CODES AND STANDARDS
FOR CANDU PLANTS

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Principal Engineer – Safety Concepts
Codes and Standards

- Requirements for CANDU design:
  - Regulatory policies, standards, guides developed and applied by Canadian Nuclear Safety Commission (formerly AECB)
  - Canadian codes and standards
    - Issued by a government body, the Standards Council of Canada,
    - Written by Canadian Standards Association (CSA)
  - Local codes and standards, as agreed by contract or imposed by regulator of that project.
Codes and Standards

- Requirements for CANDU design (cont’d):
  - International codes and standards
    - International Standards Organization (ISO)
    - International Electrotechnical Commission (IEC)
    - IAEA (NS-R-1)
  - Adopted US: ASME, IEEE, NFPA, ANSI, etc.
  - Requirements implemented through project documents:
    - Licensing Basis Document
    - Safety Design Guides
    - Design Guides
    - Design Requirements
Codes and Standards

CANADIAN STANDARDS ASSOCIATION

- Responsibility to produce CANDU nuclear standards (National Standards of Canada, N Series)

- Steering Committee:
  - decides standards to be written
  - accepts standards prepared by Tech. Committees

- Technical Committees:
  - separate committees for each topic
  - prepares standard & issues
  - revises standard every 5 years
  - answers interpretation questions, evaluates proposed changes
CSA TECHNICAL COMMITTEES

- Type and number of members are controlled:
  - Supplier / Fabricator / Contractor
  - Owner / Operator / Producer
  - Service industry (e.g. inspection agencies)
  - Government regulatory authority (e.g. CNSC, provincial)
  - General Interest (e.g. consultants, scientific institutions)
Codes and Standards
Current CSA Standards Committees

- N285: Systems and Components
- N286: Quality Assurance
- N287: Concrete Containment Structures
- N288: Environmental Radiation Protection
- N289: Seismic Design
- N290: Control Systems, Safety Systems, and Instrumentation
- N291: Safety Related Concrete Structures
- N292: Waste Management
- N293: Fire Protection
Codes and Standards
CSA N285 SERIES: SYSTEMS & COMPONENTS

CAN/CSA-N285.0 : General Requirements for Pressure Retaining Systems and Components

- selection of code classification (Section 5: Classes 1, 2, 3, 4, 6)
- design, fabrication, inspection, and installation of pressure retaining systems and components
- regulatory requirements, such as submission of documentation, inspections, approvals
- Applies ASME Section III or “non-nuclear” standards, such as CSA B51 (ANSI/ASME B31.1, ASME Section VIII, etc)
Codes and Standards
CAN/CSA N285 Series

- **N285.2**: Requirements for Class 1C, 2C, and 3C Pressure Retaining Systems and Components
- **N285.3**: Requirements for Containment Systems and Components
- **N285.4**: Periodic Inspection of CANDU Nuclear Power Plant Components
- **N285.5**: Periodic Inspection of Containment Components
- **N285.6**: Material Standards for Reactor Components
Codes and Standards

CODE CLASSIFICATION (CSA N285.0-95)

- **Class 1**: Systems that transport heat directly from nuclear fuel, and whose failure cause loss of coolant accidents. Also special safety systems: Emergency core coolant injection system and shutdown systems (SDS1, SDS2)

- **Class 2**: Containment boundary piping components (Class 6 allowed with certain conditions)

- **Class 3**: Systems which contain activity level of 0.4 TBq/kg, (based on radiation dose of 10 rem to plant worker)

- **Class 4**: Containment systems (metal components not covered by Class 2)

- **Class 6**: Systems containing radioactive substances where failure would cause a radiation dose below the Class 3 limits

- Components to which the ASME Section III code cannot be applied, designated as Class 1C, 2C, 3C
Codes and Standards
N286 Series: Quality Assurance - QA

- CAN/CSA-N286.0 Quality Assurance Program Requirements
- CAN/CSA-N286.1 Procurement Quality Assurance
- CAN/CSA-N286.2 Design Quality Assurance
- CAN/CSA-N286.3 Construction Quality Assurance
- CAN/CSA-N286.4 Commissioning Quality Assurance
- CAN/CSA-N286.5 Operation Quality Assurance
Codes and Standards
CSA N288 Series: Environmental

- CAN/CSA-N288.3.1 General Guidelines for Air–Cleaning Systems in Nuclear Facilities
- CAN/CSA-N288.3.2 High Efficiency Air Cleaning Assemblies for Normal Operation of Nuclear Facilities
- CAN/CSA-N288.4 Guidelines for Radiological Monitoring of the Environment
Codes and Standards
N289 Series: Seismic Qualification

• N289.2 Ground Motion Determination for Seismic Qualification

• N289.3 Design Procedures for Seismic Qualification

• N289.4 Testing Procedures for Seismic Qualification

• N289.5 Seismic Instrumentation Requirements
Codes and Standards
N290 Series: Control & Instrumentation

- N290.1 Requirements for the Shutdown Systems
- N290.4 Requirements for the Reactor Regulating Systems
- N290.5 Requirements for Support Power Systems of CANDU Nuclear Power Plants
- N290.6 Requirements for the Monitoring and Display of the Plant Status in the Event of an Accident
Codes and Standards

N292 Series: Waste Management

- N292.2: Dry Storage of Irradiated CANDU Fuel
- N292.3: Concrete Canister Storage of Irradiated CANDU Fuel

N293 Series: Fire Protection

- N293: Fire Protection for CANDU Nuclear Power Plants