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JSME/ASME Code Comparison Interim results

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CURRENT STATUS

- Detailed comparison table almost complete.
- Continue Check and Review for more accuracy.

General Requirements

Significant differences include:

NCA-3000: Responsibilities and Duties

No corresponding articles in JSME, since there is no qualification and accreditation systems like ASME.

NCA-4000: Quality Assurance

QA code for NPPs is established by JEA, which is based on ISO9001-2000.

NCA-5000: Authorized Inspection

No corresponding articles in JSME, since there is no Authorized Inspection and Code Data Report systems like ASME in Japan.

NCA-8000: Certificates, Nameplates…..

No corresponding articles in JSME, since there is no Authorized Inspection and Code Stamping systems like ASME.

There are more differences that are less significant.

Accreditation

JSME does not have a generic standardized program for accreditation of manufacturers and fabricators, but relies on regulatory oversight (licensee's oversight for welding inspection) of fabricators and technical qualification of the production workshop.

ASME and JSME

NB-2000 vs. PVB-2000: Materials

- Basically equivalent to NB-2000 of ASME Section III
- Some provisions are not specified in JSME
  - e.g. Welding Material (JIS specifies Welding Materials)
  - Certification of Material
  - Material Organization's Quality System Programs)

ASME and JSME

NB-3000 vs. PVB-3000: Design

- Basically equivalent to NB-3000 of ASME Section III
- Some technical changes added, such as Ke factor for Simplified Elastic-Plastic Analysis.
- For Plastic Analysis, JSME unique Code Case NC-CC-005, “Alternative Structural Evaluation Criteria for Class 1 Vessels Based on Elastic-Plastic Finite Element Analysis”, has been published.
- Some JSME unique provisions are specified, such as Evaluation of Flow-Induced Vibration, Evaluation of High-Cycle Thermal Fatigue.

These differences / additions come from:

R&D results in Japan

Reflection of Operating Experience

Major Technical Differences

- ***Ke* factors for simplified elastic-plastic analysis**
  - **Formulated based on "elastic-follow-up model", which was originally developed for FBR design in Japan.**
  - **Gives less conservative strain concentration than ASME Sec III**
- **Requirements for component supports**
  - **Hybrid of Design by Rule and Steel Structure Code (Architectural Institute of Japan)**
- **Alternative rules with direct use of 3D elastic-plastic FEA (Code Case)**
  - **Limit load analysis for primary loads**
  - **Shakedown and cyclic yielding area analysis**
  - **Fatigue evaluation by surface peak Mises stress**
- **Evaluation procedure for high cycle fatigue induced by thermal striping**

ASME and JSME

NB-4000 vs. PVB-4000: Fabrication

- Requirements for welding are basically equivalent.
- Some requirements of JSME (e.g. allowable offset in final welding joints) are not equivalent to ASME.
- Some requirements of ASME (e.g. Forming, Bending, Brazing, Mechanical Joints) are not specified in JSME.

ASME and JSME

NB-5000 vs. JSME Rules on Welding: Examination

- Requirements for examination for weld joints are basically equivalent.
- Some requirements of JSME (e.g. allowable criteria for weld edge preparation surfaces) are not equivalent to ASME.
- Some requirements of ASME (e.g. Acceptance Standards for Preservice Examination, Examination Procedure, Personnel Qualification Procedure) are not specified in JSME.

ASME and JSME

NB-6000 vs. PHT-X000: Pressure Testing

- Requirements of Pressure Testing are basically equivalent.
- Some requirements of JSME (e.g. Substitution of the System Pressure Test, Maximum Permissible Test Pressure) are not equivalent to ASME.
- Some requirements of ASME (e.g. Test Medium, Test Procedure) are not specified in JSME

ASME and JSME

NB-7000 vs. SRV-X000/VBV-X000:

Overpressure Protection

- **JSME code specifies the material and method to calculate the capacity of pressure relief devices only, so there is a significant difference between JSME and ASME codes requirement.**
- **JSME Code Case NC-CC-001 "Overpressure Protection", which specifies the general installation requirements of pressure relief devices, will be compared with ASME provisions.**
- **Some requirements of ASME (e.g. Overpressure Protection report, Operating and Design Requirements for Pressure Relief Valves, Certification) are not specified in JSME.**

ASME and JSME

ASME Appendix I vs. JSME Appendix 4-2: Design Fatigue Curves

- Requirements are basically equivalent (Exactly same in some materials).
- Design fatigue curves for some materials are not specified in JSME because they are not permitted to use in JSME.

ASME and JSME

ASME Appendix III vs. JSME Rules for Material: Allowable Stress Values

- Requirements are basically equivalent.

ASME and JSME

ASME Appendix VI vs. JSME Rules on Welding: Rounded Indications

- Acceptance criteria for rounded indications are not equivalent.
- Some requirements of ASME (e.g. aligned rounded indications, clustered indications) are not specified in JSME including JIS.

ASME and JSME

The following ASME Sec.III Appendices are not specified in JSME.

- **APPENDIX V "CERTIFICATE HOLDER'S DATA REPORT FORMS, INSTRUCTIONS, AND APPLICATION FORMS FOR CERTIFICATES OF AUTHORIZATION FOR USE OF CODE SYMBOL STAMPS"**
- **APPENDIX XVIII "CAPACITY CONVERSIONS FOR PRESSURE RELIEF VALVES"**

Typical Sources of Difference

1. QA: Utilitiy's or manufacturer's QA program based on ISO-9001 is applied in Japanese QA activities.
2. JSME Codes are based on MITI Notification No. 501 for Design and MITI Ordinance No. 81 for Welding that are government regulations and specifies necessary provisions for the regulator. Therefore the JSME Codes have a few provisions except those specified in the above regulations.

Typical Sources of Difference

3. Welding: JSME Codes specify applicable JIS's for base metals, but do not specify those for welding materials. In JSME Code, specific material specification is not designated for welding material. Then, manufacture qualifies applicable welding material based on the welding procedure qualification test conducted in accordance with the performance requirement of JSME N-1020 (Welding Code). MITI Notification No. 501 that is a basis for the JSME Code for Design referred the ASME Code Sec.III. On the contrary, MITI Ordinance No. 81 that is a basis for the JSME Code for Welding did not refer ASME Codes Sec.III, but was developed based on Japanese industry's practices and experiences. The structure of MITI Ordinance No. 81 is different from that of the ASME Sec.III.

Typical Sources of Difference

4. In Japan, a system for authorized inspection is not established yet, then, in lieu of authorized inspection of ASME, regulatory authority or his designee conducts final inspections of item and supervises welding and examination of weld during construction of item.QA: Utilitiy's or manufacturer's QA program based on ISO-9001 is applied in Japanese QA activities.
5. The JSME Fitness-for- Service Code requires performing preservice examination, but does not have acceptance standards based on the position that the objective of preservice examination is to prepare a baseline data for ISI and not to perform evaluation of flaws revealed.

Typical Sources of Difference

6. Definitions are specified according to need. The JSME Codes do not have some definitions specified in the ASME Code.
7. JSME Codes may not have provisions that are ordinarily expected to be performed if not specified.
8. JSME unique requirements are based on plant operating experience and R&D results.

Summary of Code Comparison

- Class 1 Vessel design and construction codes of ASME and JSME are compared, and differences are identified.
- The draft results are as follows:
  - Material (NB-2000/PVB-2000) and Design (NB-3000/PVB-3000) are basically equivalent.
  - There are some differences (not equivalent, not specified in JSME) in Fabrication (NB-4000/PVB-4000), Examination (NB-5000/JSME Rules on Welding), Pressure Testing (NB-6000/PHT-X000) and Over Pressure Protection (NB-7000/SRV•VBV-X000)
  - Also there are some JSME unique provisions
- The main cause of these difference are classified into some categories shown before.

JAPANESE SITUATION ABOUT "NCA & NQA"

NCA

BACKGROUND

- In order to fulfill regulatory requirements, JSME Codes have been developed for each specific fields individually.
- Then, "Systematization" of Codes is still on the way, and Subsection for "General Requirements" governing overall Codes like NCA has not been developed in JSME Codes yet.

CURRENT SITUATION

- Licensees applies JSME Codes as the regulatory requirements.
- Manufactures & fabricators applies JSME Codes as the contractual requirements with Customers (Licensees).
- And no Japanese Code directly corresponding to "NCA" of ASME.
- Then, detailed and specific comparison of ASME and JSME or other Japanese Code is very hard for subsection "NCA".

JAPANESE SITUATION ABOUT "NCA & NQA"

NQA

BACKGROUND

- Until Sept. of 2003, there had been no regulatory requirements about QA, and Electric Utilities and manufactures had developed JEAG4101 based on IAEA Safety Series, and applied it for self-imposed control.
- After Sept. of 2003, application of QM system based on ISO9001 was mandated by METI ORDINANCE No.113 for O&M.
- Then, JEA developed JEAC4111-2003 as specialized QA Code for O&M, and for Licensees only.

CURRENT SITUATION

- Licensees applies JEAC4111-2003 as the regulatory requirements to O&M.
- Manufactures & fabricators applies ISO9001 or other alternates, such as JEAG4121 App. IV, as the contractual requirements with Customers (Licensees).
- Then, detailed and specific comparison of ASME and JSME(JEA) or other Japanese Code is very hard for "NQA".

JSME(JEA) and ASME (NQA)

Equivalence/differences between NQA-1 and JEA QA are summarized:

- **For 18 Basic Requirements of NQA-1, JEA QA Code is "basically" or "conceptually" equivalent.**
- **For Supplementary requirements of NQA-1, has LESS detailed requirements.**
- **Especially differences are significant in the following three supplementary requirements that are very detailed procedural requirements in NQA-1:**
  1. **3S-1: Design Control**
  2. **7S-1: Control of Purchased Items and Services**
  3. **17S-1: Quality Assurance Records**

Next Step ?