OBTAINING THIRD-PARTY CRNs FOR N285.0 CLASS 6 COMPONENTS

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Abstract

CSA N2825.0 and CSA B51 require that components containing pressure exceeding 15 psig must have a valid Canadian Registration Number (CRN). However, many manufacturers of small pressure-retaining components refuse or are unable to obtain valid CRNs for their equipment. This creates a problem for users who require these components and are thus unable to meet Code requirements.

It's often possible for an accredited third party like Nuclear Logistics to obtain a CRN for such components. In this case the third party must assume all product liability, and must verify all aspects of the component that are pertinent to the design and pressure-boundary materials of construction.

This paper will discuss the process by which NLI conducts such work to meet client and jurisdictional requirements, by highlighting case studies from real projects, and the key considerations that must be taken into account. This paper is not a discussion of jurisdictional requirements, but rather a description of NLI's approach to solving this problem.

1. Requirements

CSA N285.0 (General Requirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants) requires that Class 6 fittings must meet the requirements of CSA B51 (Boiler, Pressure Vessel, and Pressure Piping Code). With few exceptions, CSA B51 requires that all components handling pressures exceeding 15 psig must be registered with the regulatory authority (TSSA in Ontario) and hold a valid CRN (Canadian Registration Number).

The CRN must be obtained by the manufacturer. In order to register the component, the manufacturer must have an acceptable QA program that meets the requirements of CSA B51 (e.g. CSA Z299, ISO 9001, CSA B51 Appendix H). The QA program must have been accepted by an independent organization (e.g. QMI, Lloyds, TUV, TSSA) and evidence of this (e.g. QA Certificate) must be submitted with the application for registration

2. The problem for CANDU

Many various components required for CANDU plants do not have valid CRNs for one reason or another, e.g.

- The manufacturer is non-Canadian and is unfamiliar with Canadian requirements.
- The manufacturer does not have an acceptable QA program in place.
- The component may not normally require a CRN under Provincial regulation exemptions (which don't apply to CANDU).
- The manufacturer may not consider the Canadian (or even just the Canadian nuclear) marketplace to be worth the investment.
- The component is non-standard and the manufacturer refuses to be bothered with the required analysis or proof test.
- The CRN has expired and the manufacturer has not renewed it.

This creates a real problem for CANDU, since the affected component may be part of a qualified system, or an equivalent component with a valid CRN may simply not exist. Changing out the affected component may require a significant design change with major cost implications.

3. The Solution

To solve this problem, it's possible for an accredited third party like NLI (the registrant) to obtain a CRN for the affected component.

In doing so, the registrant must act as the manufacturer and must assume responsibility for the design and construction of the component, and must verify compliance with the registered design. The process requires careful consideration to various aspects of the work:

- Manufacturing and Design Responsibility/Liability
- Design Specification
- Material Control and Traceability
- Design Verification
- Documentation
- CRN Holder and Future Supply

3.1 Manufacturing and Design Responsibility/Liability

CSA B51 is specific in requiring the CRN to be obtained by the Manufacturer. In order for NLI to obtain a CRN for an existing component design, NLI must them become the Manufacturer of Record. To identify this situation, an NLI part number or model number is assigned to the component. The component is covered under NLI's warranty, and NLI assumes all legal design responsibility and liability for the product.

The OEM does not need to be involved in the process and is not responsible for the registered component.

3.2 Design Specification

The design must be registered to an Owner's approved Design Specification This can be a Technical Specification Data Sheet or any similar document that outlines the design conditions, but it must be approved by the Owner (i.e. the Utility in question). NLI will then verify compliance of the component with all the requirements of the Design Specification.

Since the CRN will be specific to a Design Specification, the Design Specification should be broad enough to allow the component to be used in any required installation within the station. It's wise not to make the Design Specification system-specific, as this would restrict the use of the registered component to the specified system. The CRN will apply only to the conditions outlined in the Design Specification, so this should be taken into consideration when preparing the design document. For example:

- The applicable Design Code and Addenda should be identified (e.g. B31.1-2004)
- Design pressures and temperatures should envelope all intended applications.
- All intended media should be indicated.
- Special requirements such as seismic or environmental qualification should be specified if they may be required by any intended applications.
- Specific systems should not be identified.

If an owner's Design Specification does not exist, NLI will prepare one for the client's approval. Client approval is required before any work is started.

3.3 Material Control and Traceability

To verify materials of construction, a sacrificial specimen is selected at random from each batch of components. The material specifications and grades of all pressure boundary materials of construction are determined and verified by independent analysis. The materials are then verified as being acceptable to the applicable Code.

Should a material not be listed under the applicable Code, application is made to the client for approval. For example, Section 123.1.2 of ASME B31.1-2004 allows the use of unlisted materials under certain circumstances provided the Owner has accepted in writing the use of the unlisted material. In such cases, a certified NLI drawing of the component, listing the verified materials of construction, is submitted to the client for approval.

Material traceability at the OEM is verified to ensure the materials of construction of the production components comply with the verified materials. If the OEM has an acceptable registered QA program, this may suffice. Otherwise, NLI must audit the OEM to verify that adequate material control and traceability is maintained. In addition, NLI conducts non-destructive material analysis of production components as a supplementary verification.

3.4 Design Verification

A sacrificial specimen is subjected to a proof test to verify the required safety factor. The safety factor is specified by the Code or the regulatory authority (e.g. TSSA), and is a function of the pressure boundary material, e.g:

- for all materials not listed below: 4x rated pressure
- cast iron: 6x rated pressure
- glass: 10x rated pressure
- non-metallic, non-automated fabrication process: 10x rated pressure

The proof test is conducted at design (or rated) temperature, and must be witnessed and certified by an authorized third-party inspector (e.g. Canadian provincial/territorial jurisdiction, U.S. state jurisdiction, a National Board commissioned inspector, or the inspector employed by the applicant's quality system registrar)

If the component bursts during proof testing, the maximum rated pressure will be the burst pressure divided by the applicable safety factor.

In addition to proof testing, all other aspects of the Design Specification must be verified as well, e.g. component configuration, materials of construction. If the requirement for seismic or environmental qualification is indicated on the Design Specification, evidence of owner acceptance of the qualification must also be obtained.

3.5 Documentation

Following completion of all testing, the following documentation is gathered and submitted to the Jurisdictional Authority:

- Owner-approved Design Specification
- NLI drawing and BOM (with owner approval, if applicable)
- Results of material analysis for pressure boundary components
- Certified proof test results
- Evidence of Owner acceptance of any applicable qualification reports (e.g. seismic)
- NLI QA Certification
- Statutory Declaration

3.6 CRN Holder and Future Supply

The CRN is issued to NLI as the Manufacturer, not to the original component OEM. Each supplied component is labeled with the NLI part number. Although this process need not be repeated for the validity of the CRN (10 years), future supply of the registered component must be from NLI, not directly from the OEM. With each future purchase, NLI must verify compliance with the registered design to ensure that no relevant characteristics have changed (e.g. materials of construction).

4. Conclusion

To date NLI has registered approximately 100 component designs in this manner, including various components such as valves (several types), pressure switches, couplings and fittings, pressure gauges, cylinders, heating coils, instruments and the like.

Although the process may appear to be cumbersome, it is quite well-defined and provides a relatively inexpensive solution to utilities struggling with the need to use non-registered Class 6 components. Using this process, utilities can comply with all jurisdictional requirements and avoid the need to make costly design changes.

5. References

[1] CSA N285.095 and CSA N285.0-2006 "General Requirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants"

[2] CSA B51-97 "Boiler, Pressure Vessel, and Pressure Piping Code"

[3] "Technical Standards and Safety Act, 2000, Ontario Regulation 220/01, Boilers and Pressure Vessels"

[4] ASME B31.1-2004 "Power Piping"

[5] TSSA Guidelines for the Registration of Non-Nuclear Fittings in the Province of Ontario"