

CANADIAN GAS ASSOCIATION

MATERIALS TRACEABILITY TASK FORCE

Guidance for Operators and Vendors

EXECUTIVE SUMMARY

Material Traceability is a catch phrase used throughout the Oil and Gas industry within North America to describe record requirements including manufacturer, material used and lot/batch/production date information to meet emerging Pipeline and Hazardous Materials Safety Administration (PHMSA) requirements. Drivers stem back to watershed incidents such as the 2010 San Bruno pipeline rupture. While CSA Z662 does not currently require traceability, it is assumed that as record requirements become more stringent within the the industry, including the United States, those requirements will be adopted within Canada.

Purpose

As operators and manufacturers attempt to implement material traceability, alignment across all stakeholders on exactly what records are required is critical. The intent of these guidelines is to develop minimum record requirements for use by both operators and manufacturers in an effort to support implementation across all stakeholders.

Scope

These guidelines are for gas-carrying pipeline components used within pipeline systems addressed in CSA Z662. These guidelines cover material traceability only, they do not cover material tracking, which is the method of storing material traceability data in an easy-to-use manner so it can be data-mined and used to identify products for recalls or concerns of quality based upon failures. Given tracking is directly tied to operator record keeping systems, it is out of scope of this document.

Approach

Record requirements have been categorized in three groupings:

1. Plastic pipe and fittings,
2. Steel pipe and fittings, and
3. Assemblies, which are comprised of multiple items from group 1 or 2 above.

We present minimum record requirements for each of the three groups which are built off of the six fundamental characteristics as defined in ASTM 2897. Each group is divided into the major components used within the pipeline system, such as pipe, flanges, valves, heaters, and meters.

These guidelines will provide a common understanding of what records should be required for material traceability and also what other records could be considered to be required on a case-by-case basis. These guidelines will be updated from time-to-time and as-such can be considered a living document.

CGA MATERIALS TRACEABILITY TASK FORCE

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1. INTRODUCTION

Instances of product recalls, issues with materials and similar situations have caused manufacturers and pipeline operators to be aware of the need for materials traceability. On September 9, 2010, a NPS 30 Pacific Gas and Electric pipeline ruptured and became known as the San Bruno incident. One of the incident root causes was the installation of a pipe that was not intended for operational use and did not meet the applicable pipe specifications. This incident instantly raised safety concerns for oil and gas pipelines and highlighted the need for complete and accurate pipeline information, thorough understanding of historical design and materials standards and the need for an effective integrity program to assess the condition of the pipeline system.

Recently, the term material traceability has been developed within the industry to denote the need to have accurate records for pipeline system components. While this is commonly agreed to as a requirement within the industry, exactly what information is required for material traceability is not. The lack of a standard list of record requirements makes it difficult for operators' requests and manufacturers' offerings to align given each has their own assessment of what constitutes a requirement.

The goal of these guidelines is to provide a baseline understanding of material traceability record requirements for the oil and gas industry within Canada. This document is a living document and will be updated periodically (e.g. by the further addition of industry guidelines for assemblies or components as new technologies and code changes are implemented).

1.1. BACKGROUND

The oil and gas pipeline industry in Canada is evolving at an accelerated pace. The cultural and regulatory environment in which pipeline companies operate is significantly different than it was 20, or even 10 years ago. Companies have had to become more transparent about the manner in which they communicate and operate their businesses with ever increasing public, and environmental pressures. This has influenced regulatory bodies into applying more pressure on the development of codes and regulations. Regulators, in collaboration with industry, have worked in an evolutionary manner to assist in defining requirements in the oil and gas pipeline code CSA Z662.

Increasing pressure has been applied to operators to establish a safety and loss management system, which sets the framework for documented operational requirements. A key component of the operational requirements is the identification of records critical to the pipeline system. Although not specifically called out, this implies records for pipeline components.

Material traceability is a common term used throughout several industries. Traceability requirements in the oil and gas industry are beginning to be applied in the US relative to polyethylene materials, and there is an expectation that material traceability will be a requirement in the future on all material used in the oil and gas pipeline industry. As operators attempt to apply traceability requirements without an industry standard there has been some confusion, and inconsistencies are essentially unavoidable. There are variations of component

types, materials, and applications, and each classification may have different traceability requirements defined by the manufacturing standard. Alignment between the supplier community and the operators is essential to ensuring an efficient and consistent path forward.

These issues surfaced within the supplier community and led to the CGA Operations Supplier Executive Committee (OSEC) making a proposal to the CGA Standing Committee on Operations and Safety to address this concern. The two committees agreed that a joint effort to address this pending issue would be appropriate. The decision was to create the CGA Materials Traceability Task Force consisting of members of both the supplier and operator communities to prepare these guidelines.

1.2. TRACEABILITY

Traceability provides the ability to react to product recalls or material problems in an expedited manner. Traceability can help engineering, operations, and procurement to address supply chain issues quickly. The following is a list of recommendations for traceability implementation:

1. The traceability of assemblies and components should be ensured in order to facilitate control, the recall of defective materials, public information, and the attribution of responsibility.
2. With due regard to technological feasibility, operators should have in place systems and procedures to allow the documenting of assemblies or components.
3. The assemblies and components which are used in a pipeline system should be identifiable by an appropriate system which allows their traceability by means of labelling, bar-coding, relevant test documentation, and/or certifications.
4. Relevant North American design, test, and operational standards of performance should be documented to ensure the integrity of design and compliance to applicable standards.

1.2.1. FORGED/COUNTERFEIT PARTS

With the rise of replicators and “knock-off” parts, consideration for original equipment manufacturer (OEM) spare parts in pipeline systems should be considered. With counterfeit and fraudulent parts readily available, it is considered “caveat emptor” on these items to ensure that materials meet original manufacturers’ specifications. For systems containing ASME Section VIII safety relief valves designed to the North American Boiler and Pressure Vessel Code (BPVC), UG-136 (c4) mandates that all parts used in pressure safety valves shall be original OEM. Since the ASME BPVC is utilized as a worldwide standard, it would be a good template to follow for safe practice in natural gas delivery systems. Spare parts should be clearly labeled by the manufacturer with appropriate part numbers, cure dates (if applicable), manufacturer, revision level, and other relevant information that would clearly identify the part as a like-kind replacement. Counterfeiters have also copied assemblies which can also be easily mistaken with the original. If they are intermixed in the delivery systems traceability becomes difficult to maintain.

One goal is to ensure the reliability of OEM parts by ensuring conformance to original designs standards, specifications, and any technical requirements or applicable certifications.

Replacing original parts with alternate materials deviating from the original technical specification for hardness, physical, and mechanical properties, for example, can increase risk.

1.3. SCOPE

The intent of this document is to provide minimum guidelines to demonstrate material traceability for gas carrying pipeline components.

These guidelines apply only to fixed/permanent assets used within pipeline systems defined under the scope of CSA Z662 Oil and gas pipeline systems. These guidelines do not apply to portable components such as in-line cleaning and inspection tools, and no attempt has been made to align with other codes such as the CSA Z341 series, or CSA B149.1 These guidelines provide direction on the majority of components within the pipeline system, however it is not an exhaustive list.

This document considers assemblies, such as a line heater, as a single device and does not consider the individual components (such as a heater coil) that make up the assembly.

Assemblies and components that are within scope include the following:

1. Pipe both plastic and steel
2. Pipe fittings including tubing fittings
3. Bolting
4. Valves covering both manual and automated actuation
5. Gas meters of all designs and technologies that are used within a pipeline system
6. Pressure regulators
7. Relief and Safety Relief Valves
8. Skid mounted equipment and stations
9. Filters
10. Odorizers (both manual and automated connected to the pipeline)
11. Heating equipment
12. Other pressure containing components regardless of pressure ratings

1.3.1. TRACKING

Tracking and traceability go hand-in-hand, however the scope of this document is limited to traceability only. Traceability is the identification of the critical information that must be known about a given material, while tracking is the method for logging, storing, and making that information accessible. The optimal implementation of tracking will be determined by each operator. Accordingly, this document does not identify record-keeping solutions to store the collected traceability information but focuses only on what records are required from a minimum attribute viewpoint.

1.4. APPLICATION

This document is focused on natural gas carrying assets, however these guidelines could be applied to other pipeline products as deemed applicable.

1.4.1. NEW MATERIALS ONLY

Given it is impossible to create records for existing materials, this document identifies recommended records only for new pipe, fittings, and assemblies.

1.4.2. USE

These guidelines are meant to be a reference for both operators and manufacturers. By following these guidelines there will be greater consistency when different operators request traceability from manufacturers, and manufacturers may use these guidelines to build traceability features into their products.

2. RELEVANT STANDARDS

2.1. MATERIAL TRACEABILITY IN THE UNITED STATES

While not mandatory in Canada, there are several standards that may be referenced on material traceability including the following:

- ASTM F2897-15a “Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves and Appurtenances)”
- ASTM D2513-14 “Polyethylene (PE) Gas Pressure Pipe, Tubing and Fittings
- AGA Technical Committee White Paper “AGA Material Tracking and Traceability Whitepaper”
- PHMSA Notice of Proposed Rulemaking (NPRM) Plastic Pipe Rule
- Gas Technology Institute “Purchasing Specification Guidelines for Marking Polyethylene Gas System Components”

These documents will provide the reader an overview of the recommended requirements within the US which can be utilized to decide what record attributes are necessary for new pipeline system materials. This list may not be exhaustive but does note some of the more relevant standards.

The Pipeline and Hazardous Materials Safety Administration (PHMSA) currently has a Notice of Proposed Rulemaking (NPRM) entitled the Plastic Pipe Rule which identifies a number of requirements to ensure plastic pipe safety based upon findings from the National Association of Pipeline Safety Representatives (NAPSR). NAPSR identified insufficient data regarding pipe material, including date of manufacture and other relevant information, as an obstacle to determining the cause or origin of incidents.

2.2. CSA Z662 RELEVANT CLAUSES

Within the Oil and gas pipeline code, CSA Z662, there are several clauses that imply the need for traceability specific to materials.

The following are excerpts from CSA Z662-15, Clause 5 on Materials:

5.1 Qualification of materials

5.1.2:

“Materials that comply with appropriate standards or specifications listed in this Standard may be used for appropriate applications. Such publications shall be

- a) the editions listed in, or allowed by, Clause 2; or*
- b) earlier editions that the company has demonstrated to be suitable.*

5.7 Records of materials

5.7.1:

“The standards or specifications of the pipe, components and bolting materials used in the construction of pipeline systems shall be records, and such records shall be

retained as part of the permanent records of the pipeline system. The identity of the material shall be verified prior to use.”

The following is an excerpt from Clause 12 Gas distribution systems:

12.5 Materials

12.5.1 General

“The requirements of Clause 5.1.2 shall not apply. Materials that comply with appropriate standards or specifications listed in this Standard at the time of purchase may be used for appropriate applications. Such publications shall be

- a) the editions listed in, or allowed by, Clause 2; or*
- b) earlier editions of publications that the company has demonstrated to be suitable.”*

Based upon the above references, while material traceability is not explicitly mandated, accurate records for each component within the pipeline system are required, including identification of the version of the standard to which a particular component is built (e.g. Z245.1-14). Furthermore, material traceability data supports the records management and integrity management portions of an over-arching safety and loss management system required of operators by Clause 3 of CSA Z662. The expectation is that future requirements within the US will drive further requirements within Canada for material traceability.

2.3. MINIMUM MATERIAL TRACEABILITY CHARACTERISTICS

ASTM F2897 identifies six distinguishing characteristics of materials. The six characteristics are the following:

- Component manufacturer
- Component manufacturer’s lot code
- Component production date
- Component material
- Component type
- Component size

The Task Force has determined that these six characteristics will comprise the basis for minimal traceability records. For specific materials this basis will be expanded upon as required.

3. TASK FORCE RECOMMENDATIONS

This section provides a template for suppliers, engineers, procurement, and operations personnel which proposes a set of minimum attributes for traceability. Materials are divided into three groups, listed below in 3.1, covering the most common items comprising a natural gas delivery system.

Suppliers may be capable of providing greater attribute detail (e.g. the level required for nuclear facilities) over-and-above the minimal list provided in this guideline. If greater detail is required, it is recommended that the operator work with the supplier to identify what additional material attributes can be provided.

3.1. MATERIAL GROUPINGS

The CGA Material Traceability Task Force identified that record requirements differ for three material groupings:

1. Plastic pipe and fittings,
2. Steel pipe and fittings, and
3. Assemblies comprised of multiple items from group 1 or 2 above including relevant OEM spare parts where applicable.

3.2. PROPOSED TRACEABILITY REQUIREMENTS

In the below tables for each sub-group, green shading identifies that the record attribute is recommended while dark blue shading identifies the record attribute is not necessary to meet minimum material traceability requirements. Again, these are identified as recommendations, and it is up to the operating company to determine their record requirements for each material.

Table 1: Steel Pipe, Tubing and Fittings Record Recommendations

<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; background-color: #003366; margin-right: 5px;"></div> not required <div style="width: 20px; height: 20px; background-color: #FFA500; margin-right: 5px; margin-left: 10px;"></div> required (numerical qualification below) </div> 1 - Potential action item with tracking and marking of product 2 - Potential action item to determine; this is easily attainable for manufacturers 3 - When applicable by standard 4 - When applicable by manufacturing process 5 - More information needed for coating type, manufacturer, application, etc. 6 - When applicable by service application		MATERIALS								
		Stainless steel tubing	Stainless steel fittings	Bolts/studs/nuts	Gaskets	Insulating kit (sleeve, washer, etc.)	Flanges (e.g. blank)	Fittings - Wrought	Fittings - Forged	Pipe
Component manufacturer	ASTM F2897									
Component manufacturer's lot code				1						
Component production date										
Component material										
Component type										
Component size										
Mill cert (1 per 100 or 200)	General			2						
Pressure Class										
Pressure test records										
Non-Destructive Testing results									3	
Batch # / Heat # / Lot # / Serial #										
Pipe #										
Length										
Material grade										
Heat treatment		4	4	4			4	4	4	
Wall thickness										
Coating									5	
Design Standard, including year										
Notch toughness							3	3	3	
Sour service							6	6	6	
Nominal Diameter										
Seam type										
Relevant test records										
Hardness										

Table 2: Plastic Pipe and Fitting Record Recommendations:

<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="width: 15px; height: 15px; background-color: #1a3d4d; margin-right: 5px;"></div> not required </div> <div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="width: 15px; height: 15px; background-color: #f4a460; margin-right: 5px;"></div> required </div> <div style="margin-top: 10px;">7 - ASME B16.40</div> </div>		MATERIALS					
		Pipe & Tubing	Fittings	Risers	EFV's	Transitions Fittings	Valves
Component manufacturer	ASTM F2897						
Component manufacturer's lot code							
Component production date							
Component material							
Component type							
Component size							
CSA or equivalent standard required	GENERAL						7
Mill cert (1 per 100 or 200)							
Pressure Class							
Pressure test records							
Non-Destructive Testing results							
Batch # / Heat # / Lot # / Serial #							
Pipe #							
Length							
Material grade							
Heat treatment							
Wall thickness							
Coating							
Design Standard, including year							
Notch toughness							
Sour service							
Nominal Diameter							
Seam type							
Relevant test records							
Hardness							

Table 3-A: Assemblies - the following three tables (3-A, 3-B, 3-C) are to be taken together as comprising one complete set of requirements; they are not to be considered individually.

		Component Manufacturer	Component Manufacturer's lot	Component Production Date	Component Material	Component Type	Component Size	Serial #	Model #	Design Standard, including year	Design & Operating Pressure	Wall Thickness	(End) Connection Type	Body Type (welded/bolted)	Temperature Rating	Pressure Class (PN or ANSI)	Measurement Canada Approval	Service - Sweet/Sour	CRN	Final Assembly Drawings	Manufacturer's Data Sheet	Flow Direction	Location of Manufacturing/ Assembly/Testing
		ASTM F2897							GENERAL														
MATERIALS	Service Regulators																						
	Commercial Regulator																						
	Other Regulators																						
	Meter - Rotary																						
	Meter - Diaphragm																						
	Meter- Turbine																						
	Meter- Orifice																						
	Meter - Other																						
	NPS 2>/=Steel Valves-gate, ball, globe, check																						
	Indirect fired Line Heater																						
	Anodeless Risers & Transition fittings, EFVs																						
	Pressure transmitters/sensors/transducers																						
	Pressure and Temperature gauges																						
	Temperature elements																						
	Thermowells																						
	Level transmitters																						
	Coriolis meter																						
	Ultrasonic meter																						
	Meter run (assembly with any type of meter)																						
	Filters/Separators/coalescers																						
	strainers																						
	Control valves																						
	Actuators - pneumatic																						
	Relief valves																						
	Rupture disc assemblies																						
	Boilers																						
	Heat exchangers																						
	Compressors																						
	Blowdown Silencers/fittings																						
	Solenoids																						
Assembled stations - welded																							
Assembled stations - threaded																							
Pilot heaters																							
Sampling/injection fittings (for odourant/ sample systems)																							
Odourant systems																							
Tanks (odourant, glycol, lube oil, etc.)																							
Pressure Vessels - other																							
Tubing Fittings																							

Table 3-B: Assemblies (chart continued)

		Certificate of Conformity	Calibration Documentation	Pressure Test Records/certificate	Non-Destructive Test Results	Material Grade	Heat Treatment	MTR (material test reports)	Heat #	Lot # / Batch #	Impact Testing / Notch Toughness	Body Material	Rated Capacity	Temperature Compensated	Pressure Compensated	Orifice Size and material	Spring Range and material	Seat Material	Pilot Body Material	Noise Attenuation	Max CV	
		TEST INFORMATION											METER			REG & CONTROL VALVES						
MATERIALS	Service Regulators																					
	Commercial Regulator																					
	Other Regulators																					
	Meter - Rotary																					
	Meter - Diaphragm																					
	Meter- Turbine																					
	Meter- Orifice																					
	Meter - Other																					
	NPS 2>=Steel Valves-gate, ball, globe, check																					
	Indirect fired Line Heater																					
	Anodeless Risers & Transition fittings, EFVs																					
	Pressure transmitters/sensors/transducers																					
	Pressure and Temperature gauges																					
	Temperature elements																					
	Thermowells																					
	Level transmitters																					
	Coriolis meter																					
	Ultrasonic meter																					
	Meter run (assembly with any type of meter)																					
	Filters/Separators/coalescers																					
	strainers																					
	Control valves																					
	Actuators - pneumatic																					
	Relief valves																					
	Rupture disc assemblies																					
	Boilers																					
	Heat exchangers																					
	Compressors																					
	Blowdown Silencers/fittings																					
	Solenoids																					
	Assembled stations - welded																					
	Assembled stations - threaded																					
	Pilot heaters																					
	Sampling/injection fittings (for odourant/sample systems)																					
Odourant systems																						
Tanks (odourant, glycol, lube oil, etc.)																						
Pressure Vessels - other																						
Tubing Fittings																						

Table 3-C: Assemblies (chart continued)

<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="width: 15px; height: 15px; background-color: #003366; margin-bottom: 5px;"></div> not required <div style="width: 15px; height: 15px; background-color: #FFA500; margin-bottom: 5px; margin-top: 5px;"></div> required <div style="width: 15px; height: 15px; background-color: #ADD8E6; margin-top: 5px;"></div> may be required </div>		Fuel Type	max and min input rating	max fuel inlet pressure	min/max burner manifold pressure	Body Type	Port Size/type	Actuation/operation configuration	seat material	Type of Filtration	Number of Elements	Element Material	DP Rating
		BURNER EQUIPMENT				VALVES				FILTERS			
		MATERIALS											
Service Regulators													
Commercial Regulator													
Other Regulators													
Meter - Rotary													
Meter - Diaphragm													
Meter- Turbine													
Meter- Orifice													
Meter - Other													
NPS 2>=Steel Valves-gate, ball, globe, check													
Indirect fired Line Heater													
Anodeless Risers & Transition fittings, EFVs													
Pressure transmitters/sensors/transducers													
Pressure and Temperature gauges													
Temperature elements													
Thermowells													
Level transmitters													
Coriolis meter													
Ultrasonic meter													
Meter run (assembly with any type of meter)													
Filters/Separators/coalescers													
strainers													
Control valves													
Actuators - pneumatic													
Relief valves													
Rupture disc assemblies													
Boilers													
Heat exchangers													
Compressors													
Blowdown Silencers/fittings													
Solenoids													
Assembled stations - welded													
Assembled stations - threaded													
Pilot heaters													
Sampling/injection fittings (for odourant/sample systems)													
Odourant systems													
Tanks (odourant, glycol, lube oil, etc.)													
Pressure Vessels - other													
Tubing Fittings													

Notes applicable to Table 3: Assemblies

- A serial number may be the only required record for the operator, assuming the manufacturer is able to provide all required records using the serial number upon the request. The operator will need to ensure the manufacturer's recordkeeping practices align with what is required as some manufacturers destroy records after a certain period of time.
- Manufacturer's Data Sheet: Specifically for pressure equipment covered under CSA B51
- Temperature element: If the temperature element is subjected to line pressure (i.e. no thermowell)
- Pressure Vessels - Other: includes dehydration systems, pulsation bottles, in-line silencers, actuator cylinders, gas dryers
- Heat exchangers: Includes after-coolers
- Compressors: includes compressor casings, all pressurized compression components
- Filters/Separators/Coalescers: includes regulator, control and accessory type filters, dryers, coalescers

4. CONCLUSION

Material traceability is only a single tool within the greater requirement of a comprehensive safety and loss management system (SLMS). A SLMS also requires a robust supplier quality assurance process, and the tracking of materials from design, to installation, to abandonment.

The increased emphasis on the need for comprehensive records for pipeline systems is evident throughout the Oil and gas pipeline code, recent pipeline failure root cause investigations, PHMSA proposed rules, and elevated public scrutiny. Without adequate records, is it difficult to identify components for recalls, to perform complete engineering assessments, and, ultimately, to effectively manage pipeline risks.

The recommended record requirements proposed within these guidelines will provide a common understanding of material traceability records for both operators and manufacturers which can be leveraged in purchase specifications and record requirement discussions. Once the Canadian gas industry implements these recommendations, it will be much more effective than the current practice where each manufacturer, supplier and operator has their own requirements which are implemented on an individual case-by-case basis. While these records are not necessarily required today, the expectation is that they will be in the future, so it is best to proactively implement now.

ACKNOWLEDGEMENT

The CGA Materials Traceability Task Force would like to thank the American Gas Association (AGA), in particular Kate Miller, for support in preparing these guidelines. The AGA participated in multiple conference calls and provided input into this report. Going forward there is an intent for collaboration to continue to ensure alignment across Canadian and US efforts regarding materials traceability.