also, the Chief Inspector:

- › Gives verbal direction to TSASK’s inspectors on priority areas, such as inspection of equipment at schools, hospitals, and other healthcare facilities
- › Requires that historical steam engines be inspected annually due to the higher risk associated with their age

However, although TSASK has considered some higher risk areas and taken actions to mitigate these risks, it does not have documentation to support these risk assessments.

In the fall of 2013, TSASK started to develop a risk management framework (framework) to satisfy requirements of the Safety Standards Agreement (Agreement). The Agreement requires, for each technology for which it is responsible,⁷ that TSASK develop an

⁷ TSASK is responsible for administering Saskatchewan’s safety program for boilers, pressure vessels, elevating devices, and amusement rides.



effective process for identifying major risks and developing appropriate risk mitigation plans, including any recommendations for legislative or regulatory changes with respect to those risks.

TSASK's framework includes policies and processes for identifying, analyzing, evaluating, treating, and monitoring risks. The Chief Inspector, the Manager of Quality Assurance, and the Chief Executive Officer meet periodically to discuss the risks identified in the framework. TSASK's framework does not yet address how to determine the severity of a risk or how to set priorities for treatment of identified risks.

Using its framework, TSASK identified seven risks related to the technologies for which it is responsible and has started assessing some of these risks, but the risks identified are not specifically related to TSASK's inspection strategy. For example, although one of TSASK's goals is to reduce outstanding inspections to zero, management did not use its framework to identify and assess the risk of outstanding inspections. To ensure that it identifies and addresses all of the key risks concerning boilers and pressure vessels, it is important that TSASK conduct and document a formal risk assessment that considers the risks to inspections.

- 1. We recommend that the Technical Safety Authority of Saskatchewan identify and formally assess the risks surrounding the inspection of boilers and pressure vessels.**

While TSASK has some components of a risk-informed strategy (e.g., policy concerning inspection frequency, inspection priority, verbal communication of inspection priority areas, risk management framework), it has not yet documented a risk-informed inspection strategy. With a complete risk assessment surrounding its inspection of boilers and pressure vessels, TSASK could develop a risk-informed strategy that would guide who and when to inspect. Developing a strategy based on documented risk assessments would allow TSASK to focus its resources on the highest risk areas and contribute to the achievement of its objectives. To ensure the continued relevance of the strategy, it is also important for TSASK to require periodic re-evaluations of the strategy.

- 2. We recommend that the Technical Safety Authority of Saskatchewan use a documented risk-informed strategy for inspection selection.**

- 3. We recommend that the Technical Safety Authority of Saskatchewan establish a policy requiring periodic formal re-evaluation of its risk-informed strategy for inspection selection.**

5.1.2 Establish Policies and Procedures

We expected TSASK to set clear policies and procedures to carry out its strategy, including policies for handling incidents and complaints. The Agreement requires TSASK to investigate incidents, analyze the information gathered during investigations, and take necessary action to resolve systematic problems. We found that TSASK has processes in place for handling incidents and complaints, and that staff were aware of these processes. However, the established incident and complaint processes are not supported by documented policies or procedures.

Documenting policies and procedures can prevent confusion or actions that do not align with established processes, and promotes consistency in handling similar situations. Policies and procedures are also a form of written communication that provide clear direction for staff and help everyone work towards the same goals.

4. We recommend that the Technical Safety Authority of Saskatchewan establish written policies and procedures for handling incidents and complaints.

TSASK's inspectors are required to use a three-part checklist when they inspect a boiler or pressure vessel (i.e., equipment). The checklist identifies the equipment inspected, deficiencies identified during the inspection, repairs needed, and the deadline for when the owner is required to complete corrective actions. After the inspection is complete, the inspector provides one part of the checklist to the equipment owner. Equipment owners are required to submit a form notifying TSASK when they have completed the required corrective actions. Depending on the significance of the corrective action, TSASK may perform an additional inspection.

During our testing of inspections, we found some instances where the inspector did not identify the deadline for corrective action. Employees entering the inspection details into the electronic records inspection system, LISA, are expected to follow up with the inspectors if a deadline for corrective action is not identified. We found inconsistencies with how employees addressed unidentified deadlines. For example, some employees entered a default deadline of 90 days after the inspection date rather than consulting with the inspector. TSASK expects its inspectors to set deadlines for correcting inspection deficiencies based on the inspectors' assessment of the safety risk that the deficiencies pose.

When an equipment owner has not taken required corrective action by the deadline, TSASK has an established process to follow up with the equipment owner. During our testing of inspections, we found 3 out of 9 instances where required follow up with equipment owners was not timely (i.e., up to six months after the last follow up).

TSASK does not have a policy that provides inspectors with guidance on the timing of follow up of inspection deficiencies. Depending on the significance of the equipment deficiency found (i.e., the potential risk to safety), inspectors may need to follow up uncorrected defects with equipment owners sooner. A documented policy would help clarify expectations and would enable consistent follow up of deficiencies.



5. We recommend that the Technical Safety Authority of Saskatchewan establish a written policy for follow up of inspection deficiencies.

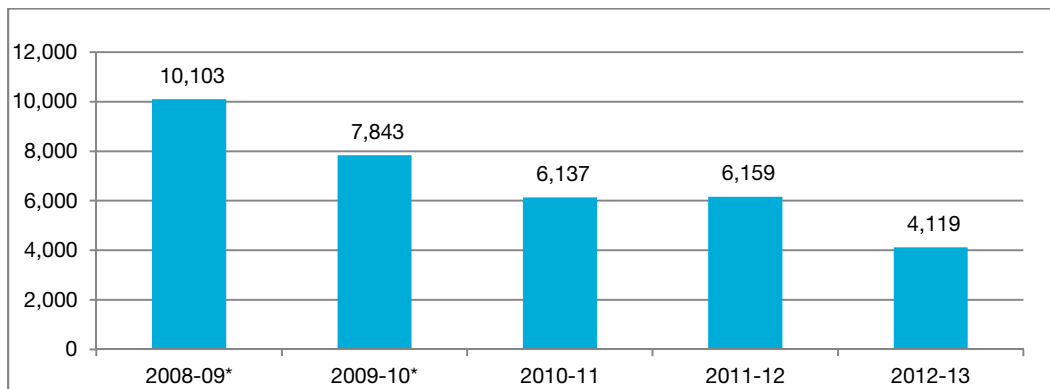
5.2 Carry Out Inspections in Accordance with Strategy

5.2.1 Need to Address Outstanding Inspections

To carry out inspections in accordance with its strategy, we expected TSASK to use qualified personnel, carry out inspections as planned, and investigate any incidents or complaints. We found that TSASK has set out appropriate qualifications for its inspectors. TSASK monitors the qualifications of its inspectors, and the qualifications of inspectors for companies with a QMS in place. We also found that TSASK investigates and maintains a log to track all reported incidents and complaints.

Figure 4 below shows the number of outstanding inspections for boilers and pressure vessels from 2008-09 to 2012-13.

Figure 4—Number of Outstanding Boiler and Pressure Vessel Inspections from 2008 to 2013



Source: TSASK inspections database

*Before TSASK's creation in 2010-11, the Ministry of Corrections, Public Safety and Policing managed the inspection of boilers and pressure vessels

As Figure 4 indicates, TSASK has reduced the number of outstanding inspections by over half from 2008-09 levels and by approximately 47% since it started operations on July 1, 2010. These improvements are largely attributed to a focused effort by TSASK to address outstanding inspections. As noted earlier, TSASK gives priority to regular in-service inspections that are due or overdue. While TSASK has made significant improvements in reducing the number of outstanding inspections, it still has work to do to eliminate its backlog. Elimination of its backlog is critical so that TSASK carries out inspections in a timely manner, as set out in its policies and Regulations. Untimely inspection of equipment increases the risk of equipment deficiencies being undetected.

6. We recommend that the Technical Safety Authority of Saskatchewan formalize the process to clear its backlog of outstanding inspections for boilers and pressure vessels within a reasonable amount of time.

5.2.2 Need to Assess Accuracy and Completeness of Electronic Inspection Records

To carry out inspections in accordance with its strategy, we expected TSASK to have complete and accurate information regarding its inspections, as well as processes to ensure the accuracy and completeness of data. We found that TSASK relies on its electronic inspection records system, LISA, to track and provide key information on its inspections. Using LISA, TSASK determines which pieces of equipment require inspection through review of reports regarding inspections that are due or outstanding. We used Computer Assisted Auditing Techniques to analyze data in LISA. We found inconsistencies that could impact when an inspection is flagged for completion, as well as the reporting of overdue inspections. For example, we found equipment records with incorrect inspection frequencies, equipment types, next inspection dates (or where next inspection dates were not entered), as well as instances where inspections were not properly updated in the system. Overall, the number of inconsistencies found in the data was small (i.e. less than 1% of all equipment records). However, depending on the type of equipment, inaccurate information could have a significant impact (e.g., we found a piece of equipment required to be inspected every five years, but had a next inspection date set for 2035 – over 20 years away).

Management is replacing LISA with a new electronic inspection records system. Management noted that concerns surrounding updating data and limited system capabilities are factors that contributed to its replacement decision. Management has advised us it will implement the new system in the first half of 2014. Processes to ensure that data entered into inspection records is complete and accurate (e.g., use of edit checks, mandatory fields) are important. Inaccurate and incomplete information can result in misleading reports, untimely completion of inspections, or inefficient use of resources (e.g., conducting inspections more frequently than required).

7. We recommend that the Technical Safety Authority of Saskatchewan establish processes to ensure the accuracy and completeness of its electronic inspection records.

5.3 Monitor Compliance with Standards

5.3.1 Need to Assess Reporting Requirements

We expected TSASK to give periodic reports to its Board, senior management, and the Ministry of Government Relations (Ministry). The Chief Inspector provides TSASK's Board with a report at each meeting on boiler and pressure vessel inspections. This report includes graphs or charts detailing comparative information on inspections completed to date, outstanding inspections, and reported incidents.

TSASK's senior management meets approximately every week to discuss operations. This allows management to discuss progress and concerns, and monitor operations. In addition, the Chief Inspector maintains regular contact with inspectors.



As previously noted, TSASK's responsibility for conducting inspections is set out through the Agreement with the Ministry. The current Agreement's term ends in 2015. The Agreement requires that TSASK provide the following periodic reports:

- › Quarterly reports on statistical indicators for safety, including:
 - Total inspections
 - Total outstanding inspections
 - Total reported incidents
 - Total corrective action reports

- › Annual trend analyses including:
 - Trends in all sectors regulated by TSASK
 - Explanations for trends
 - Explanations of the measures implemented by TSASK to monitor trends and mitigate risks
 - Working towards comparing trends in Saskatchewan to other jurisdictions, where possible

We found that TSASK began providing the Ministry with the required quarterly information in early 2014. These quarterly reports also included trends in all sectors regulated by TSASK. However, these quarterly reports did not provide explanations for trends or comparisons to other jurisdictions, as required under the Agreement. By December 31, 2013, TSASK had not provided the Ministry or its Board with the required annual analysis explaining trends and the measures implemented by TSASK to monitor trends and mitigate risks. Such information is necessary to enable the Ministry and the Board to assess TSASK's performance, and to ensure that TSASK meets its legislative requirements.

Management was aware that it had not met all of its reporting requirements and cited challenges with providing all of the information required under the Agreement. For example, it noted that comparing trends in Saskatchewan to other jurisdictions has been difficult because each province operates under different legislation and has different methods to track, measure, and report information.

Management advised that it will be approaching the Ministry to renegotiate the Agreement before the end of its current term. TSASK plans to continue to provide the Ministry with quarterly reports on statistical indicators.

8. We recommend that the Technical Safety Authority of Saskatchewan give its Board and the Ministry responsible for Safety Standards Agreement written analysis of:

- › Trends for regulated sectors
- › Measures implemented to monitor trends and mitigate risks

5.3.2 Need to Monitor QMS Inspections

We expected that TSASK would monitor inspections completed by each company operating under an approved QMS. At December 2013, TSASK had nine companies operating under a QMS which comprised 21% of licensed provincial inventory of boilers

and pressure vessels. Some additional companies have also expressed an interest in pursuing a QMS.⁸

As previously noted, the Regulations require each company operating under a QMS (i.e., operator) to provide the Chief Inspector with reports that outline all inspections made subject to a QMS. When a company applies to be a QMS operator, it must submit a QMS program manual that documents the company's inspection program. The Chief Inspector then reviews and approves the QMS program manual leaving evidence of his review and approval. For the sample of manuals we examined, we found that the Chief inspector reviewed the QMS program manual, ensuring that it:

- ▶ Required the company to submit reports to TSASK, using a standardized form, twice per year. Use of the standardized form ensures TSASK receives information on the equipment inspected, the inspector, inspection date, and next inspection date
- ▶ Specified the dates that the operator must submit the standardized forms to TSASK

However, we found that TSASK does not have a process in place to track and monitor whether QMS operators submit the required reports by the dates specified in their manuals. If TSASK does not track and monitor receipt of these reports, there is a risk that QMS operators will not complete inspections in accordance with the QMS program manuals approved by TSASK. Untimely inspection of equipment by QMS operators increases the risk of undetected equipment deficiencies.

9. We recommend that the Technical Safety Authority of Saskatchewan establish processes to track and monitor completion of inspections by Quality Management System operators, to confirm inspections have been completed in accordance with their approved manuals.

6.0 SELECTED REFERENCES

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⁸ *Technical Safety Authority of Saskatchewan 2013 Annual Report*, p. 7.

