ASME Section III Upgrading – Case Studies

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Abstract

Nuclear utilities are constantly facing problems obtaining ASME Section III pressure-boundary components, due to manufacturers' not having acceptable American Society of Mechanical Engineers (ASME) III or Technical Standards and Safety Association (TSSA) N285.0 Certificates of Authorization, or allowing their ASME III programs to lapse. The list of qualified manufacturers is relatively tiny, thereby restricting the availability of acceptable pressure-boundary components.

Nuclear Logistics, Inc. (NLI) works with cooperative Original Equipment Manufacturer's (OEM's) to produce their equipment under NLI's ASME Section III Certificates of Authorization. This engineering and manufacturing model allows utilities access to a much wider range of pressure-boundary equipment, available from NLI as N285.0 Class 1, 2 or 3.

This presentation outlines some case studies describing NLI's ASME Section III upgrading process.

Introduction

Nuclear utilities are constantly facing problems obtaining ASME Section III pressure-boundary components, due to manufacturers' not having acceptable ASME III or TSSA N285.0 Certificates of Authorization, or the original OEM is no longer in business or the original OEM no longer makes the needed component.

During the height of nuclear plant construction there were several hundred manufacturers which held ASME Section III Certificates of Authorization. As nuclear plant construction slowed down and then stopped in the early 1980's many of the original manufacturers dropped their ASME Section III programs. In 2007 the list of qualified manufacturer's is relatively tiny, thereby restricting the availability of acceptable pressure-boundary components.

NLI works with cooperative OEM's to produce their equipment under NLI's ASME Section III Certificates of Authorization. This engineering and manufacturing model allows utilities access to a much wider range of pressure-boundary equipment, available from NLI as N285.0 Class 1, 2 or 3.

ASME Section III Program

NLI worked closely with ASME to generate and put in place an ASME Section III Program to meet the nuclear industry's need for ASME Section III equipment. NLI successfully passed the ASME audit in December of 2005.

The NLI ASME Code compliance program is written in accordance with the ASME Boiler & Pressure Vessel Code, Section III, 2004 edition, with the applicable addenda and code cases.

The NLI scope of supply for ASME Section III items is as follows:

- "N" Certificate holder:
  - Division 1, Class 1, 2 and 3 vessels
  - Division 1, Class 1, 2 and 3 valves
  - Division 1, supports constructed in accordance with Subsection "NS"
  - Subsection "NPT" for all required parts.

The NLI ASME Code Section III program meets the requirements of Canadian Standard N285.0-1995 with supplemental requirements.

All work is performed in accordance with NLI's Quality Assurance Program meeting the requirements of 10CFR50, Appendix B, 10CFR21 and ASME NQA-1-2000. The NLI Quality Assurance Program also meets the requirements of CSA Z299.2-1985.

Case Studies

The following case studies will be presented and discussed in the paper:

- Accumulator parts supplied as Subsection NPT.
- Class 1 gate valves.
- Chiller with ASME Section III, Class 3 evaporator and condenser.
- Weld Material
- Ball Valves

The case studies will briefly summarize NLI's ability to supply the subject equipment using our ASME Section III N, NPT and NS Certificates of Authorization. The ASME

Code is a very detailed prescriptive code explaining the requirements with exacting definition. However, there are three main points to be considered in every project:

- Design control
- Material control
- Pressure boundary weld control including Non-Destructive Examination (NDE)

The ASME Code is very strict with regards to pressure boundary welding. The Code is very specific with regards to weld material, weld process, training for welders, certification for welders/weld inspectors and NDE associated with welding. As a result all welding must take place at the approved location shown on the Certificate of Authorization.

Accumulator Parts

Many nuclear plants use hydraulic accumulators in their ASME III piping. Typical bladder arrangement shown in the picture. Greer Hydraulics, Inc. (GHI) used to manufacture and supply these accumulators as ASME Section III equipment. GHI sold this product line to Parker Hannifin. Parker Hannifin does not maintain an ASME Section III program. As a result NLI works very closely with Parker Hannifin to build, test, document and supply the accumulator parts with NLI's ASME Section III Subsection NPT Certificate of Authorization. Each accumulator design is licensed to NLI as a client need surfaces. NLI then manufactures the components in accordance with our ASME Section III program.

The typical NLI Process includes:

- Procure raw material as Code material.
- Machine parts per Parker Hannifin drawings licensed to NLI.
- NDE and inspections per the Code.
- Prepare documentation per the Code.

Hydraulic Accumulator Parts

This case study is a very simple example since there is no pressure boundary welding required to manufacture the accumulator parts. In addition the raw material in this example is purchased as ASME Section III material and does not require any upgrading by NLI.

Gate Valves

Many valve OEM's have dropped their ASME Section III programs over the years due to increased QA requirements and decreased nuclear industry demand. This is an ever increasing situation for nuclear power plants. This case study discuses the supply of gate valves as ASME Section III, Class 3 to meet a nuclear plant's diesel fuel transfer application.

The gate valves, as shown in the below drawing, were manufactured and supplied per client ASME Code design specification. The valves were supplied as "N-Stamp" equipment.

The NLI process involved:

- Audit valve manufacturer.
- NLI procure material as Code material. Supply material to manufacturer.
- NLI control special processes at manufacturer.
- NDE per the Code at NLI facility.
- Hydro testing at NLI facility.

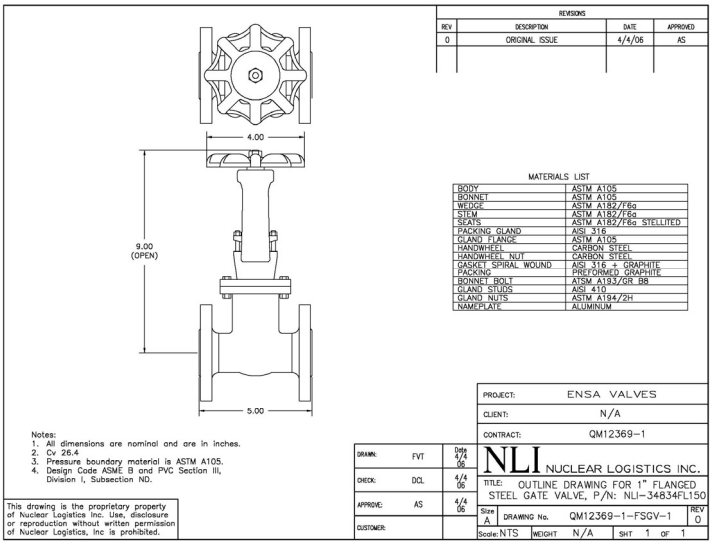
NLI is responsible for the generation and supply of all documentation to meet the Code. Typical documentation included:

NLI design documents:

- Design drawings.
- Design report.
- Code data report.

NLI manufacturing documents:

- Production Traveler.
- Special process and personnel qualifications.
- NDE procedures and personnel qualifications.
- Hydro procedures and personnel qualifications.



NLI Drawing Showing Gate Valve

This case study is also a rather simple example since there were no pressure boundary welds and the raw material was purchased as ASME Section III material. However, this case study does show the need for the manufacturer and NLI to work in concert to control the design, control material, manufacture, perform NDE, test and document all aspects of valve production.

Chillers

This case study discusses the design, manufacture, test and supply of safety related custom chillers with ASME Section III condensers and evaporators. The chillers were manufactured in conjunction with NLI's Teaming Partner Ketema LP of Grand Prairie, TX. The chillers were supplied as "N-Stamp" equipment. The shell and tube heat exchangers, as shown below, are the crucial element of the chiller to control from an ASME Section III requirement.

The chillers were manufactured and supplied per client ASME Code design specification.

The design was based on the manufacturers standard design. Modifications were made to meet ASME Section III, seismic and client unique requirements.

The NLI manufacturing process included:

- Audit manufacturer/long term partnership with manufacturer.
- NLI upgrade material to Code material and supply to manufacturer.
- NLI Quality Control (QC) detailed oversight.
- Control special processes at manufacturer.
- Welding per the Code.
- NDE per the Code.
- Hydro per the Code.
- Performance/Factory Acceptance Testing (FAT) testing per the client specification.

Shell & Tube Heat Exchanger

NLI Design Documents included:

- Design drawings.
- Design report.
- Code data report.

NLI Manufacturing Documents included:

- Production Traveler.
- Special process and personnel qualification.
- Welding procedures, procedure qualification and personnel qualification.
- NDE procedures and personnel qualifications.

Welding Control is Critcial

- Hydro procedures and personnel qualification.

This is an extremely complicated case study. This example involves a very good working relationship with a long term partner, control over special processes, upgrading of commercial material by NLI to code material and finally pressure boundary welding at our teaming partners facility.

As stated earlier pressure boundary welding, as shown in the above picture, is an extremely important aspect of meeting the requirements of the ASME Section III Code. As a result the ASME Committee requires all pressure boundary welding to be performed at the address as shown on the ASME Certificate of Authorization. Since the pressure boundary welding for this case study was not performed at the ASME approved NLI facility, an ASME augment audit was performed to provide temporary authorization of the pressure boundary welding to be performed at the Ketema facility. This required detailed welding procedures, training to procedures, mock-up welding on sample applications and an ASME audit of the process.

Weld Material

This case study explains upgrading commercially available material to Code material. The weld material, shown to the right, was purchased from an approved vendor as commercial material. The manufacturer was audited to establish lot control.

Typical Welding Rods

NLI performed chemical testing and Charpy testing on representative samples from the lot. The material was upgraded to Code material and was supplied with NLI Subsection NPT Certificate of Authorization.

NLI Design Documents included:

- Design drawings.
- Design report.
- Code data report.

This is a simple example, but shows the need to establish material control in order to upgrade the material to Code material.

Ball Valves

As with the gate valve case study discussed earlier there are very few ASME Section III ball valve manufacturers supporting the nuclear industry. This case study discusses upgrading ball valves to meet a client unique ASME Section III application.

The ball valves, as shown below, were supplied as ASME Section III, Class 2 components using the NLI "N-Stamp" Certification of Authorization.

The ball valves were manufactured and supplied per client ASME Code design specification.

NLI process included:

- Audit manufacturer.
- Audit subvendor for special ball hard facing.
- NLI procure material as Code material. Supply material to manufacturer.
- NLI control special processes at manufacturer.
- NDE per the Code at NLI facility.
- Hydro testing at NLI facility.

NLI design documents included:

- Design drawings.
- Design report.
- Code data report.

NLI manufacturing documents included:

- Production Traveler.
- Special process and personnel qualifications.
- NDE procedures and personnel qualifications.

Ball Valves Being Assembled

This case study is a straight forward example since the raw material was purchased as Code material and there were no pressure boundary welds. The example still required strong coordination with the manufacturer and the sub-vendor for the special process (ball hard facing) control.

These are just a few examples to briefly explain the process of how NLI supplies ASME Section III equipment to meet nuclear client needs. Other recent examples include:

- Pressure switches.
- Flow meters.
- Waste gas compressors.
- Heat exchanger plates.
- Water pump.
- Pump Casing
- Thermowells

Summary & Benefits for Nuclear Plant

NLI becomes the designer and manufacturer of record for supplied equipment. NLI is responsible for all aspects of the Code, specifically material control, welding, personnel qualifications, NDE and documentation. All pressure boundary welding must either take place at NLI or be approved by local Authorized Nuclear Inspector (ANI) and controlled by NLI.

The NLI approach to supplying ASME Section III equipment expands availability of ASME Section III equipment/material to the nuclear industry.

The process as briefly described herein allows manufacturers which had an ASME III program at one time to still supply needed material to the nuclear industry even though they dropped their program.

The process described herein may help mitigate the need for a design change at the plant due to availability of parts/components previously not available as Code material.