CODES AND STANDARDS FOR CANDU PLANTS

Presented by: A. Stretch
Principal Engineer – Safety Concepts

Canada

AECL Atomic Energy of Canada Limited

EACL Énergie atomique du Canada limitée

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, scuh 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