

TECHNICAL SPECIFICATION
FOR
NS UNIT 1 HIGH ENERGY PIPING
NON DESTRUCTIVE EXAMINATION
Spring 2022 Outage

PWO 30764813

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1.0 General

1.1 Scope of Work: The scope of work is to perform NDE of the welds and components on the JEA Northside Generating Station NS 1 Main Steam, Hot Reheat, and Cold Reheat, and Feed water piping. Only the Priority 1 NDE locations on Attachment A will require NDE.

1.2 Schedule: The NDE will be performed during the NS 1 Maintenance Outage from March 1 thru March 21, 2022.

1.3 The NDE Contractor shall make all surface preparations required to perform the NDE.

2.0 Nondestructive Examination Work to be provided by Contractor

SCOPE

Nondestructive examinations (NDE) shall be completed on the JEA NS-1 Main Steam, Hot Reheat, Cold Reheat, HP bypass, and LP bypass piping systems to establish the current condition of the material. Results shall be analyzed to estimate the remaining life of the piping systems based on the locations tested. Each NDE test location and method shall be considered for future testing and a recommended test frequency shall be provided. Following evaluation of NDE test results, additional testing shall be recommended if applicable. NDE plans can be found in Appendix A.

The NDE Contractor shall make all surface preparations required to perform the NDE.

TECHNICAL REQUIREMENTS

Nondestructive Testing (NDE) shall be completed by qualified Contractor in accordance with the following. Testing locations are identified in the Recommended NDE Testing summary table provided for each of the systems to be tested.

The NDE shall be completed and performed in accordance with the methods specified in the latest additions of the ASME B31.1 Code for Pressure Piping. The various NDE methods used shall be in accordance with ASME Section V, Non-Destructive Testing Code. Acceptance criteria shall be that indicated with B31.1 Code for Pressure Piping.

NDE shall be performed in accordance with written procedures that are prepared by the Contractor in accordance with the indicated code. The Contractor shall have all written procedures, except those for visual examination only, approved by a qualified and certified NDE Level III. This approval shall be documented on each NDE procedure. NDE procedures shall be submitted to the Owner for review prior to their use.

Personnel performing NDE other than visual examination shall be qualified and certified for the applicable NDE method. Personnel shall meet written practice ASNT SNT-TC-1A, unless permitted otherwise by the referencing code or prior written approval from TMPA is obtained. NDE personnel qualifications shall be made available for review when requested.

The NDE results shall be provided in a NDE Report that is evaluated, interpreted, and accepted by Level III NDE personnel. Records of these examinations shall be documented.

Manual techniques shall be utilized where linear phased array ultrasonic testing is specified. Automated or semi-automated encoded scans shall be performed where access permits. The Contractor shall provide a scan plan that details the technique(s) used at each test location along with a detailed description of any physical obstructions. Following review and approval, the Owner will endorse each completed scan plan per B31.1 section 136.4.6 Ultrasonic Examination (A.1). This endorsement will indicate the Owner's agreement with the Contractor on the locations where physical obstructions prevent the use of systems capable of recording the UT data for repeatability of subsequent examinations.

Microstructures from the replications shall be interpreted by a metallurgist who is experienced in evaluating microstructures for creep damage or other damage from exposure to elevated temperatures. The microstructure shall be evaluated to determine if there are any creep voids, micro cracking, other abnormal structures or phase evolutions (which may include spheroidization, coarsening of precipitates, or development large regions without precipitates (alloy dependent)).

The Contractor shall complete hardness testing of the piping in accordance with the requirements of this Section.

Review the minimum wall thickness requirements for all test locations. Determine actual pipe wall thickness requirements using UT thickness testing. Since testing will be performed at girth welds, thickness readings should be obtained at each test location since the pipe inside diameter may have been machined for a match fit to the mating component.

Based on minimum wall requirements, determine if there is sufficient material thickness to remove up to 0.04" or more without violating minimum wall thickness requirements.

CAUTION: Care must be used when grinding specific areas to ensure that minimum wall thickness is not violated. If grinding violates minimum wall thickness requirements, costly weld repair, inspection, post weld heat treatment, hardness testing and possible

construction delays may result. Additional welding and heat treatment also has the potential of reducing the material's long-term creep resistance.

Table 8-1 lists the yield strength, ultimate tensile strength, and the corresponding approximate Brinell hardness for typical materials to be tested.

Table 1 **Yield Strength, Ultimate Tensile Strength, and Corresponding Approximate Brinell Hardness for Typical Materials to be tested**

MATERIAL	YS (KSI)	US (KSI)	BRINELL HARDNESS
ASTM A36	36	58-80	120-167
ASTM A106			
GR A	30	48	110
GR B	35	60	126
GR C	40	70	146
ASTM A53			
GR A	30	48	110
GR B	30	48	110
ASTM A672, GR B70	38	70	146
ASTM A335, GR P11	30	60	126
ASTM A335, GR P22	30	60	126
ASTM A335, GR P91	60	85	200-210
ASTM A335, GR P5	30	60	126
ASTM A691, Class 22, 2 ¼ CR	30	60	126
ASTM A193 GR B16 & B7			24 to 35 HRC
ASTM A194 GR 2H & 3			24 to 35 HRC

Measured hardness values lower than those listed above may indicate loss of strength in the material. In addition hardness values above 190-200 Brinell may indicate loss of material toughness. A metallurgical replica of the area(s) in question may be requested if hardness test results indicate a possibly unacceptable material condition.

The results of all inspections shall be documented in a detailed report that provides a summary of testing completed, results, print outs and photographs, locations of testing so that future testing at the same location can be completed, any recommendations for further inspections and estimated remaining life in operating hours for the main steam system based on the inspections and the reference information contained herein. The exact location of any reject able indications shall be documented and the indication mapped so that a fitness for service evaluation can be completed if required.

DETAILED TESTING PLAN

The types of testing and locations for NDE have been summarized on the piping drawings (where applicable) and testing requirement tables included in Appendix A. The following is a summary of NDE testing to be completed.

- **Visual (V).**
- **Pipe Tape Diameter Measurements (OD):**
 - Check for ovality or out of roundness with eight measurements. All OD measurements should be within tolerance as defined by the ASTM standard associated with the pipe material.
- **Wet Fluorescent Magnetic Particle (WFMT):**
 - Attachment Lugs – 100% inspection of the weld and adjacent base metal (pipe and lug).
 - Girth Welds – 100% of weld and heat affected zone.
- **Ultrasonic Wall Thickness (U-WT):**
 - Girth Welds – Determine wall thickness of the base metal at four locations around the circumference of the pipe at 90 degree increments on both sides of the girth weld.
 - Bend – Determine wall thickness for a 6 inch wide by 24 inch long strip on 2 inch centers on bend intrados and extrados.
 - Straight Pipe Sections – Four measurements shall be recorded at 90 degree increments.
- **Linear Phased Array (LPA):**
 - Girth Welds – 100 percent with Linear Phased Array.
- **Replications (R):**

- Straight Pipe Sections – Minimum of two readings at 90 to 180 degree increments.
- Girth Welds – Minimum of two readings on the pipe directly adjacent to the weld (in the heat affected zone). Readings shall be 90 to 180 degrees apart.
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- **Hardness Testing (HT):**
 - Girth Weld – Four readings shall be recorded on the weld at 90 degree increments. Four readings shall also be recorded on both sides of the weld, but still in the heat affected zone at 90 degree increments for a total of twelve readings at each girth weld.
 - Straight Pipe Sections – Four readings shall be recorded at 90 degree increments.

(Notify the client immediately if soft pipe is discovered. Test locations will likely be increased to determine the extent of the soft material.)
- **Positive Material Identification (PMI):**
 - Test four locations around the pipe at 90 degree increments. At girth welds, check weld material and material on both sides of the weld.

3.0 Work To Be Provided By JEA

- 3.1 The JEA will provide the 120 Volt power required for tools and inspection equipment.
- 3.2 The JEA's Scaffolding Contractor **Safeway** will furnish and install all of the scaffolding or platforms required to access the piping welds in order to perform the NDE and replications.
- 3.3 The JEA's Insulation Contractor **Unitherm** will remove piping covering and insulation as necessary to allow the Contractor to perform the NDE and replications.