

U. S. ATOMIC ENERGY COMMISSION
REGION III
DIVISION OF COMPLIANCE

Vendor Inspection Report
System Piping

Vendor: Grinnell Company
Warren, Ohio

Report No. Grinnell 70/2

Facility Inspected For: Metropolitan Edison Company
Three Mile Island 1 (50-289)

Dates of Inspection: November 17-18, 1970

Inspector: *R. E. Oller* R. E. Oller Metallurgical Engineer 12-3-70

Licensee Representative: E. Allen - Metropolitan Edison Co.

Reviewed By: *W. E. Vetter* W. E. Vetter Senior Reactor Inspector 12-9-70

Proprietary Information: Summary and Section II of Report

Licensee Application Requirements: FSAR designates controlling codes as USAS B31.1.0-67 and USAS B31.7-68 (Draft) per CO:I.

SUMMARY

A review was made of the Gilbert Associates (Design Engineers) Specification Nos. SP-5544 and SP-5550 covering fabrication and acceptance standards (respectively) for the Three Mile Island Unit 1 piping being fabricated at the Grinnell Company, Warren, Ohio shop. Two categories of piping have been classified, along with respective code requirements, as Engineered Safeguard systems designated "S-1, 2 and 3", and Nuclear systems designated "N-1, 2 and 3". The specification SP-5544 requires that: (1) the "S" systems to be designed, fabricated and inspected in accordance with the USA B31.1.0-67 code and (2) that the "N" systems be designed in accordance with USA B31.1.0-67

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but fabricated and inspected in accordance with the USAS B31.7-1968 Draft Code. (See Section II.A.1 & 2 of this report.)

The Grinnell Fabrication Specification Supplements for Three Mile Island Unit 1 (3MI-1) piping were in three volumes which were approved by United Engineers & Constructors. The fabrication specifications for austenitic stainless nuclear piping, carbon steel engineered safeguard systems piping and carbon steel piping were in separate volumes. The inspector reviewed the specifications for the stainless steel nuclear piping fabrication and confirmed that they were in accordance with Specifications SP-5544 and SP-5550. (Section II.A.3.)

A shop inspection was made of in-process fabrication of S-1 and N-2 piping. The workmanship appeared acceptable. The identification stamping of each piece in each assembly was in accordance with specification requirements. The shop welds were observed to be in the "as welded" condition. The weld cover passes contained a considerable number of irregularities and were discolored with a black heat oxide. No undercutting was observed. (Section II.B.)

The MTR's for assembly components in three systems were reviewed. All the MTR's were in accordance with their respective specifications except one for weld wire from the Linde Company which failed to specify the AWS and ASTM designation. Grinnell had detected this omission and taken corrective action. (Section II.C.)

The radiograph films for six shop welds in various assemblies of the Decay Heat Removal (DHR) system were reviewed. The films indicated the radiographic technique was acceptable, but that the irregularities of the weld reinforcements caused a masking effect of the weld images which could preclude detection of unacceptable weld defects. Radiographing of welds without smoothing up of the weld reinforcement appears to be poor practice. (Section II.D.)

The Warren shop has not been ASME surveyed and an anticipated date for the survey was not available. The USAS B31.7 Code requirement for NPP stamping and furnishing of NP-1 Data Forms by Grinnell for completed work is not required in the 3MI-1 contract. The Warren shop uses a cutting map to maintain traceability of supplier's RT films for longitudinal seam welded nuclear piping. All stamped identification on cut pipe is transferred to the new pieces. Nonconforming tagged material is now held in a locked cage storeroom until disposition is determined. (Section II.E.)

I. Scope of Inspection

An announced vendor inspection was made on November 17-18, 1970, of Grinnell Company, Warren, Ohio by R. E. Oller, Metallurgical Engineer, Region III. The Warren shop was previously inspected on April 14-16, 1970^{1/}

The purpose of this inspection was to inspect Grinnell's fabrication and QC activities with regard to work performed on piping systems for the Three Mile Island Unit 1.

The following persons were contacted during this inspection:

Grinnell Company - Warren Shop

H. W. Robinson - QC Manager
J. Gratsen - QC Documentation Representative
B. Caulfield - QC Representative (Providence Office)

Metropolitan Edison Company

E. Allen - Senior 3MI Site QA Engineer

II. Results of Inspection

A. Documents Reviewed

1. General

The inspector was informed that the specifications for the 3MI-1 piping were prepared by Gilbert Associates and administered by United Engineers & Constructors. The CO inspector reviewed three controlling documents, i.e., Gilbert's Fabrication Specification SP-5544; Quality Acceptance Standard SP-5550, and Grinnell's book of Fabrication Supplements for 3MI-1 Stainless Steel Pipe.

2. Specification SP-5544 dated 8/30/68 and Revisions dated 4/1/70 and 5/12/70

A review of Specification SP-5544, and Revisions, indicated that the specifications were in conformance with the requirements of the USA B31.1.0-67 and USAS B31.7 Codes for the respective classes of piping. The Engineered Safeguard Systems, Class I, were designated as "S" systems and were required to

Results of Inspection (continued)

be designed, fabricated and inspected in accordance with the requirements of the USA B31.1.0-67 Code. The nuclear piping systems were designated as "N" systems and were required to be designed in accordance with the requirements of the USA B31.1.1-67 Code but fabricated and inspected in accordance with the requirements of the USAS B31.7 (1968 Draft) Code.

3. Specification SP-5550, Rev. III, dated May 7, 1968

This specification was reviewed for specific acceptance standards for shop weld reinforcement finish and the controlling NDT requirements for shop fabrication. The inspector noted that paragraph 7.3.6 "Surface Preparation", required grinding only to remove surface irregularities which would affect the interpretation of tests or mask indications of defects.

The controlling codes for the radiography of the "S" systems were noted to be: (1) ASME Section I, PW-51 for butt welds; (2) Section VIII UW-51 for piping and other welds; (3) Section VIII, Appendix VIII, for all PT inspection and (4) Section VIII, Appendix VI, for all MT inspection.

4. Grinnell's Fabrication Supplements for 3MI-1

The Grinnell specification supplements (approved by WE&C) were contained in separate volumes for the following categories of piping fabrication: (1) stainless steel - nuclear piping, (2) carbon steel - engineered safeguard piping, and (3) carbon steel river water piping.

The CO inspector reviewed, in depth, the volume of supplements covering the fabrication of austenitic stainless steel nuclear pipe and found it to be in accordance with SP-5544. The specifications, instructions and procedures reviewed included the following subjects:

- a. Standard Fabrication Instructions
- b. Quality Control Standards
- c. Instructions for Weld Rod Handling, Ovens and Written Issuance Forms for Welding Material
- d. Instructions for Cleanliness Check of Received Material Using pH Indicating Papers

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- e. Instructions for Welding, Forming and Inspection
- f. Procedures for Automatic Submerged Arc Welding of Stainless Steel Pipe
- g. Procedure for Manual Tungsten-inert-gas Welding of the Root Passes
- h. QC Procedure for Shop Documents
- i. QC Procedure for Shop Records
- j. PT Inspection Specification to Meet the Requirements of the USAS B31.7 Code, 1968 Draft
- k. RT Inspection Specification to Meet the Requirements of the USAS B31.7 Code, 1968 Draft
- l. Material Specifications for Welding Filler Metals Including Minimum Ferrite Content and Vendor MTR's

B. Shop Inspection

The Grinnell Registrar Listing of 134 piping system major assemblies for 3MI-1 at the Warren Shop was reviewed by the inspector as a starting point to secure an inspection sample. The assemblies were classified according to Specification SP-5544 as S-1, S-2 and S-3 (Engineered Safeguard Piping) and N-1, N-2 and N-3 (Nuclear Piping). From a selection of 13 major assemblies, QC documentation revealed that assemblies from only three systems were in process. The three were: (1) Decay Heat Removal (N-2), (2) Intermediate Cooling (S-1) and (3) Core Flooding (N-2). The balance of ten major system assemblies were either shipped or had not been set up for work.

Inspection was made of three assemblies in the DHR system, one in the IC system and one in the CF system. The results were as follows:

- 1. Each of the stainless steel pipe sections and stainless steel fittings in the assemblies were properly stamped with diameter, wall schedule, ASTM designation, heat number, Classification No., shop welder symbols and RT symbol for longitudinal welds. Comparison of information on the traveler fabrication sketches with the information stamped on the pieces indicated acceptable correlation.
- 2. All of the welds examined were in the "as welded" condition with the weld reinforcement containing ripples, irregularities and black heat oxide. No undercutting was observed. The inspector questioned whether the reinforcement thickness of several welds met code requirements. He was told by Grinnell

Results of Inspection (continued)

that each weld reinforcement will be measured with a "No-go" gage before shipment and ground if necessary. The CO inspector checked several welds reinforcements with the "No-go" gage and found them to be acceptable.

3. The inspector watched a welder making a consumable ring, tungsten-inert-gas, root pass between a Schedule 140, 12" diameter, A-376 TP-316 stainless pipe and a Schedule 140 A-403, WP-316 stainless elbow in a DHR assembly. The inspector noted that the weaving of the root pass was skillfully performed. After completion of the root pass, the inspector made an examination and observed that the fusion was uniform and free of visible defects.
4. The assemblies examined in the shop are listed as follows:

<u>System</u>	<u>Registration No.</u>
DHR	#5399-1
DHR	5399-11
DHR	5400-10
IC	5854-5
CF	AE-790-4

5. In general, a cursory examination of other completed stainless steel piping assemblies by the inspector indicated that the work was acceptable. Piping appeared to be clean as well as free of scars and abusive marks. Finished assemblies were stored on timbers. The shop area was clean and free of debris.

C. Material Test Reports

All related MTR's were reviewed for each component, including consumable insert rings and weld filler material, in the following assemblies:

1. Decay Heat Removal System Assemblies DH-63, 66 and 73

The stainless steel piping consisted of: (1) 12", and 14" schedule 40S, A-358 Class I, TP-304 supplied by Allegheny Ludlum and (2) 4" schedule 40S, A-312 TP-304 seamless supplied by U. S. Steel. The stainless steel elbows which were supplied by the Flowline Corporation, consisted of 12" and 14", A-403, WP-304 seamless material. The insert rings were supplied by

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Grinnell and the welding rod, consisting of three separate heats, was supplied by Arcos Corporation. The test data on all MTR's was examined and appeared to be complete and in accordance with specification requirements.

2. Intermediate Cooling Assembly, Registrar #5854-5

The material in this assembly consisted of 3" diameter, 40S, A-312, TP-304 seamless pipe; 3" 40S, A-403, WP-304, 90° and 45° elbows, one 3" x 3/4" A-182, F-304, 3000# Sockolet; 3" 40S insert rings and three heats of electrodes. MTR's were examined for: A. B. Murry (warehouse) piping, Flowline elbows, the Bonney Forge Sockolet, Arcos bare weld wire, Chematron weld rod, and Grinnell insert rings. All of the MTR's were complete and the test data was in accordance with the respective ASTM Specifications.

3. Main Steam Piping, Registrar #5454

All main steam piping (S-1), had been shipped to the 3MI-1 site. However, an audit was made of the material records and fabrication sketches to evaluate Grinnell's quality control performance on this system.

The material in this system consisted of the following: A-106, 24" schedule 60, Grade B piping; eight 24" schedule 60, A-234 Grade WPB elbows, two Sockolets, one heat of consumable insert rings and ten heats of weld filler metal. There were twelve fabrication sketches (MS-1 to MS-12) prepared for the system. All material and fabrication information was shown on the sketches. The MTR's from all of the suppliers were reviewed and found to be in accordance with the respective ASTM specifications except one from the Linde Division of Union Carbide for 4995 lbs. of welding wire, heat Nos. 806C36 and 831T36. In this case Linde had failed to designate the AWS and ASTM specifications on the MTR as required by Gilbert Specification SP-5544. Mr. Robinson stated he had detected the omission and had contacted Linde. This item was discussed in the exit interview.

D. Radiography

The inspector reviewed radiographic films for six shop welds in selected assemblies of the Decay Heat Removal System (N-2). Each weld was radiographed 100% using four films and an Iridium-192 source. The

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radiographs and the techniques used were in accordance with Specification SP-5550 and USAS B31.7 (1968 Draft Code) requirements for all six welds. However, it appeared to the inspector that the masking effect of the weld reinforcement on the films for several welds tended to compromise adequate interpretation of the welds. The inspector noted all films had been signed as being acceptable. The questionable interpretation of films was discussed in the exit interview.

E. Items Discussed

The inspector inquired into the Warren shop ASME survey status and was told that no survey had yet been made and that a date for the survey was not available. The inspector inquired as to whether the completed nuclear piping for 3MI-1 required an NPP Stamp and NP-1 Data Forms. He was told this was not a requirement as the contract with Grinnell predated this code requirement.

The inspector inquired into Grinnell's method for correlating longitudinal seam RT films with cut pieces of pipe. Mr. Robinson said that the shop was provided cutting maps for seam welded nuclear pipe, and that pieces were cut off in sequence from the zero end so the supplier's RT films could be recorded for each cut piece. In addition, he stated that all original stamped identities were transferred to each cut piece.

The inspector inquired into the Warren shop's provisions for segregation of nonconforming material. He was told that a locked room is now in use.

F. Exit Interview

An exit interview was held on November 18, 1970 prior to the completion of the inspection with personnel listed in the "Scope of Inspection". The interview was held early to facilitate previous commitments on the part of Mr. Allen.

Discussion was as follows:

1. The inspector commented that he had observed some supplier MTR's came from warehouses with the original test data retyped on warehouse company letterheads. This transfer of data is of concern, the inspector said, because it could lead to questions regarding data authenticity. Mr. Robinson stated that he was constantly trying to get the original manufacturer's MTR's

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with proper certification of all ASTM tests performed. Mr. Allen stated that he also is insisting on copies of original MTR's.

2. The inspector commented that MTR's from Linde for weld rod did not specify the AWS or ASTM identity of the rod. Mr. Robinson stated that he had contacted Linde in regard to this omission and was waiting for a reply.
3. The interview members were informed that interpretation of welds in the RHR system was difficult due to image masking caused by weld reinforcement irregularities and that Compliance would be interested in the applicant's interpretation of these weld films. Mr. Allen stated that he would take this matter under consideration.
4. The inspector advised Mr. Allen that, following a review of the inspection findings, the discrepant aspects of the inspection may be communicated to the Metropolitan Edison Company.

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