Boilers and Pressure Vessels Safety

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DESIGN REGISTRATION GUIDELINES FOR NUCLEAR PRESSURE RETAINING PIPING SYSTEMS AND COMPONENTS

1. Scope:

This document contains guidelines for the registration of pressure retaining piping systems and components in nuclear power plants and may also be used for the registration of pressure retaining piping systems and components in research reactors and isotope producing reactors (licensed by CNSC) and for CANDU offshore nuclear power plants where an agreement for the registration services by the Technical Standards and Safety Authority (TSSA) exists.

The design, fabrication, welding, quality assurance, installation, examination, testing and inspection of nuclear pressure retaining piping systems and components are governed by the following legislation, codes and standards:

- Canadian Nuclear Safety Act and Regulations for nuclear facilities in Canada
- Technical Standards and Safety Act, 2000, (Act) and Regulations for Boilers and Pressure Vessels Regulations), and Boilers and Pressure Vessels Safety Code Adoption Document (CAD)
- Canadian Standards Association Standards CAN/CSA-N285.0 and CSA B51
- American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel and Piping Codes

The definitions of terms in this document are as per CSA N285.0.

The edition of CSA N285.0 to be applied for registration shall conform to the edition identified in the Nuclear Facility's Licensed Conditions Handbook (LCH), where one exists.

. The provisions in this guideline are based on CSA N285.0:23.

This document explains these requirements and is not a substitute for the governing documents themselves. In case of conflict between the requirements of this document and the applicable Act, Standard or Code, the requirement of the applicable Act, Standard or Code, shall take precedence.

2. General:

Currently, TSSA performs Authorized Inspection Agency (AIA) duties on behalf of the Licensee under a Service Agreement recognized by the CNSC. In this capacity, TSSA is responsible for registering designs and welding procedures, carrying out Authorized Nuclear Inspector (ANI) duties, and performing other functions and activities as defined by CSA N285.0 and its applicable referenced standards, including CSA B51 and the National Board Inspection Code (NBIC).

To submit a design registration application, applicants must follow the latest submission instructions provided on the TSSA website at:

Register a Design

Upon submission, TSSA will acknowledge receipt of the application and assign an engineer to conduct a technical review of the design documentation, to verify that the design conforms to the requirements of the applicable design specifications, codes and standards.
If no deficiencies are identified during the review, a Canadian Registration Number (CRN) will be issued, and stamped documents will be returned to the applicant electronically.

If deficiencies or requests for clarification are identified during the review, comments will be emailed to the applicant, and the application will be placed on hold. The applicant must submit a satisfactory response within 21 calendar days of the receipt of the TSSA comments. If all deficiencies are not addressed to the satisfaction of the reviewing engineer or the submitter does not respond within this timeframe, the work order may be cancelled, and the submitter will be notified of the cancellation.

3. Documentation:

The following supporting documents describing and demonstrating the acceptability of the design must be included with a design registration submission. Table 1 of CAN/CSA-N285.0 should be consulted. Documents which may be required are listed below:

1. System Classification List (SCL) or Classification Approval Form approved by the Canadian Nuclear Safety Commission (CNSC)
2. System Flow Sheet
3. Drawings
4. System Design Documents or Design Specifications
5. Design Report
6. N285.0 Statutory Declaration (Appendix C)
7. Capacity Certification Test Report
8. Catalogue
9. Load Capacity Data Sheet
10. Overpressure Protection Report (OPPR)

For example, for the registration of Nuclear Class 1, 2 and 3 piping systems, only documents numbered 1, 2, 4, 5 and 10 are required, refer to Appendix A of this document for details. The submitter should ensure that the contents and the certification of these documents conform with the requirements of CAN/CSA-N285.0 and the applicable sections of the ASME Boiler and Pressure Vessel Code. For Class 6 piping system and components registration refer to the attached Appendix B of this guideline.

The registration application for piping systems shall be made by the licensee or licensee's designee.

When the application is not from the licensee, a transmittal letter must be supplied by the licensee identifying the applicant is acting on behalf of the licensee.

When the ASME Section III Design Specification is not prepared by the Owner/Licensee and/or the ASME Section III Certificate Holder and/or Owner's Review of the Design Report is not completed by the Owner/Licensee, a document prepared by the Licensee indicating the designee acting on behalf of the Owner should be included in the submission.

4. Quality Assurance:

The manufacturer must maintain a quality assurance program meeting the requirements of CAN/CSA-N285.0 current edition. The quality assurance program must be accepted by AIA and certified by ASME or TSSA as per Clause 10.7.1 of N285.

In the province of Ontario, the Authorized Inspection Agency (AIA) is the Technical Standards and Safety Authority (TSSA).

5. Reconciliation or New fabrication of Previously Registered Components & Component Supports

Registered items may continue to be fabricated under the issued CRN, provided that:

- The terms of the registration including the organization to which the CRN was issued, the design criteria, and the location (if specified) remain unchanged; and
- The scope of the manufacturer's quality assurance program remains valid, with no changes to its original scope, in accordance with Section 4 of this document.

Detailed requirements for design changes that require a registration update or re-registration are provided in CSA N285.0:23, Annex H.4.

Appendix 'A'

Documents Required for Components Subject to TSSA Technical Design Review and Registration

Table 1 of CSA N285.0 outlines the required design registration documents for equipment of various nuclear classes and sizes. Refer to the table in the applicable edition of N285.0 for a detailed breakdown of the items and their corresponding documentation requirements.

Table 1 from CSA N285.0:23 is reproduced below for reference.

Notes:

Professional Engineering Certification
System flowsheets, drawings, design ASME Section III Design Specifications, Design Reports, and Overpressure Protection Reports (OPRs) shall be certified by an Ontario Professional Engineer (P.Eng.) or a Professional Engineer holding a Temporary License issued by PEO qualified in accordance with the requirements of ASME Section III Appendix XXIII.
Where documents are prepared by the Licensee's designated service provider, a letter of delegation shall be provided with the documents clearly defining the scope of delegation.

1. **N285.0 Statutory Declaration Form for Nuclear Items**
   A Statutory Declaration form is not required when an Authorized Inspector performs the required inspections, and the applicable data report is signed off (see details provided in table 1)

2. **Certificate of Authorization – Nuclear Components**
   Manufacturers or fabricators of nuclear components shall hold a valid Certificate of Authorization, issued in accordance with CSA N285.0 requirements.

3. **Certificate of Authorization – CSA B51 Components**
   Manufacturers or fabricators of CSA B51 components shall hold a valid Certificate of Authorization, issued in accordance with the CSA B51-2024 edition Clause 4.1.1.1
4. **Reference Standard for Documentation Requirements**
   CSA N285.0:23, Clause 6 and Table 1 provide the documentation requirements for the registration of nuclear piping systems and components.
   Note: Additional information is provided in, Annex A, Annex B and Annex C.

5. **Category F Fittings**
   In accordance with CSA N285.0:23, Clause 7.8.1.3, the pressure boundary portion of instruments installed in Class 1, 1C, 2, 2C, 3, 3C, or 4 components with an inlet size of NPS ¾ or smaller shall be registered as Category F fittings. Registration may be performed in accordance with CSA B51.

Δ

Table 1
Summary of required documentation for registration and inspection
(See Clauses 6.1.1.1, 6.1.4.2, 11.4.3, 12.2.1, 12.4.1.3, 12.4.1.6, 12.4.7.3, 12.4.8.3, B.6, D.2, and I.4.3, and Figure D.1.)

Item	NPS size	Class	Required design registration documents* (see Legend)	Inspector†‡	Required permanent records (see Clause 12.2.1 and Table 3)
Piping systems	All sizes	1, 2, 3	1, 2, 4, 5, 10	A	PR-1
Vessels	All sizes	1, 1C, 2, 2C, 3, 3C, 4	3, 4, 5	A	PR-1
Standard fittings (Category A or B): seamless and welded without filler metal§**	All sizes	1, 2, 3, 4	3, 6	††	‡‡
Standard fittings (Category A or B): welded with filler metal	≤ NPS 2	1, 2, 3, 4	3, 6	A or B	PR-2
	> NPS 2	1, 2, 3, 4	3	A	PR-2
Non-standard fittings (Category A or B): seamless and welded without filler metal	All sizes	1, 1C, 2, 2C, 3, 3C, 4	3, 4, 5, 6	††	‡‡
Non-standard fittings (Category A or B): welded with filler metal	≤ NPS 2	1, 1C, 2, 2C, 3, 3C, 4	3, 4, 5, 6	A or B	PR-1
	> NPS 2	1, 1C, 2, 2C, 3, 3C, 4	3, 4, 5	A	PR-1
Fittings (Category C)	≤ NPS 2	2	3, 4, 5, 6	A or B	PR-1
	> NPS 2	2	3, 4, 5	A	PR-1
	All sizes	1	3, 4, 5	A	PR-1
	All sizes	3	3, 4, 5, 6	A or B	PR-1
Fittings (Category D, E, or H)	≤ NPS 2	1, 1C, 2, 2C, 3, 3C, 4	3, 4, 5, 6	A or B	PR-1
	> NPS 2	1, 1C, 2, 2C, 3, 3C, 4	3, 4, 5	A	PR-1
Fittings (Category F)§§	> NPS 3/4 but ≤ NPS 2	1, 2, 3, 4	3, 4, 5, 6	A or B	PR-1
	> NPS 2	1, 2, 3, 4	3, 4, 5	A	PR-1
Fittings (Category G)	All sizes	1, 2, 3	3, 4, 5, 7	A	PR-1
Pumps	≤ NPS 2	1	3, 4, 5	A or B	PR-1

(Continued)

Table 1 (Continued)

Item	NPS size	Class	Required design registration documents* (see Legend)	Inspector†‡	Required permanent records (see Clause 12.2.1 and Table 3)
	> NPS 2	1	3, 4, 5	A	PR-1
	All sizes	2, 3	3, 4, 5	A or B	PR-1
Standard supports, welded	All sizes	1, 2, 3, 4	3 or 8 and 5 or 9	††	PR-3
Standard supports, non-welded	All sizes	1, 2, 3, 4	3 or 8 and 5 or 9	††	‡‡
Plate-and-shell and linear-type supports	All sizes	1, 1C, 2, 2C, 3, 3C, 4	3, 4, 5	††	PR-1

* *For standard fittings A to F, a catalogue may be substituted for drawings.*
† *A = authorized inspector; B = licensee's verifier.*
‡ *Where B is indicated, A may be substituted. In this case, a statutory declaration (6) is not required as part of the design registration documentation.*
§ *A standard fitting is a fitting that complies with the ASME* BPVC *or another standard acceptable to the AIA. See Clause 6.1 for information on standard fittings, non-standard fittings, and pumps.*
** *See Clause 6.1.6 for categories of fittings.*
†† *No requirement.*
‡‡ *CMTR or certificate of compliance (C of C), where required by the ASME* BPVC, *Section III, Division 1.*
§§ *These requirements may be used for Category F fittings less than or equal to NPS 3/4.*

Legend:

1 = system classification list or classification approval form approved by regulatory authority
2 = system flowsheet
3 = drawing (see Note *)
4 = system design documents (see Clause 7.3.1) or design specifications, where required [see Clause 7.4.2 a) or 7.5.2.5a)]
5 = design report certified when required by either Clause 7.4.2 b) or 7.5.2.5 b)
6 = statutory declaration
7 = capacity certification test report
8 = catalogue (see Note *)
9 = load capacity data sheet
10 = overpressure protection report

Appendix 'B'

GUIDELINES FOR REGISTRATION OF CLASS 6 PIPING SYSTEMS AND COMPONENTS FOR A CNSC NUCLEAR LICENSED FACILITY LOCATED IN ONTARIO

Definition:

CSA N285.0:23 provides the requirement for pressure-retaining systems and sections of pressure-retaining systems having a design pressure greater than 103 kPag (15 psig) to be code classified.

CSA N285.0:23 defines Class 6 systems as follows:

- Clause 5.2.4.1.1:
  Systems or portions of systems that contain no radioactive substances, or that contain radioactive substances with a tritium concentration not exceeding 74 GBq/kg (2 Ci/kg), are classified as Class 6.

- Clause 5.2.4.1.2:
  Piping and instrument lines NPS 3/4 or smaller that would otherwise be classified as Class 1, 2, or 3 may be classified as Class 6, except that this provision does not apply to vessels, and instrument lines connected to Class 1 or Class 2 systems, or to systems that directly transport heat from nuclear fuel, shall be assigned the same class as the connected system.

- Clause 5.2.4.1.3:
  Systems or vessels otherwise classified as Class 3 may be classified as Class 6 where a consequence-of-failure analysis demonstrates that the effective dose to a nuclear power plant worker does not exceed 20 mSv.

Registration:

The design of component(s) that have been classified as Class 6 shall be registered in accordance with the requirements of CSA B51 edition adopted by the province of Ontario.

CSA N285.0:23 Clause 6.2.2 specifies the Class 6 components and fittings that are exempt from registration.

Boiler and Pressure Vessel Registration

To obtain registration, the design drawings must be presented to the Boilers and Pressure Vessels Safety program of TSSA, and shall include:

- design drawings;
- applicable specifications; and
- design report / calculations.

All drawings shall be **signed and sealed by a licensed Professional Engineer in Ontario** with experience in boiler and pressure vessel design.

Design drawings shall show as a minimum the following information:

a) Substance contained in the Pressure Vessel;
b) Maximum allowable working pressure or design pressure;
c) Design temperature and MDMT;
d) ASME latest Code edition
e) Material specification;
f) Material thicknesses (minimum required thickness including corrosion allowance);
g) Corrosion allowance;
h) Welding details (symbols);
i) Non-destructive examination requirements;
j) Post weld heat treat requirements;
k) Material impact test requirements;
l) Test pressure and temperatures;
m) Special service conditions (i.e. cyclic service, etc.).

Supporting calculations/design report demonstrating compliance with the applicable ASME design code and any other design specification requirements shall accompany the registration submission.

Fittings Registration

Refer to the guidelines available on the TSSA website for fittings registration.

Guidelines for the Registration of Non-Nuclear Fittings in Ontario

Class 6 Piping Systems Registration

Design submittals for Class 6 piping systems registrations, in accordance with CSA B51 shall include the following documents:

- Letter of application
- CNSC approved System Classification List (SCL)
- Flow diagrams
- General arrangement or isometric piping drawings
- Specifications
- Calculations

Letter of Application:

The registration application, for piping systems, must be made by the licensee. When the application is not from the licensee, a transmittal letter must be supplied by the licensee identifying the applicant is acting on behalf of the licensee

The letter of application must include address, the name and telephone number of a person who can be contacted for information, the location of the installation, scope of design registration or modification and a list of drawings submitted.

Drawings:

General information required on these drawings shall include, but is not limited to, the following:

- Construction Code Information i.e. ASME B31.1, B31.3 or B31.5 latest Ed.; or the code edition as agreed by the CNSC for the nuclear facility and specified in the License documents (if applicable)
- Design Pressure;
- Design Temperature;
- Test Pressure and Type of Test;
- Service Fluid Information (e.g. Air, Water, Steam or specific Gas or Liquid);
- The seismic category and level boundaries;
- System code classification and, when more than one class is specified, classification boundaries
- Safety/Relief Valve Setting and Location, or statement regarding overpressure protection.

Specifications:

Any applicable Design Specification shall be provided .

Piping specification shall indicate, as a minimum, the following:

- Pipe line identification;
- Pipe size and schedule;
- Pipe material (in accordance with ASME or ASTM material specification);
- Fitting(s) type, identification and rating; (For details see TSSA's Guidelines for the Registration of Non-Nuclear fittings in the Province of Ontario. Also note Appendix "D" of this Guideline, for the requirements for flexible hose assemblies)
- Statement attesting that only registered fittings are used;
- Pipe joining methods and details (welding, brazing, or others);
- Non-destructive examination (NDE);
- Statement describing maximum support spacing and type, and anchor location.

Calculations:

Calculations need to address:

- Design and service conditions
- Weight Effects such as live loads, dead loads
- Thermal expansion/contraction
- Dynamic loads such as wind, seismic, impact, vibration; and
- Any other applicable loads.

General Information:

To help expedite registration non-relevant drawings to the piping system being registered should <u>not</u> be included.

For submissions that include a large number of drawings or systems, the submitter must provide a line list and drawings list. For piping systems, which contain multiple services where some are subject to registration and others are not, those systems' part(s), subject to registration, must be highlighted. Also, additions or modifications to existing systems should be identified (highlighted).

Installer:

The installer of the piping system must have a Certificate of Authorization from TSSA for piping system installation.

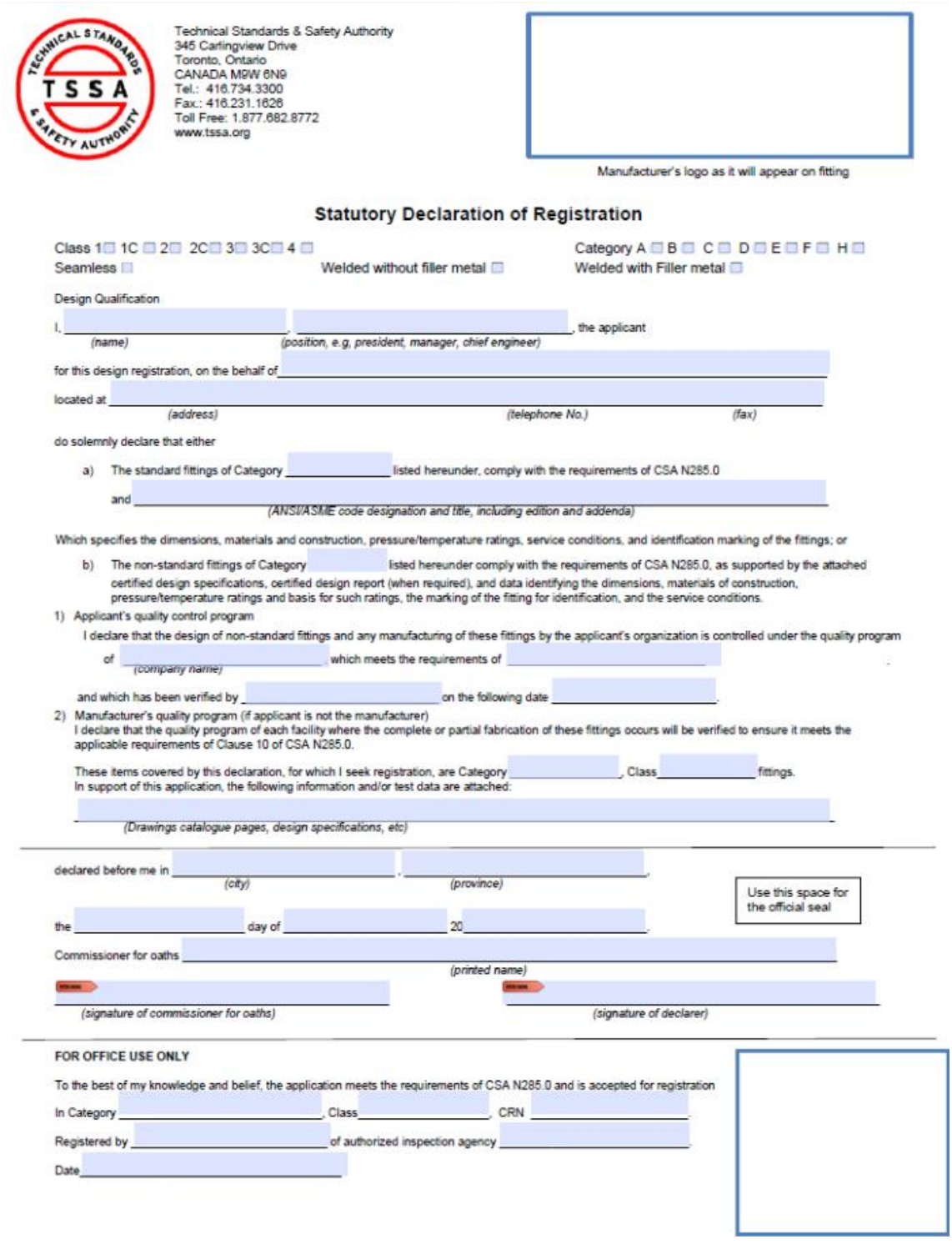
Inspection:

The local TSSA Authorized Inspector must be notified prior to commencement of the installation.

Shop fabricated piping must be registered and inspected during fabrication and a Piping Installation and Test Data Report Form must be prepared and signed by fabricator and countersigned by the Authorized Inspector and submitted to the owner of the installation.

Appendix 'C'

[Click here to download the form]



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Manufacturer's logo as it will appear on fitting

Statutory Declaration of Registration

Class 1 ☐ 1C ☐ 2 ☐ 2C ☐ 3 ☐ 3C ☐ 4 ☐ Category A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ H ☐
Seamless ☐ Welded without filler metal ☐ Welded with Filler metal ☐

Design Qualification

I, _____ (name), _____ (position, e.g, president, manager, chief engineer), the applicant

for this design registration, on the behalf of _____

located at _____ (address) (telephone No.) (fax)

do solemnly declare that either

a) The standard fittings of Category _____ listed hereunder, comply with the requirements of CSA N285.0

and _____ (ANSI/ASME code designation and title, including edition and addenda)

Which specifies the dimensions, materials and construction, pressure/temperature ratings, service conditions, and identification marking of the fittings; or

b) The non-standard fittings of Category _____ listed hereunder comply with the requirements of CSA N285.0, as supported by the attached certified design specifications, certified design report (when required), and data identifying the dimensions, materials of construction, pressure/temperature ratings and basis for such ratings, the marking of the fitting for identification, and the service conditions.

1) Applicant's quality control program
I declare that the design of non-standard fittings and any manufacturing of these fittings by the applicant's organization is controlled under the quality program of _____ (company name) which meets the requirements of _____
and which has been verified by _____ on the following date _____.

2) Manufacturer's quality program (if applicant is not the manufacturer)
I declare that the quality program of each facility where the complete or partial fabrication of these fittings occurs will be verified to ensure it meets the applicable requirements of Clause 10 of CSA N285.0.

These items covered by this declaration, for which I seek registration, are Category _____, Class _____ fittings.
In support of this application, the following information and/or test data are attached:

_____ (Drawings catalogue pages, design specifications, etc)

declared before me in _____ (city), _____ (province),

Use this space for the official seal

the _____ day of _____ 20_____.

Commissioner for oaths _____ (printed name)

_____ (signature of commissioner for oaths)

_____ (signature of declarer)

FOR OFFICE USE ONLY

To the best of my knowledge and belief, the application meets the requirements of CSA N285.0 and is accepted for registration

In Category _____, Class _____, CRN _____

Registered by _____ of authorized inspection agency _____

Date _____

(Source: Fig B.1, **CSA N285.0:23/CSA N285.6 SERIES:23**. © 2023 Canadian Standards Association. Please visit **store.csagroup.org**)