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INTEGRATED DOCUMENT

SPECIFICATION 9321-05-248-18-INT
FABRICATION OF PIPING SYSTEMS

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UNITED ENGINEERS & CONSTRUCTORS INC.
Philadelphia, Pennsylvania 19105

INFORMATION

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Specification

for

Fabrication of Piping Systems

Westinghouse Electric Corporation
Indian Point Generating Station-Unit No. 3
Consolidated Edison Company of New York

Date: December 16, 1968
Rev. 5: April 21, 1975 (by C.E.)* Specification No. 9321-05-248-18-INT

* Includes U.E. & C Addenda No's 1 thru 15 and updating of Technical Society data.

I N D E X

Spec. No. 9321-05-248-18-INT (R-
Rev. 1) July 20, 1970 Add.
Rev. 5) April 21, 1975

SECTION 1 GENERAL INFORMATION

Owner	Consolidated Edison Company of New York, Inc.
Engineer-Constructor (Purchaser) ...	United Engineers & Constructors, Inc. 1401 Arch Street Philadelphia, Pennsylvania 19105
Description	Specification for Fabrication of Piping Systems for Indian Point Generating Station, Unit No. 3

SECTION 2 SCOPE OF WORK

2.1 Work by Shop Fabricator

2.1.1 Furnish all labor and supervision, tools, equipment and material to completely shop detail, shop fabricate, inspect, test, clean, prepare for shipment and deliver to the jobsite all piping systems 3" and larger as shown on the drawings and in accordance with the requirements of this specification and including the following:

2.1.2 All branch nozzles, vent, drain, sample and instrument connections as required and shown on the drawings connecting to piping systems 3" and larger. Add.#

2.1.3 All welded and flanged fittings for the above systems;

2.1.4 All bored sections of pipe;

2.1.5 Installation of flow nozzles, which are furnished by Others, in accordance with the instructions of the Supplier;

2.1.6 Shipment of flow meter runs after installation of flow nozzles to meter manufacturer or laboratory for calibration of his equipment, if required;

2.1.7 Connection to piping of all welded hanger, anchor, support and restraint lugs which are furnished by Others.

2.1.8 All end plates for Main Steam and Feedwater piping penetrations of the Containment Building.

2.1.9 Furnish copies of Quality Control records relative to material certification and non-destructive testing as required herein and documents as required under Section 7 of this specification.

2.2 Work by Others

2.2.1 Unloading, storage and erection of shop fabricated piping assemblies.

2.2.2 Fabrication of piping systems 2 1/2" in size and smaller.

2.2.3 Hanger design, fabrication and erection. Welded hanger attachments will be provided by Others for attachment in the Fabricator's shop.

2.2.4 Insulation, weather-proofing and finish painting.

2.2.5 Valves, traps, orifice plates, strainers, expansion joints and accessories.

2.2.6 Bolts, nuts, gaskets, consumable insert rings and backing rings for field made joints. Add.

2.2.7 Flow nozzles-supplied to Seller for installation in shop fabricated pipe.

2.2.8 Plumbing.

2.2.9 Potable water connection to Unit No. 1 supply header and piping to Unit 3 services.

2.2.10 Yard fire protection piping.

2.2.11 Standpipe fire protection piping.

2.2.12 Heating, ventilation and air conditioning systems.

2.2.13 Crossover piping (reheater-moisture separator to low pressure turbines).

2.2.14 Crossunder piping (high pressure turbine exhaust to moisture separators).

2.2.15 Steam piping from turbine stop valves to high pressure turbine casing inlet.

2.2.16 Reactor coolant system piping including pressurizer surge line.

2.2.17 Underground equipment and floor drains in Primary Auxiliary Building, Fuel Storage Building and Trenches.

2.2.18 Floor and wall sleeves.

2.2.19 Service water piping.

2.2.20 Circulating water and deicing piping.

2.2.21 Turbine-Generator piping consisting of turbine oil supply and drain piping, oil drain guard piping, generator seal oil piping, steam seal piping from gland steam regulator, gland seal leakoff to gland steam condenser, low pressure valve stem leakoff to gland steam condenser, gland steam piping inside of condenser shell and extraction steam to feedwater heaters No. 1 and 2.

2.2.22 Coating and wrapping of all underground piping in accordance with AWWA Spec. C-203.

SECTION 3 FABRICATION OF PIPING SYSTEMS

3.1 Drawings

3.1.1 For bidding purposes, the Engineer will supply one (1) transparency of each piping drawing marked "For Unit No. 3 Bidding Purposes Only." Unit 2 drawings will be used for bidding. The Engineer will have on file a record set of prints. Add

3.1.2 After award of contract, the Engineer will supply one (1) transparency of each piping drawing. These drawings and/ or the transmittal letter will indicate that the drawings are issued for 1) ordering material, 2) detailing, fabrication and construction or 3) revised. Drawings will indicate the prefix to be used for detail sheets and piece marks. Certain drawings will indicate the location of field welds and pipe piece mark numbers which are to be used by the Fabricator. Add

3.1.3 The Fabricator, upon receipt of drawings issued for detailing, fabrication and construction, shall prepare an isometric stretch-out for each piping system. The isometric shall contain complete information for the piping shown including overall dimensions, location of instrument, vent and drain connections, applicable ASTM specifications, piping system classification, seismic classification, heat treatment, welding procedure, non-destructive testing required, stress relief required, location of field welds and piece mark identification. The isometric will serve as the base quality control document for the piping system. Other documents, as enumerated in Section 7 Records, are to be attached to the isometric for incorporation in the Project Quality Control file. Add.

3.1.4 The Fabricator shall submit two(2) prints and one(1) transparency of each isometric for the Engineer's approval to: Add.#

Con Edison Co. of NY
4 Irving Place
N.Y.C., N. Y. 10003
Attn:

Con Edison Co. of N.Y.
Indian Point Station
Unit No. 3
Buchanan,N.Y. 10511
Attn:

(R-5

3.1.5 Isometrics will be examined by the Engineer for overall dimensions and conformance with this specification. The Engineer will mark the isometrics with information regarding the exact location of welded hanger, anchor, support and restraint lugs,where required,and return one copy either approved or marked,showing changes required. When changes are required, isometrics shall be resubmitted promptly, with revisions clearly marked, until finally approved. When approved, the isometric is released for fabrication. Add.#6,7

3.1.6 The Fabricator, upon receipt of approved isometrics shall shop detail all piping systems. Each detail sheet shall contain complete information for one finished fabrication including applicable ASTM material specifications, heat treatment, welding procedure, non-destructive testing required, stress relieving, and shall contain a complete Bill of Material for the fabrication shown. The detail sheet shall contain piece mark and the estimated weight for the finished fabrication. Identical pieces will require duplicate detail sheets, each with a unique piece mark number. Each weld shown on the detail sheet will be assigned a unique identification letter. Adc

3.1.7 The Fabricator shall submit four (4) prints and three (3) transparencies of each approved isometric and each detail sheet to: Add

Con Edison Co. of NY
4 Irving Place
N.Y.C., NY 10003
Attn:

Con Edison Co. of NY
Indian Point Station
Unit No. 3
Buchanan, NY 10511
Attn: (R-

3.2 Fabrication

3.2.1 Codes

3.2.1.1 The fabrication of all piping shall meet the requirements of the latest edition of the American National Standards Institute, Code for Pressure Piping, ANSI B31.1 as modified by appropriate code cases and other portions of this specification. If conflict should occur between referenced codes, the drawings and/or this specification, such conflict shall be brought to attention of the Engineer for resolution. (R-

Add.#

3.2.1.2 The dimensions of all piping components shall meet the requirements of applicable American National Standards Institute publications. (R-5

3.2.2 Materials

3.2.2.1 All pipe materials shall be of American manufacture and shall be in accordance with Section 8 and 9 of this specification, piping schedule and material. No substitutions of specified material shall be made without the prior written approval of the Purchaser.

3.2.2.2 The Fabricator shall supply certification of material conformance to specification requirements in the manner described in Section 7 of this specification for all materials incorporated as a part of the work.

3.2.3 Workmanship

3.2.3.1 All workmanship shall be in accordance with the methods and procedures of best recognized pipe fabrication and must be done in a good and workmanlike manner.

3.2.3.2 Flanged or welded nozzles, branch connections, welding outlets, adaptors and taps shall be true and faced at right angles to the axis of the pipes to insure accurate fit. Connections shall not extend inside the pipe.

3.2.3.3 Bends, offsets and branch connections shall be made true to the sizes, dimensions, angles and radii indicated on the drawings, with ends true and faced at right angles to the axis of the pipe.

3.2.3.4 Bends shall be made to five (5) times the nominal pipe diameter, except where shown otherwise on the drawings. Finished bends shall be generally smooth in contour and free from excessive buckles and distortion. The cross section of the pipe shall not be changed by more than 8% from the original dimensions, out of roundness, etc.. Add.

3.2.3.5 Bends made to three (3) times the nominal pipe diameter, which are hot-coined to a uniform wall thickness, may be substituted for five (5) diameter bends subject to prior approval of the Purchaser and the requirements of Paragraph 3.2.3.4.

3.2.3.6 Bends may be made either hot or cold. Hot bends shall be made with sand packing.

3.2.4 Specific Requirements

3.2.4.1 Piping shall be fabricated in the largest practical sections to minimize the number of field joints.

3.2.4.2 Mitering of pipe to form elbows is permitted only where shown clearly on the drawings.

3.2.4.3 Branch connections may be made with either welding tees, branch outlet fittings (Bonney Forge weld-o-let or sweep-o-let or equal) or reinforced branch welded connections made in accordance with the ANSI Code for Pressure Piping, ANSI B31.1, and the following restrictions: (R-5

For radioactive service:

when the branch size equals the run size, use welding tee; when the branch size is greater than one-half the run size, use reducing welding tee; when the branch size is less than or equal to one-half the run size, use either reducing welding tee, forged branch outlet fitting or welded branch connection.

For non-radioactive service:

when the branch size equals the run size, use welding tee; when branch size is less than the run size, use either reducing welding tee, forged branch outlet connection or welded branch connection.

3.2.4.4 Branch welding outlet fittings shall be forged steel, flared for improved flow where attached to the run, reinforced against external stresses and shall be of ANSI schedule number and pressure -temperature rating compatible with that of the piping to which it is attached. In large sizes these may be furnished as castings. (R-5,

3.2.4.5 The use of extruded outlet headers will not be approved by the Engineer. Add.#

3.2.4.6 Socket welding and threaded connections on pipe lines shall be made by half coupling or forged outlet fittings, Bonney Forge or equal. Fittings and couplings shall be of sufficient weight to satisfy reinforcement requirements and pressure -temperature ratings compatible with the pipe to which it is attached. Half couplings shall be machine beveled to provide for a full penetration weld. The holes in pipe headers made for these connections shall be drilled the same size as coupling inside diameter. All burrs shall be removed and threaded couplings shall be re-tapped after welding.

3.2.5 Welding - General

3.2.5.1 Welding shall at all times be acceptable to authorized representatives of the Owner, the Constructor and the Engineer. Add.#9

3.2.5.2 Welding shall be in accordance with Chapter V of the ANSI Code for Pressure Piping, ANSI B31.1, and the special requirements of this specification. (R-5)

3.2.5.3 Welding shall be done in accordance with United Engineers Welding Specifications or alternate specifications approved by the Engineer. Add.

3.2.5.4 Welding procedures, welders and welding operators shall be qualified in accordance with the ASME Boiler and Pressure Vessel Code, Section IX, Welding Qualifications.

3.2.5.5 Three (3) certified copies of each procedure qualification test shall be furnished to the Engineer. Add.

3.2.5.6 Welder and welding operator qualification certificates shall be maintained on file by the Fabricator and will be subject to review by the Engineer at all times. Add.

3.2.5.7 Welding shall be done in accordance with qualified procedures, and shall be performed by qualified welders and welding operators. In addition, welders employing open-butt joint design shall have performed an open-butt weld within the three month period prescribed in ASME Section IX for renewal of performance qualification. Add.

3.2.5.8 The expense of instruction, testing and qualification of welders shall be borne by the Fabricator.

3.2.5.9 The Fabricator shall maintain a permanent record of each weld and the welder(s) employed at each joint. When more than one welder in employed on a single joint, the record shall indicate the portion(s) accomplish by each welder.

3.2.5.10 All material used in welding, preheating and stress relieving shall be in accordance with the ANSI Code for Pressure Piping, ANSI B31.1, and is subject to approval by the Engineer. (R-5 Add.

3.2.5.11 All welds shall be full penetration welds with the exception of socket welds. This applies to pipe butt welds, instrument, vent and drain connections and welded attachments used for the purpose of support, thermal, seismic or pipe whip restraints. Add.

3.2.5.12 All surfaces, 2 inches on each side of a joint, shall be free from foundry or mill scale, rust, sand, slag, paint, marking and temperature crayon or ink, alkaline cleaner residue, low melting point rust preventatives, and any type of surface oxide or dirt. These may be removed by machining, wirebrushing, grinding, or abrasive blasting with angular alumina or silicon carbide grit which is free of lead, zinc, brass, tin, etc. Remove all oil and grease from all surfaces, 12 inches on each side of a weld joint, using acetone or alcohol. All grinding shall be done using only rubber or resin bonded aluminum oxide or silicon carbide grinding wheels which have not previously been used on lead, zinc, brass, tin, etc. Add.

3.2.5.13 The use of jigs, fixtures, and clamps is recommended in the handling and assembly of parts to be welded. When tack welds are used, they shall be deposited with approved filler metal in complete conformance with the provisions of an approved welding procedure. Tack welds shall be kept to a minimum number and size. When they are not removed, but are to be incorporated into the finished weld, they shall be ground so that they do not exceed 1/16 inch in thickness and their edges feathered prior to depositing subsequent weld metal. Add.#9

3.2.5.14 Tungsten arc welding without the uniform addition of filler metal shall not be used for tack welding or joining base materials; nor shall it be used on joints for the purpose of surface finishing, sometimes called "wash pass" welding. Add.#9

3.2.5.15 The inert gas tungsten arc welding process using a consumable insert or open-butt design accompanied by the uniform addition of filler metal and employing welding grade argon gas on the reverse side of the weld, shall be used on the root pass of all butt welds in Class 1 and Class 2 seismic systems. Add.#9,12

3.2.5.16 Consumable insert rings are preferred in accomplishing the root pass. When using the open-butt technique, the filler rod should be held tangential to the root of the welding groove and fused to the root lands of the joint by manipulation of the torch. The rod is consumed into the root of the weld without force feeding simulating the same condition as a consumable insert. Add.#9 Add.#12

3.2.5.17 Prior to welding, the purging gas shall be analyzed with a gas analyzer at the exit side of the joint to assure that the gas passing the joint contains less than 1% oxygen, or the purging gas shall be allowed to flow for a sufficient length of time to provide at least six volume changes within the pipe chamber. Add.#9

3.2.5.18 The insert gas purge shall be maintained during tack welding and until weld metal has been deposited to a thickness of 3/16 inch or three layers, whichever is greater. Add.#9

3.2.5.19 Backing rings may be used in accordance with the requirements and limitations of Section 8 of this specification for the piping system described therein. Add.#9

3.2.5.20 Backing rings shall not be permanently left in place at any welds in Class 1 Seismic piping systems or any piping inside the Containment Building. Backing rings may be employed in the system above provided that the reverse side of the weld is accessible for examination, the ring is removed, the reverse side is cleaned up and/or repaired to sound metal and so verified by liquid penetrant examination. Add.#9

3.2.5.21 If split backing rings are used, whether they remain in place or are removed, the ring shall be fitted, sized and welded to form an integral ring prior to making the pipe weld. Add

3.2.5.22 The crater of each bead deposited in the first layer and on groove faces shall be removed by grinding before depositing the next successive pass of weld metal. All craters in subsequent passes shall be visually examined for soundness and all questionable craters shall be removed by grinding and then rewelded. No welds shall be peened. Add.

3.2.5.23 Weld metal layers generally shall not exceed 1/8 inch in thickness in order that a minimum amount of penetration of base metal will result. All welds shall be deposited as stringer beads. Weaving shall not exceed four electrode diameters or one-fourth the gas cup orifice inside diameter. The manner of depositing weld metal shall be such that cutting of a groove face shall be held to a minimum. Undercutting of a groove face in excess of 1/32 inch shall be blended in by grinding before depositing the next layer of weld metal. Undercutting at the toe of a weld shall not exceed ten percent of the material thickness or 1/64 inch whichever is smaller. Undercutting exceeding these limits shall be corrected by depositing a cover pass of weld metal. Sharp changes in section at the toe of any weld shall be eliminated by grinding, taking care to avoid thinning of the base metal. Add.

3.2.5.24 The final surface of all welds shall be free of sharp surface irregularities, intermittent hollows and bumps. The weld surface finish shall not exceed a roughness value of 1000 RMS. In no case shall the surface condition interfere with the interpretation of liquid penetrant, magnetic particle or radiographic examinations. The weld reverse side shall be clean, smooth and free from the presence of icicles, lumps, slag accumulations and excessive oxidation. Add.

3.2.6 Welding - Stainless Steel

3.2.6.1 Pipe cutting shall be performed by machining, sawing or ironfree aluminum oxide abrasive discs, which have not previously been used on other types of materials. If power or arc cutting is used, all remaining slag, scale, or oxides shall be removed by machining or grinding the cut end.

3.2.6.2 All pipe ends in stainless steel piping 3" and larger in diameter shall be prepared for field welding in accordance with Westinghouse Drawing 498 B 932, "Weld Preparation for Stainless Steel P[illegible] with Consumable insert."

3.2.6.3 All pipe ends in [illegible]inless steel piping 3" and larger in diameter shall be [illegible]epared for shop welding in accordance with Westinghouse Drawing 498 B 932 or alternate approved by the Engineer. Add.

3.2.6.4 All pipe ends in stainless steel piping 2 inch and smaller shall be prepared for socket welding with square cut plain end. All burrs, both inside and outside, shall be removed. Add.

3.2.6.5 The interpass temperature shall not exceed 350 F in austenitic stainless steel welds. Add.

3.2.6.6 All wire brushing on stainless steel shall be done using stainless steel brushes which have not previously been used on other types of materials. Add.

3.2.7 Welding - Carbon Steel

3.2.7.1 Pipe cutting shall be performed by machining, sawing or roll pipe cutters. If oxy-acetylene burning is used, all remaining slag, scale, or oxides shall be removed by machining or grinding the cut end to sound base metal and to provide a smooth, notch free contour. Add.

3.2.7.2 All pipe ends in carbon steel piping 2 1/2 inch and larger in Class 1 and Class 2 Seismic systems shall be prepared for field welding in accordance with PFI Standard ES-21, "End Preparation for Manual Inert-Gas Tungsten-Arc Root-pass Welding". Add.

3.2.7.3 All pipe ends in carbon steel piping 2 1/2 inch and larger in Class 1 and Class 2 Seismic systems shall be prepared for shop welding in accordance with PFI Standard ES-31, "End Preparation for Manual Inert-Arc Root-pass Welding" or alternate approved by the Engineer. Add.

3.2.7.4 All pipe ends in carbon steel piping 2 1/2 inch and larger in Class 3 Seismic systems shall be prepared for shop and field welding in accordance with ANSI Standard for Butt Welding End: Pipe, Valves, Flanges and Fittings, ANSI B16.25 or alternate approved by the Engineer. Add. (R-3

3.2.7.5 All pipe ends in carbon steel piping 2 inch and smaller shall be prepared for socket welding with square cut plain end. All burrs, inside and outside, shall be removed. Add.

3.2.7.6 The metallic inert gas welding process may be used for welding the root pass only when the reverse side is accessible for cleaning, visual inspection and repair. Add.

3.2.8 Welding - Alloy Steel

3.2.8.1 All pipe ends in alloy steel piping 2 1/2 inch and larger will be prepared in accordance with PFI Standard ES-21, "End Preparation for Manual Inert Gas Tungsten-Arc Root-pass Welding." Add.

3.2.8.2 The inert gas tungsten arc process, employing a consumable insert ring and welding grade argon gas on the reverse side of the weld, shall be used on the root pass of all butt welds. Add

3.2.9 Welding - Dissimilar Metals Add.

3.2.9.1 Welds joining piping materials of different P - numbers grouping (ASME Section IX) shall be made using the inert gas tungsten arc welding process using a consumable insert ring and with welding grade argon gas on the reverse side. Add.

3.2.9.2 Welds joining ferrous and non-ferrous piping materials shall be made using the inert gas tungsten arc welding process, using a consumable insert ring, and with welding grade argon gas on the reverse side. Add.

3.2.9.3 A dissimilar metal assembly using a solid plug which is bored to the pipe inside diameter after welding may be substituted for the welding process described in Paragraphs 3.2.9.1 and 3.2.9.2 Add.

3.2.9.4 Welds joining piping material to other materials, such as plates, shall be made using the inert gas tungsten arc welding process with uniform addition of filler metal for the root pass. A shielded metal arc process may be used to complete the weld. Add.

3.2.9.5 Deleted Add.

3.2.9.6 Deleted Add.

3.2.10 Welding - Socket Welds Add.

3.2.10.1 Socket welded joints shall require pipe ends cut square and reamed internally. The pipe end shall be fully bottomed in the socket, marked at the shoulder, withdrawn 1/16 inches, and tack welded in this position. The use of paper spacers for socket welding gaps will not be permitted. Add.

3.2.10.2 The inert gas shielded tungsten arc welding process with the uniform addition of filler metal and with welding grade argon gas on the reverse side shall be used for all socket welds. Add.

3.2.11 Welding - Pipe Attachments Add.

3.2.11.1 Attachments which are to be welded to piping for the purpose of support, thermal, seismic or pipe whip restraint shall be made of the same type and grade as the pipe material. Add.

3.2.11.2 The weld joint design for attachments to Class 1 and Class 2 seismic systems shall provide for full weld penetration. Add

3.2.12 Heat Treatment Add

3.2.12.1 Heat treatment for piping systems shall be in accordance with the ANSI Code for Pressure Piping, ANSI B31.1. When welding dissimilar metals the fabricator shall submit a detailed heat treatment procedure to the engineer in the manner described in Section 7 of this specification. Add (R- Add.-

3.2.12.2 Post-bending solution anneal heat treatment is required for hot-bent austenitic stainless steel pipe bends. The bends or entire pipe assembly shall be uniformly heated to a range 1900 to 1950 F. This temperature shall be maintained for one hour plus one hour per inch of wall thickness followed by rapid cooling using water quench (preferred method), water spray, or high velocity air blast. Add.

3.2.12.3 Post-bending heat treatment is not required for hot-bent carbon steel bends provided the temperature at which bending is performed is at least 1650 F but not greater than 1800 F. If bending is performed at temperature higher than 1800 F, bending and and post-bending heat treatment procedures shall be submitted to the Engineer for approval, prior to use. Add.

3.2.12.4 Stress relieving shall be performed after all attachments, including hanger lugs, are made. Add.- Add.#1

3.2.12.5 Welds in stainless steel piping shall not be stress relieved. Welded joints between stainless steel and carbon steel shall not be stress relieved. Add.-

3.2.12.6 Copies of heat treatment and stress relief charts shall be furnished to the Engineer in the manner described in Section 7 of this specification. Add.-

3.2.12.7 The use of propane torches in stress relieving procedures is not pemitted. In furnace heat treatment, direct impingement of the flame on the material shall be avoided. Add. #1

3.2.12.8 Rate of heating and cooling shall be indicated on the heat treatment chart. Add. #1

SECTION 4 INSPECTION AND TESTS

4.1 Prior to fabrication:

4.1.1 All materials to be used in the fabrication of piping systems shall receive a thorough visual examination for damage. Damaged material shall be rejected for use on this project or shall be repaired. The procedure for repair of damaged material will require the Engineer's approval. Add.

4.1.2 The Fabricator shall ascertain that all materials meet the requirements of the applicable ASTM specification and that properly executed certificates of compliance, mill test reports, etc., are available for incorporation into the Quality Control records.

4.2 During and after fabrication:

4.2.1 The Fabricator shall inspect the work of each person employed by him to assure himself that the work being done in accordance with the approved welding procedures and this specification.

4.2.2 Carbon steel pipe bends shall be examined by the magnetic particle inspection method over the outer half of the circumference and over the entire length of the bend and including one pipe diameter of tangent ends. Add.

4.2.3 Stainless and alloy steel pipe bends shall be examined by the liquid penetrant inspection method over the outer half of the circumference and over the entire length of the bend and including one pipe diameter of tangent ends. Add.

4.2.4 All welds shall be carefully visually examined on both inside and outside surfaces wherever accessible. Additional inspections to assure quality of welds shall be performed and shall be radiographic, liquid penetrant or magnetic particle as listed below for the various classes and services of piping systems.

4.2.5 All full penetration butt-welds joining dissimilar materials shall be 100% radiographed. All other welds joining dissimilar materials shall have their root and final passes examined by the liquid penetrant inspection method.

4.2.6 Radiographic inspection of butt welds shall be performed and evaluated in accordance with the ASME Boiler & Pressure Vessel Code, Section VIII, paragraph UW-51, for both random and 100% radiography.

4.2 7 The 10% random radiographic inspection is defined as the random selection (preferably by use of a Table of Random Numbers) of 10% of the completed welds made by each welder. The welds thus selected shall be 100% radiographed. Random radiographic inspection does not imply partial radiography of a weld nor does it imply that the acceptance standard is other than that specified.

4.2.8 The 10% random radiographic inspection shall apply to each welder's work per shift, but not less than one weld of each welder's production per shift shall be radiographed. Add.

4.2.9 Evidence of unacceptable quality corresponding to random 10% radiography shall require an additional 10% random inspection of the remaining unradiographed welds of the sampling group. If no rejectable welds are found in this additional 10% sampling, the welders subsequent work shall be subject to only the original radiographic inspection frequency. If additional rejectable welds are revealed in this additional 10% sampling, the entire sampling group shall be 100% radiographed and the welders subsequent work in areas requiring radiographic inspection shall be 100% radiographed.

4.2.10 Liquid penetrant inspection shall be performed in accordance with the ASME Boiler & Pressure Vessel Code, Section VIII, Appendix VIII. The acceptance standard shall be in accordance with that defined in the ANSI Code Case N-10. (R-

4.2.11 Magnetic particle inspection may be substituted for liquid penetrant inspection in carbon steel pipe. If the substitution is made, the magnetic particle inspection and acceptance standards shall be in accordance with the ASME Boiler & Pressure Vessel Code, Section VIII, Appendix VI. Add.

4.2.12 The root pass of all welds, both butt welds and socket welds, in Class 1 and Class II seismic piping and which are not subject to radiographic inspection shall receive a thorough visual examination. This examination shall be performed under adequate lighting conditions by a person having normal visual acuity (20-20 vision either aided or unaided) and with the use of a 5X magnifying glass. Unacceptable conditions found by this examination and which require repair are cracks, lack of fusion, undercutting, porosity beyond the acceptance standards of the ASME Boiler and Pressure Vessel Code, Section VIII and excessive irregularities.

4.2.13 Branch welds shall be liquid penetrant inspected on both the outside surface of the finished weld and if accessible, at the inside weld root.

4.2.14 Liquid penetrant dyes and developers shall be free of chlorides and halides and so certified in accordance with the requirements of Section 7 of this specification.

4.2.15 The finished fabrication shall receive a thorough visual examination for surface damage. All nicks, abrasions, are strikes and other defects which create an notch effect shall be removed by grinding and blending taking care to avoid thinning the base material below the minimum required wall thickness. Weld repairs may be made to those defects that infringe on minimum wall requirements only if a complete record of the defect, including location and extent, and repair are maintained and the welding is performed by a qualified welder in accordance with an approved welding procedure. Add.#

4.2.16 Shop hydrostatic testing of the completed piping subassemblies is not required; however, the Seller shall certify that all materials and welds furnished to the Purchaser shall be capable of withstanding the hydrostatic tests as governed by the ANSI Code for Pressure Piping ANSI B31.1, paragraph 137.4. This hydrostatic test will be performed by Others after completion of erection of each system. (R-#

4.2.17 Inspection or audit by the Engineer or his authorized representative, shall in no way relieve the Fabricator of his responsibility for providing finished material in full accordance with this specification. Add.#

4.2.18 A visual fit-up inspection shall be performed by a Quality Control representative and documented accordingly for each weld where the open-butt technique of inert gas tungsten arc welding process is to be employed. Add.#1

4.2.19 Except for butt welds joining dissimilar metals, welds in pipe materials less than 1/4 inch thick do not require radiographic inspection. Add.#1

CLASS	FINISHED WELD LIQUID PENETRANT		RADIOGRAPHY BUTT WELDS ONLY	
	SOCKET WELDS (2)	BUTT WELDS	RANDOM 10%	100%
151N	X	X	X (1)	
151R	X	X		X (1)
152N	X	X	X (1)	
152R	X	X		X (1)
301N	X	X	X (1)	
301R	X	X		X (1)
302N	X	X	X (1)	
302R	X	X		X (1)
601N	X	X	X	
601R	X	X		X
602N	X	X	X	
602R	X	X		X
901N	X	X	X	
901R	X	X		X
902N	X	X	X	
902R	X	X		X
903N	X	X	X	
903R	X	X		X
1501N	X	X	X	
1501R	X	X		X
1502N	X	X	X	
1502R	X	X		X
2501N	X	X	X	
2501R	X	X		X
2502N	X	X	X	
2502R	X	X		X
2503N	X	X	X	
2503R	X	X		X
2505	X			

(R-3

NOTES: (1) Class 1 and Class 2 Seismic Only, and para 4.2.19. Add.#8,1

(2) The finished surface of socket welds in reactor coolant, Add.#1 safety injection, residual heat removal, chemical and volume control, and component cooling systems shall be 100 percent liquid penetrant inspected. For piping systems other than those listed above, the finished surface of socket welds in piping subjected to operating conditions in excess of either 150 psig pressure or 212 F temperature shall be liquid penetrant inspected.

	LIQUID PENETRANT		RADIOGRAPHY	
	FINISHED WELD		BRANCH AND BUTT WELDS	
PIPE CLASS	SOCKET WELD	BUTT WELD	10%	100%
A-1 Class 1 Seismic	X	X		X
A-1 Class 3 Seismic				18" & Larger
B-1 Class 1 Seismic	X	X		X
B-1 Class 3 Seismic				12" & Larger
B-2	X	X		X
C-3 Class 1 Seismic	X	X	X	
E-1 Class 1 Seismic	X	X	X	
J-3	X	X	X	
K-2	X	X	X	
K-3	X	X	X	
N-1	X	X	X	
N-2	X	X	X	
N-3	X	X	X	

SECTION 5 CLEANING AND PAINTING

5.1 Straight lengths of carbon steel pipe and carbon steel fittings shall be internally cleaned by power wire brush or by grit blasting using aluminum oxide or chilled iron grit. Internal cleaning shall remove all lacquer or other preservatives.

5.2 Straight lengths of stainless steel pipe and stainless steel fittings shall be internally cleaned by power wire brush using 18-8 stainless steel wire brush not previously used on other materials, or by grit blasting using aluminum oxide or silicon carbide grit.

5.3 Chilled iron grit shall not be used for any cleaning operation of stainless steel material.

5.4 Wire brushing or grit blasting shall be done after fabrication if conditions and equipment permit, but may be done prior to fabrication.

5.5 Pipe bends in carbon steel pipe shall be cleaned after forming by grit blasting using aluminum oxide or chilled iron grit; the use of silicon is prohibited.

5.6 Pipe bends in stainless steel pipe may be cleaned after forming by grit blasting using aluminum oxide or silicon carbide grit or by acid pickling. Pickling must be done only after solution anneal heat-treatment.

5.7 Shot blasting will not be permitted for any cleaning operation.

5.8 All lube oil and diesel fuel oil piping fabrications shall be cleaned, acid pickled and internally coated in general conformity with the following procedure. The fabricator shall submit a detailed procedure for the review of the Engineer. Add.-

5.8.1 Completely coat flange faces, threaded pipe ends and connections and all other nondetachable surfaces subject to harmful acid attack with acid resistant protection compound. Add.-

5.8.2 Clean with an aqueous solution consisting of 10 to 15 oz. of alkaline detergent cleaner per gallon of water, heated to 180-200 F for 15 to 30 minutes; rinse with hot water at 160-180 F for 30 minutes.

5.8.3 Pickle with a 10% by volume sulphuric acid solution maintained at 160-180 F for 30 minutes followed by a hot water rinse at 160-180 F for 30 minutes.

5.8.4 After completion of the alkaline and acid baths, drain, airblast dry, and spray or swab the interior of the piping with a rust preventative within 30 minutes of the last cleaning process.

5.85 The following rust preventatives may be used:

Tectyl 894 - Valvoline Oil Company
Nox Rust 208 - Danbert Chemical Company
Gulf Coat TD - Gulf Oil Company

5.9 Immediately prior to sealing, the fabrication shall be wiped, swabbed, or rinsed out to remove all loose material, rust, grinding and blasting grit, oil and grease, leaving the inside surfaces clean and smooth. No preservative coating will be applied except for lube oil piping as required by paragraph 5.8.4.

5.10 Weld ends of carbon steel fabrications shall be coated with Deoxaluminite, as manufactured by Special Chemicals Corporation, except those weld ends already coated with mill lacquer. Add.

5.11 Final cleaning and sealing of the fabrications shall be done in an area free of dirt and dirt producing operations.

5.12 The outside surfaces of all carbon steel piping fabrications shall be painted with one coat of rust inhibiting, heat resistant primer or heat resistant, clear lacquer. Painting may be done after final preparation for shipment, provided all surfaces are suitably protected. The outside surfaces of all carbon steel fabrications of the Auxiliary Coolant System inside the Containment Building shall be painted with one coat of Carbo Zinc No. 11 as manufactured by Carboline Co. of St. Louis, Missouri. All surface preparation and painting shall be in strict accordance with the paint manufacturers recommendations. Add. #1

5.13 Stainless steel and aluminum fabrications shall not be painted.

5.14 Each fabrication shall have piece marks in at least two separate and distinct places. The piece marks shall correspond to piece marks on detail sheets specified in Section 3.

SECTION 6 PREPARATION FOR SHIPMENT

6.1 Pipe ends prepared for field welding shall be provided with spun-metal type caps securely fastened. Bent shim metal or other types of caps are not acceptable as protective covers.

6.2 Flanged connections shall be provided with one inch thick marine grade plywood blind flanges, bolted on.

6.3 Socket welding connections shall be provided with spun-metal caps securely fastened, or heavy plastic plugs.

6.4 Screwed connections shall be provided with carbon steel plugs or caps. Cast iron plugs and caps are not acceptable.

6.5 All spun-metal caps and blind flanges shall be sealed using a heavy duty, pressure sensitive, waterproof tape.

6.6 Loose material, such as bolts, nuts, gaskets and backing rings shall be securely packaged in waterproof containers. Each package shall contain material of the same type and size and a description of the contents shall be given in at least two separate and distinct locations on each package.

6.7 The fabricated piping shall be loaded using sufficient dunnage to prevent damage during shipment and to facilitate unloading at the site. Additional protection in the form of bracing, bundling or covering shall be provided to prevent damage during shipment. Add.#3

6.8 The preparation for shipment shall be such that, upon arrival at the jobsite, the load is essentially in the same condition as when it left the Fabricator's shop. The unloading of the shipment shall not jeopardize the safety of personnel nor shall it require extra-ordinary equipment.

6.9 All materials used and preparations made for shipment shall be suitable for an extended period of outdoor storage at the plant site without allowing the entrance of moisture, dirt or animals.

SECTION 7 RECORDS TO BE FURNISHED

7.1 Welding

7.1.1 Welding Procedure Specifications

Welding procedures employed shall be the UE&C Welding Specifications for Indian Point Units 2 and 3 attached. The Fabricator may elect to use other welding procedures provided these are submitted to the Engineer for approval prior to execution of any work. Weld repair procedures shall be included. Add.#

7.1.2 Three copies of Welding Procedure Certifications and test results shall be submitted to the Engineer for records. Add.#

7.1.3 Welder and welding operator qualification certificates pertinent to this work shall be maintained on file by the Fabricator and shall be available for review. Copies shall be submitted to the Engineer if required at a later date. Add.#

7.2 Quality Control Program

7.2.1 Within four weeks after receipt of the purchase order and prior to start of manufacturing, the fabricator shall submit to the Engineer a detailed inspection point program which the Fabricator and his subcontractors will follow as it will apply to this order. This program shall cover all operations from raw material procurement and subcontractor inspection through final preparation for shipment. It shall be designed to assure the quality and satisfactory performance of items to be fabricated and will reference applicable inspection data, material and other test reports required that will be generated as evidence of performance and acceptability of all test and inspection requirements. Add.#

7.2.2 After reviewing the Fabricator's inspection point program, the Engineer will determine mandatory inspection points where the Engineer will inspect, witness and/or require the Fabricator to submit evidence of inspection results. These points shall not be by-passed by the Fabricator unless prior authorization has been obtained from the Engineer. The Engineer's representatives inspection effort is not limited by those items appearing on the mandatory inspection points. Add.#

7.2.3 The Fabricator is responsible for the performance of his subcontractors and shall establish and maintain a Quality Control plan to provide surveillance, product and/or process verification at subcontractor's plants which ensures that applicable requirements are met.

7.2.4 Items to be covered in the inspection point program shall include but not necessarily be limited to:

a. Quality control organization
b. Material procurement
c. Material control continuity of identification
d. In process inspection - visual and dimensional
e. Heat treat and stress relieving inspection and verification of temperatures and holding times.
f. Welding inspection
   1) Qualifications
   2) Liquid penetrant inspection procedures and records
   3) Magnetic particle inspection procedures and records
   4) Radiographic inspection procedures and records
   5) Visual inspection
   6) Weld identification
g. Cleaning inspection procedures and records
h. Packaging and preparation for shipment inspection and records
i. Continuity and assembly of individual fabrication and system inspection and test records.

7.3 Documentation Required

7.3.1 Isometric - The Fabricator shall prepare an isometric drawing or drawings to cover each system. Three (3) copies of these isometrics shall be submitted to the Engineer prior to completion of any fabrication within the system. The isometric will show individual piece marks and limits of individual fabrications. Add.#7

7.3.2 Sketches - Sketches will be prepared as required in Section 3. Sketches will have attached to them sheets which contain the applicable material specifications, non-destructive testing requirements, heat treat or stress relief requirements, special cleaning requirements, weld identification, and packaging and protection requirements. As each step of fabrication and testing is completed, the process note will be initialled by the responsible party.

7.3.3 Material certifications - For items and fabrications in Class 1 seismic systems, mill test reports showing actual heat chemical and mechanical test results shall be submitted to the Engineer. Each item or part of a fabrication will be identifiable to an individual test report. This is termed UNIQUE item certification. Add.#7 Add.#8 Add. #11

For welding materials, i.e., electrodes, wire, consumable inserts, in Class 1 seismic systems, heat or manufacturers lot reports showing heat chemical and physical test results shall be submitted to the Engineer. For stainless steel material actual chemistry is required. These mill test Add.#

reports shall be identifiable to a Fabricator's "shop lot." All mill test reports for material from within this "shop lot" shall be submitted to the Engineer. Add.

On all other piping, a letter of compliance to material specification requirements including welding material, shall be furnished but may reference and apply to several fabrications within a system. The letter of compliance will indicate which fabrications are applicable and show the applicable material specification designation. In no case shall such a letter of compliance cover fabrications from more than one system. This is termed regular certification. Add.

7.3.4 Nondestructive Test Reports

For welds in the Class 1 seismic areas, individual reports covering all nondestructive tests on all welds in an individual fabrication will be prepared. These reports will contain the sketch number and system identification, a list of applicable weld numbers, tests performed on each weld, test procedure numbers, results of each test, date of each test and signature of the responsible person(s) performing the test and evaluating the results.

For all other piping, the results of nondestructive testing may be reported in the form of a letter of compliance listing the applicable fabrication numbers and weld numbers, tests performed, and a statement that all tests were performed in accordance with approved procedures and results were satisfactory in accordance with specification requirements. In no case shall such a letter of compliance cover welds in more than one system.

All of the above requirements also apply to liquid penetrant inspection of pipe bends.

Where a weld requires radiographic examination, copies of the radiographs shall be maintained as follows: radiographs for each weld shall be contained in a separate protective envelope. These envelopes will contain the applicable system identification, sketch number, weld number, list of radiographs enclosed, interpretation of each radiograph, and the signature of the responsible person who made the interpretation. Filing of radiographs will be by sketch number and system.

7.3.5 Visual inspection - all material and processes are subject to careful visual inspection and a letter of compliance verifying these inspections shall be submitted. These letters of compliance should cover items in not more than one system and will include the system identification and applicable sketch number(s).

7.3.6 Heat Treat and Stress Relief Charts

Copies of all heat treat and stress relief charts shall be furnished to the Engineer and shall be identifiable by system and sketch number. Add

7.4 Material and Process Control

The Fabricator shall establish a system of material and process control (such as sketches with attached process sheets as in 7.3.2 above), which will indicate the various material, process, inspection, and testing requirements applicable to an individual piece, pieces and complete fabrication. This system should be described and submitted to the Engineer for review. Individual steps of process, inspection, and testing shall be checked and initialled by the responsible party as the step is completed. Add.

The above system of records execution and maintenance is recommended to assure the required quality of the work and documentation thereof in a complete and orderly manner sufficient for absolute identification and quick recall.

If the Fabricator has similar methods of documentation which will accomplish the same end and satisfy the intent, these may be submitted to the Engineer for complete review and approval prior to execution of any work. Add.#

7.5 Submission of Reports and Records

Three copies of all required reports and records described in 7.3 above shall be submitted to the Engineer prior to shipment of any completed item to the job site. Add.#

Inasmuch as receipt of material at the project site will not be permitted until and unless required records and reports are available on site, a complete record and report package covering items in a shipment except weld material reports shall accompany the shipment. This package shall be attached to the shipment in a weatherproof envelope and be marked "Quality Control Document; Attention Con Edison Field Supervisor-Quality Control."

In addition, at the time the final shipment in a system is made, a letter shall be submitted indicating that all items and processes completed in the system comply with the requirements of the specifications and all required documents covering material, processes, inspections, and tests have been separately forwarded to the Engineer and shall list the dates and contents of previous submittals. At this time the Fabricator shall ship to the project site, Attention Con Edison Field Supervisor, Add.#7 (R-5)

Quality Control, one copy of all radiographs applicable to the system, including the original and all repair radiographs. A letter of transmittal shall accompany the radiographs and three copies of this letter shall be sent to the Purchaser.

7.6 Inspection Access

The Owner, Westinghouse Electric Corporation or the Engineer, and their representatives shall have access to work in progress in the Fabricator's facilities or his subcontractors facilities for inspection. The Fabricator shall provide or arrange for proper facilities for such access and for inspection purposes. The Fabricator shall perform an evaluation of the Quality Control or inspection system at subcontractor's plants at a frequency dependent upon their quality performance, and shall arrange for the Engineer's Quality Control participation in these evalua tions on subcontractor quality performance shall be maintained by the Fabricator and are subject to review of the Engineer's Quality Control representative as applicable to the material or equipment on this purchase order. Add

7.7 Deviations from Specifications

Should the Fabricator propose to deliver material or equipment which deviates from the requirements of the order, it is the Fabricator's responsibility to submit for approval, a description and evaluation of the deficiency in writing, certifying that the deviation will not affect the guarantee, function, safety, interchangeability, reliability or service life of the equipment.

7.8 Repair Procedures

Prior approval of repair procedures is required if the extent of the repair is beyond the scope of drawings, specifications or procedures approved by the Engineer. Add.#7

7.9 Notice of Inspection

Fabricator shall furnish the Engineer advance notice of inspection at least 72 hours prior to the time of inspection required at the specified Engineer's mandatory inspection hold point or prior to shipment whichever is applicable. Add.#7

7.10 Adequacy of Inspection Equipment

The Fabricator shall utilize appropriate gauging, measuring, and test equipment, and shall regularly calibrate his inspection equipment using appropriate standards traceable to the National Bureau of Standards. Records of such calibration shall be maintained by the Fabricator. If the Engineer's Quality Control representative has reason to question the accuracy of the calibration, he may require and witness recalibration of the questionable equipment. Add.

All measurements shall be determined using equipment capable of measuring accurately to at least 10% of the tolerance range specified. The discrimination (fineness of graduations) and sensitivity (smallest reading) of the inspection equipment used shall be adequate to assure this requirement is met.

7.11 Progress (or Status) Report

The Fabricator shall maintain a progress report showing the status of each piece of fabrication. Three (3) copies of this report shall be submitted to the Purchaser on the first working day of each month.

7.12 Purchase Orders

One (1) copy of all engineering bills of material for material to be purchased on this order and two (2) unpriced copies of all purchase orders shall be submitted to the Purchaser.

SECTION 8 - PIPING SCHEDULE & MATERIALS - TURBINE GENERATOR PLANT

This section of the specification contains material specifications for piping systems in the Turbine Generator Plant. The piping material sheets each contain a complete list of services for the particular class of piping.

Each material sheet also contains a symbol which will be used as a prefix for piping detail sheets, piece numbers, hanger detail sheets, hanger numbers and valve numbers.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS A-1
SYMBOL MS

Date December 16, 1968
Rev. 1) August 31, 1972

DESIGN PRESS. 1085 psig
DESIGN TEMP. 600° F

UE&C WELDING SPEC. No. 1 & No. 20

PIPE

28"	A-155 EFW	Gr. KC-70	Class 1	0.912" Min. wall
20" & 24"	A-106	Gr. C		Sch. 60
4" to 18"	A-106	Gr. B		Sch. 80
2-1/2", 3"	A-106	Gr. B		Sch. 40
2" & Smaller	A-106	Gr. B		Sch. 80

FITTINGS

2-1/2" to 18", A-234 Gr. WPB, Butt Weld, Sch. to match pipe
2" & Smaller , A-105 Gr. II, 3000# Socket Weld
20", 24" and 28" A-234 Gr. WPC, Butt Weld, Sch. to match pipe

FLANGES

2-1/2" to 28", A-105 Gr. II, 600# ASA R. F. Weld Neck
2" & Smaller , A-105 Gr. II, 600# ASA R.F. Socket Weld

VALVES

2-1/2" to 28", A-216 WCB, 600# ASA, Butt Weld ends, S.S. trim
2" & Smaller , A-105 Gr. II, 600# ASA, Socket Weld ends, S.S. trim

BOLTING A-193 Gr. B7 Full threaded bolt studs
A-194 Cl. 2H Semi-finished hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS None

BACKING RINGS

Class I Service - None - Use consumable insert and TIG welding
Class 3 Service - 2-1/2" & larger, Split commercial type with short nubs

CLASS A-1

SYMBOL MS

SERVICE Class 1 Seismic

1. Main steam piping from steam generator to outlet of second valve.
2. Main steam piping to atmospheric relief valves and steam generator relief valves.
3. Main steam piping to auxiliary feedwater pump turbine.
4. Valve by-passes, line vents and drains on above lines.
5. Instrument piping on above lines through first stop valve.
6. Trap piping on above lines through trap and by-pass valve.

SERVICE Class 3 Seismic

1. Main Steam piping from outlet of second valve to turbine.
2. Main steam headers to -

   Reheaters

   Boiler feed pump turbines

   Steam seal regulator

   Turbine by-pass (dump) steam lines to condensers.

   Steam jet air ejectors.
3. Valve stem leak-off to gland steam condenser.
4. High pressure turbine drains.
5. Vents and drains on above lines.
6. Instrument piping on above lines through first stop valve.
7. Trap piping on above lines through last stop valve.
8. Trap piping on Class 1 Seismic lines downstream of trap and by-pass valve.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS	A-2	Date December 16, 1968
SYMBOL	6EX	Rev.
DESIGN PRESS.	450 psig max.	
DESIGN TEMP.	450° F max.	
UE&C WELDING SPEC.	No. 1	

PIPE

10" - 18"	A-106	Gr. B, Sch. 30
8" & smaller	A-106	Gr. B, Sch. 40

same

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe

2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-105 Gr. II, 300# ASA R. F. Weld neck

2" & smaller , A-105 Gr. II, 300# ASA R. F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 300# ASA, Butt weld ends, S. S. trim

2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING	A-193 Gr. B-7 Full threaded bolt studs A-194 Cl. 2H, Semi-finished hex. nuts
GASKETS	Asbestos filled, spiral wound 304 S.S. Flexitallic type
UNIONS	2" & smaller, F.S. S. W. 2000# Steel to stainless ground joint

BACKING RINGS

2-1/2" & larger; Split commercial type with short nubs.

CLASS A-2

SYMBOL 6EX

SERVICE

Extraction steam to No. 6 heaters including stop valve by-passes, line vents, instrument piping through first stop valve and trap piping through last stop valve.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS A-3
SYMBOL 5EX

Date December 16, 1968
Rev. 1) July 25, 1969.

DESIGN PRESS. 250 psig max.
DESIGN TEMP. 400°F

UE&C Welding Spec. No.1

PIPE

28"	A-155 EFW Gr.C-55, Class 2, 0.375" Wall
10" to 24"	A-53 Seamless, Gr.B, Sch.20.
3" to 8"	A-53 Seamless, Gr.B, Sch.40.
2½" & smaller	A-106 Gr.B, Sch.40.

FITTINGS

2½" & larger	A-234 WPB, Butt Weld, Sch. to suit pipe
2" & smaller	A-105 Gr. II, 2000# Socket Weld

FLANGES

2½" & larger	A-105 Gr. II, 300# ASA R.F. Weld Neck, Bore to suit pipe.
2" & smaller	A-105, Gr.II, 300# ASA, R.F. Socket Weld.

VALVES

2½" & larger	A-216 WCB, 300# ASA, Butt Weld ends, S.S. trim
2" & smaller	A-105 Gr. II, 600 ASA, Socket weld ends, S.S. trim.

BOLTING A-307 Gr.A Square head bolts, A-194 Cl. 2H Semi-finished hex. nuts.

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type.

UNIONS 2" & smaller, F.S. S.W. 2000# steel to stainless ground joint.

BACKING RINGS 2½" & larger, Split commercial type with short nubs.

Class A-3 — 250 psig max.
5EX — 400° F

a) on Unit 2 - 10" to 18" was Sch. 20
- 3" to 8" was Sch. 40

b) 18" connections at turbine are machined to match Sch. 20.

c) 18" connections at heaters are machined to match Sch. 20.

d) Unit 2 wall thickness O.K. for pressure

CLASS A-3

SYMBOL 5EX

SERVICE

Extraction steam to No. 5 heaters including stop valve by-passes, line vents, instrument piping through first stop valve and trap piping through last stop valve.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS	A-4	Date December 16, 1968
SYMBOL	RS	Rev. 1) July 25, 1969
DESIGN PRESS.	205 psig	
DESIGN TEMP.	505° F	
UE&C WELDING SPEC.	No. 1	

PIPE

12" & larger , A-106 Gr. B, Sch. 20
10" & smaller, A-106 Gr. B, Sch. 40

FITTINGS

2-1/2" & larger , A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger , A-105 Gr. II, 300# ASA, R.F. Weld neck, Bore to suit pipe
2" & smaller , A-105 Gr. II, 300# ASA, R.F. Socket weld

VALVES

2-1/2" & larger , A-216 WCB, 300# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING	A-193 Gr. B-7, Full threaded bolt studs A-194 Cl. 2H Semi-finished hex. nuts
GASKETS	Asbestos filled, spiral wound 304 S.S. Flexitallic type
UNIONS	2" & smaller, F.S. S.W. 2000# steel to stainless ground joint.
BACKING RINGS	2-1/2" & larger, Split commercial type with short nubs.

Class A-4 — 205 psig.
R.S. — 505 °F

a) on Unit 2 – 12" and larger was Sch. 20
10" and smaller unchanged.

b) one section of 14" pipe of heavier wall could affect stress analysis and force on B.F.P.T. This changes the combined loading on the turbine which has already been approved

CLASS A-4

SYMBOL RS

SERVICE

1. Steam from reheater - moisture separator to boiler feed pump turbine including stop valve by-passes, line vents, instrument piping through first stop valve and trap piping through last stop valve.
2. Crossover piping instrument piping through first stop valve.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS A-5
SYMBOL 4EX

Date December 16, 1968
Rev. 1) Feb. 28,1969
2) July 25, 1969

DESIGN PRESS. Full vacuum to 100 psig max.
DESIGN TEMP. 400° F.

UE&C WELDING SPEC. No. 1

SEE ON DRAWINGS

20" pipe requires reinforcing rings at max. spacing of 18'-0

PIPE

14" to 20"	A-53 Seamless Gr. B, Sch. 10
8" to 12"	A-53 Seamless Gr. B, Sch. 20
3" to 6"	A-53 Seamless Gr. B, Sch. 40
2-1/2" & smaller	A-106 Gr. B, Sch. 40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA, R.F. Weld neck, Bore to suit pipe
2" & smaller , A-181 Gr. I, 150# ASA, R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts; A-194 Cl. 2H Semi-finished hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, F.S. S.W. 2000# integral ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

Class A-5 Vac. to 100 psig.

4EX 400°F

a) on Unit 2 - 14" to 20" was Sch. 10
- 8" to 12" was Sch. 20

b) 20" connections at heaters are machined to match Sch. 10

c) max. length of 20" pipe is 36'-0"

d.) Sch. 10 is not enough wall for 36'-0"

e) Sch. 10 is O.K. at max. length of 18'-0"

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS A-5

SYMBOL 4EX

SERVICE

1. Extraction steam to No. 4 heaters including line vents, instrument piping through first stop valve and trap piping through last stop valve.
2. Turbine gland leak-off to gland steam condenser.

Class A-6 Vac. to 50 psig.
3EX 300°F

a) on Unit 2 - 28" was .3125" wall
14" to 20" was Sch. 10
8" to 12" was Sch. 20

b.) max. length of 28" pipe is 104'-0"

c) .3125" wall not enough for 104'-0"

d) .3125" wall is O.K. at max. length of 18'-0"

e) 20" connections at heaters are machined to match Sch. 10

f.) max. length of straight 20" pipe is 16'-0"

g) Sch. 10 is O.K. at max. length of 16'-0"

h) max. length of straight 18" pipe is 38'-0"

i.) Sch. 10 is O.K at max. length of 38'-0"

j.) Stress analyses for Unit 2 will be O.K. if spec. is revised to agree with Unit 2.

k) Add 24" size to Unit 2 listing (Sch. 10)

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS A-6
SYMBOL 3EX

Date December 16, 1968
Rev. 1) Feb. 28, 1969
2) July 25,1969
3) Sept. 15, 1969

DESIGN PRESS. Full vacuum to 50 psig
DESIGN TEMP. 300° F

UE&C WELDING SPEC. No. 1

PIPE

48" - 54"	A-155 EFW	Gr. C-55 Class 2, 0.625" wall
28"	A-155 EFW	Gr. C-55 Class 2, 0.3125" wall
14" to 24"	A-53 Seamless	Gr. B Sch. 10
8" to 12"	A-53 Seamless	Gr. B Sch. 20
3" to 6"	A-53 Seamless	Gr. B Sch. 40
2-1/2" & Smaller	A-106	Gr. B Sch. 40

FITTINGS

2-1/2" & Larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & Smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# A.S.A., R.F. Weld neck, Bore to suit pipe
2" & smaller , A-181 Gr. I, 150# A.S.A., R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-194 Cl. 2H Semi-finished hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, F.S. S.W. 2000# integral ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

CLASS A-6

SYMBOL 3EX

SERVICE

1. Extraction steam to No. 3 heaters and to flash evaporator.
2. Boiler feed pump turbine exhaust to condenser.
3. Boiler feed pump turbine gland steam supply and leak-off to gland steam condenser.
4. Line vents and instrument piping through first stop valve on above lines.
5. Trap piping through last stop valve on above lines.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS B-1
SYMBOL BFD

Date December 16, 1968
Rev. 1) July 25, 1969
2) Sept. 15, 1969

DESIGN PRESS. 1440 psig
DESIGN TEMP. 450°F

UE&C Welding Spec. No 1 & No.20

PIPE

30"	A-155 EFW Gr. KC-70, Class I, 1.260" min. wall
24"	A-106 Gr. B, Sch. 100
18" & 20"	A-106 Gr. C, Sch. 80
8" to 16"	A-106 Gr. B, Sch. 100
6" & smaller	A-106 Gr. B, Sch. 80

FITTINGS

30"	A-234 WPC, Butt weld, 1.260" min. wall
24"	A-234 WPB, Butt weld, Sch. 100
18" & 20"	A-234 WPC, Butt weld, Sch. 80
2½" to 16"	A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller	A-105 Gr. II, 3000# Socket weld

FLANGES

2½" & larger	A-105 Gr. II, 900# ASA, R.F. Weld neck, Bore to suit pipe
2" & smaller	A-105 Gr. II, 900# ASA, R.F. Socket weld

VALVES

3" & larger	A-216 WCB, 900# ASA, Butt weld ends, S.S. trim
2½"	A-216 WCB, 1500# ASA, Butt weld ends, S.S. Trim
2" & smaller	A-105, Gr. II, 1500# ASA, Socket weld ends, S.S. Trim

BOLTING	A-193 Gr. B-7 Full threaded bolt studs A-194 Cl. 2H Semi-finished hex. nuts
GASKETS	Asbestos filled, spiral wound 304 S.S. Flexitallic type
UNIONS	None

BACKING RINGS

Class I Service - None - Use consumable insert and TIG welding
Class 3 Service - 2½" & larger, split commercial type with short nubs.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS B-1

SYMBOL BFD

SERVICE Class 1 Seismic

1. Auxiliary feedwater pump discharge through last valve.
2. Auxiliary feedwater pump recirculation line through breakdown orifice to last valve.
3. Auxiliary feedwater pump warm-up piping from inlet of valve BFD-45.
4. Auxiliary feedwater pump and turbine drive bearing cooling water to outlet of valves BFD-73 and BFD-74.
5. Boiler feed lines from inlet of check valve to outlet of gate valve outside of Containment Building.
6. Line vents and drains and instrument piping through first stop valve on above lines.

SERVICE Class 3 Seismic

1. Boiler feed pump discharge to inlet of check valve outside of Containment Building, including No. 6 heater by-pass.
2. Auxiliary feedwater pump warm-up piping to inlet of valves BFD-45.
3. Heater No. 6 chamber vent and relief valve inlet piping.
4. Valve by-passes, line vents and drains and instrument piping through first stop valve on above lines.
5. Boiler feed pump recirculation line vents and drains.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS B-2
SYMBOL BFD

Date December 16, 1968
Rev.

DESIGN PRESS. 1085 psig
DESIGN TEMP. 450° F

UE&C WELDING SPEC. No. 1 & No. 20

PIPE

18" A-106 Gr. C, Sch. 60
16" & smaller A-106 Gr. B, Sch. 80

same

FITTINGS

18" A-234 WPC, Butt weld, Sch. 60
2-1/2" to 16" A-234 WPB, Butt weld, Sch. 80
2" & smaller A-105 Gr. II, 3000# Socket weld

FLANGES

None — Identical Cladding —

VALVES

None

BOLTING None

GASKETS None

UNIONS None

BACKING RINGS None. Use consumable insert rings and TIG welding.

CLASS B-2

SYMBOL BFD

SERVICE CLASS 1 SEISMIC

1. Boiler feed pump discharge from last valve outside Containment Building to steam generator.

2. Auxiliary feedwater pump discharge piping from last valve to main boiler feed lines.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS B-3
SYMBOL BFR

Date December 16, 1968
Rev. 1) Sept. 15, 1969

DESIGN PRESS. 1440 psig
DESIGN TEMP. 450° F

UE&C WELDING SPEC. No. 5, No. 18 & No. 20

PIPE

4" to 8"	A-335	Gr. P-22, XXS

FITTINGS

4" to 8"	A-182	F-22, Butt weld, XXS

FLANGES

None

VALVES

2-1/2" & larger	A-217	WC6, 900# ASA, Butt weld end, S.S. trim

BOLTING None

GASKETS None

UNIONS None

BACKING RINGS None. Use consumable insert rings and TIG welding.

CLASS B-3

SYMBOL BFR

SERVICE

Boiler feed pump recirculation line to drains collecting tank.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS B-4
SYMBOL BD

Date December 16, 1968
Rev.

DESIGN PRESS. 1085 psig
DESIGN TEMP. 600° F

PIPE

3" & larger, A-106 Gr. B, Sch. 80
2-1/2" & smaller, A-106 Gr. B, Sch. 80

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 80
2" & smaller , A-105, Gr. II, 3000# Socket weld

FLANGES

None

VALVES

2-1/2" & larger, A-216 WCB, 600# ASA, Butt weld ends, S.S. trim
2" & smaller, A-105 Gr. II, 600# ASA, Socket weld end, S.S. trim

BOLTING None

GASKETS None

UNIONS None

BACKING RINGS None. Use consumable insert and TIG welding.

CLASS B-4

SYMBOL BD

SERVICE CLASS 1 SEISMIC

1. Steam generator blowdown lines through second isolation valve.
2. Steam generator shell drain.
3. Steam generator sample connection through first stop valve.

SERVICE CLASS 3 SEISMIC

1. Steam generator blowdown lines from second isolation valve to blowdown valve.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS B-5
SYMBOL BD-

Date December 16, 1968
Rev.

DESIGN PRESS. 100 psig
DESIGN TEMP. 550° F

UE&C WELDING SPEC. No. 1 & No. 20

PIPE

3" & larger , A-106 Gr. B, Sch. 160
2½" & smaller, A-106 Gr. B, Sch. 160

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 160
2" & smaller , A-105 Gr. II, Socket weld, Sch. 160

FLANGES

None

VALVES

2-1/2" & larger, A-216 WCB, 600# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING None

GASKETS None

UNIONS None

BACKING RINGS None - Use consumable insert and TIG welding.

CLASS B-5

SYMBOL BD

SERVICE

Steam generator blowdown lines from blowdown valves to blowdown tank.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

Checked for Vac. Cond.

CLASS C-1
SYMBOL CD

Date December 16, 1968
Rev.

DESIGN PRESS. 665 psig
DESIGN TEMP. 400° F

UE&C WELDING SPEC. No. 1 & No. 20

PIPE

30" A-155 EFW Gr. KC-70 Class 1 0.625" Min. wall — was .626" min. wall
24" & smaller A-106 Gr. B, Sch. 40

FITTINGS

2-1/2" & larger	A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller	A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger	A-105 Gr. II, 300# ASA, R.F. weld neck, Bore to suit pipe
2" & smaller	A-105 Gr. II, 300# ASA, R.F. Socket weld

VALVES

2-1/2" & larger	A-216 WCB, 300# ASA, Butt weld ends, S.S. trim
2" & smaller	A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-193 Gr. B-7 Full threaded bolt studs
A-194 Cl. 2H Semi-finished hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS None

BACKING RINGS

Class 1 Service - None - Use consumable insert and TIG welding
Class 3 Service - 2-1/2" & larger, Split commercial type with short nubs.

Power Authority of the State of New York

Design and Analysis Division

R2

CLASS C-1

SYMBOL CD

SERVICE Class 1 Seismic

1. Condensate dump line from check valve CD-109 to condensate storage tank

2. Auxiliary feedwater pump recirculation from last valve to condensate dump line

3. Auxiliary feedwater pump and turbine drive bearing cooling water outlet of valves BFD-73 and BFD-74 to recirculation line

SERVICE Class 3 Seismic

1. Condensate pump discharge
   through heaters 1 to 5 to boiler feed pump suction including heater by-pass lines;
   through flash evaporator and flash evaporator by-pass;
   through steam jet air ejectors and gland steam condenser;
   recirculation line to condenser;
   to turbine exhaust casing spray;
   dump line to check valve CD-109;
   to boiler feed pump seals through seal injection pumps;
   to heater drain pump cold injection.

2. Boiler feed pump seal water to seal drain tank

3. Heaters 1, 2, 3, 4 and 5 chamber vent and relief valve inlet piping

4. Valve by-passes, line vents and drains and instrument piping through first stop valve.

5. Vacuum Deaerator piping and valves from check valve CS-34 to valve CD-6. R2

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS C-2
SYMBOL CS

Date December 16, 1968
Rev. 1) July 25, 1969

DESIGN PRESS. Full vacuum to 30 psig
DESIGN TEMP. 100° F.

UE&C WELDING SPEC. No. 1

PIPE

48" - 54" A-155 EFW Gr. C-55 Cl. 2, 0.625" wall
30" A-155 EFW Gr. C-55 Cl. 2, 0.375" wall
8" to 24" A-53 Seamless or ERW, Gr. B, Sch. 20
3" to 6" A-53 Seamless or ERW, Gr. B, Sch. 40
2-1/2" & smaller A-106 Gr. B Sch. 40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

24" to 54" A-181 Gr. I, 125# ASA, F.F. Slip-on , LIGHT WEIGHT.
2-1/2" to 20" A-181 Gr. I, 125# ASA, F.F. Weld neck, Bore to suit pipe
2" & smaller A-181 Gr. I , 125# ASA, F.F. Socket weld

VALVES

8" to 30" Flangeless Butterfly with rubber liner
A-126 Cl. B Body and Disc, 125# ASA Drilling, S.S. trim
2-1/2" to 6", A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller, A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. B Square head bolts, A-307 hex. nuts

GASKETS 1/8" thick full face rubber

UNIONS 2" & smaller, F.S. S.W. 2000# integral ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS C-2

SYMBOL CS

SERVICE

1. Condensate pump suction from condenser.
2. Hotwell dump line from condenser to low level trip pot.
3. Condensate suction header vents to condenser.
4. Drains and instrument piping through first stop valve on above lines.
5. Condenser hotwell instrument piping through first stop valve.
6. Condensate from drains collecting tank to condenser.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS C-3
SYMBOL CT

Date December 16, 1968
Rev. 1) July 25, 1969

DESIGN PRESS. Full vacuum to 150 psig
DESIGN TEMP. 225° F max.

UE&C WELDING SPEC. No. 1 & No. 20

PIPE

14" to 20"	A-53 Seamless or ERW, Gr. B, Sch. 10
8" to 12"	A-53 Seamless or ERW, Gr. B, Sch. 20
3" to 6"	A-53 Seamless or ERW, Gr. B, Sch.40
2½ & smaller	A-106 Gr.B, Sch.40

FITTINGS

2-1/2" & larger	A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller	A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger,	A-181 Gr. I, 150# ASA R.F. Weld neck, Bore to suit pipe
2" & smaller ,	A-181 Gr. I, 150# ASA R.F. Socket weld

VALVES

2-1/2" & larger,	A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller,	A-105 Gr. II, 600# ASA, Socket weld end, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 hex. nuts

GASKETS 1/16" thick, compressed asbestos, ring type

UNIONS 2" & smaller, F.S. S.W. 2000# integral seat, ground joint

BACKING RINGS

Class 1 Service - None - Use consumable insert ring and TIG welding.
Class 3 Service - 2-1/2" & larger, Split commercial type with short nubs.

Design and Analysis Division
PIPING SCHEDULE & MATERIAL

Date: September 8, 1982

In addition to above, the following applies only to portions of vacuum deaerator piping and materials.

PIPE

Stainless Steel	A 312 Seamless Gr. TP 316L Sch. 40S

FILLER METAL

ASME SFA 5.4 E 316L-16 or ASME SFA 5.9 ER 316L

FLANGES AND FITTINGS

Stainless Steel

2½" & larger	A-182 Gr. F 316L, 150#, R.F. Weld Neck
2" & smaller	A-182 Gr. F 316L, 150#, R.F. 3000# socket weld

VALVES

Stainless Steel

2½" & larger	Cast or forged, ASTM A351 Gr. CF3M or ASTM A-182 Gr. F 316L, Butt weld ends
2" & smaller	Cast or forged, ASTM A351 Gr. CF3M or ASTM A-182 Gr. F 316L, Socket weld ends
Type	Check valves, swing type Gate valves, flexible wedge, rising stem, bolted bonnet, OS&Y, backseat.

Carbon Steel/Stainless Steel Interfaces
Flanged, insulating gaskets, washers, sleeves, asbestos

CLASS C-3

SYMBOL CT

SERVICE Class 1 Seismic

1. Condensate from condensate storage tank to auxiliary feedwater pump suction and through level control valve LCV-1158.
2. City water supply from check valves CT-25, 28 and 31 to auxiliary feedwater pump suction.
3. Balancing line on motor driven auxiliary feedwater pump.
4. Condensate storage tank vent, overflow and drains.
5. Condensate storage tank sample and instrument piping through first stop valve.
6. Line vents, drains and instrument piping on above lines through first stop valves.

SERVICE Class 3 Seismic

1. Condensate make-up to condenser from level control valve LCV-1158.
2. Hotwell dump and condensate transfer pump suction from low level trip pot and discharge to condensate dump line and to discharge tunnel.
3. Condensate transfer line from Unit No. 1.
4. Condensate pump seal water lines.
5. Condensate pump vents to condenser.
6. Hotwell dump and condensate transfer pump vent and low level trip pot vent to condenser.
7. Boiler feed pump seal leak-off system from seal water collecting tank to drains collecting tank.
8. Condensate to valve and pump gland sealing system.
9. Condensate to hydrazine and morphaline feed tanks.
10. Condensate to alkali and phosphate feed tanks.

12. Low level trip pot and boiler feed pump seal water tank instrument piping through first stop valve.

13. Vacuum deaerator inlet piping from tap upstream of valve LCV 1128, from tee upstream of valve CT-36 and from Culligan demineralized water to vacuum deaerator inlet flange. R2

14. Vacuum deaerator outlet piping from outlet flange to flange upstream of valve LCV 1128 A and to check valve CS-34.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS C-4 — Date December 16, 1968
SYMBOL FEB — Rev.

DESIGN PRESS. Full Vacuum to 50 psig
DESIGN TEMP. 250° F

UE& C WELDING SPEC. No. 1 — was prefix CS.

PIPE

36"	A-155 EFW Gr. C-55, Class 2, 0.500" wall	
12" to 24"	A-53 Seamless or ERW, Gr. B , Std. wall	same
3" to 10"	A-53 Seamless or ERW, Gr. B , Sch. 40	
2-1/2" & smaller	A-106 Gr. B, Sch. 40	

FITTINGS

2-1/2" to 36"	A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller	A-105 Gr. II, 2000# Socket weld

FLANGES

24" - 36"	A-181 Gr. I, 150# ASA R. F. Slip-on
2-1/2" to 20"	A-181 Gr. I, 150# ASA R. F. Weld neck, Bore to suit pipe
2" & Smaller	A-181 Gr. I, 150# ASA R. F. Socket weld

VALVES

Flangeless Butterfly with Hycar Liner, 125# ASA
Drilling A-126 Cl. B Body, Ni-Resist Discs, S.S. Trim

2-1/2" & larger	A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller	A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. B Square head bolts, A-307 hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, 2000# F.S. S.W. Integral ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs

CLASS C-4

SYMBOL FEB

SERVICE

1. Flash evaporator brine recycle pump suction and discharge.
2. Brine recycle pump vents
3. Line vent and instrument piping through first stop valve.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS C-5A
SYMBOL CT

Date December 16, 1968
Rev. 1) Sept. 15, 1969

DESIGN PRESS. Full vacuum to 50 psig
DESIGN TEMP. 150° F

UE&C WELDING SPEC. No. 1

PIPE

3" & larger A-53 Seamless, Gr. B, Sch. 40
2-1/2" & smaller A-106 Gr. B, Sch. 40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 40
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA R.F. Weld neck, Bore for Sch. 40
2" & smaller , A-105 Gr. II, 2000# Socket weld

VALVES

2-1/2" & larger A-216 WCB, 150# ASA, Butt weld ends, S. S. trim
2" & smaller A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, F.S. S.W. 2000# integral seat, ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

CLASS C-5 A

SYMBOL CT

SERVICE

1. Boiler feed pump turbine drip tank drain pumps discharge and recirculation.

2. Instrument piping through first stop valve on above lines.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS	D-1	Date December 16, 1968
SYMBOL	RHD	Rev.
DESIGN PRESS.	1085 psig	
DESIGN TEMP.	600° F	
UE&C WELDING SPEC.	No. 1	

prefix was MS

PIPE

4" & larger	A-106 Gr. B, Sch. 80
2-1/2" - 3"	A-106 Gr. B, Sch. 40
2" & smaller	A-106 Gr. B, Sch. 80

3" was sch. 40
2½" & smaller was sch 80

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 3000# Socket weld

FLANGES

2-1/2" & larger, A-105 Gr. II, 600# ASA R.F. Weld neck, Bore to suit pipe
2" & smaller , A-105 Gr. II, 600# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 600# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA Socket weld ends, S.S. trim

BOLTING A-193 Gr. B-7 Full threaded bolt studs
A-194 Cl. 2H Semi-finished hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS None

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs

CLASS D-1

SYMBOL RHD

SERVICE

1. Reheater drains to reheater drain tanks.
2. Reheater drain tanks to No. 6 heaters and to condensers.
3. Reheater drain tank vent and balancing line to reheaters.
4. Reheater drain tank vent to condenser.
5. Scavenging steam from reheaters to No. 6 heater extraction steam line.
6. Main steam trap header to drains collecting tank and to discharge tunnel.
7. Line vents, drains and instrument piping through first stop valve.
8. Reheater drain tank instrument piping through first stop valve.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS D-2
SYMBOL 6HD

Date December 16, 1968
Rev.1) July 25, 1969

DESIGN PRESS. 450 psig
DESIGN TEMP. 450° F

UE&C WELDING SPEC. No. 1

PIPE

10" & larger, A-106 Gr. B, Sch.30
8" & smaller, A-106 Gr. B, Sch. 40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-105 Gr. II, 300# ASA R.F. Weld neck, Bore to suit pipe
2" & smaller , A-105 Gr. II, 300# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 300# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-193 Gr. B-7, Full threaded bolt studs
A-194 Cl. 2H , Semi-finished hex. nuts
GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, F.S. S.W. 2000# steel to stainless ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

CLASS D-2

SYMBOL 6HD

SERVICE

1. Drain lines from No. 6 heaters to level control valve at heater drain tank.
2. Vent lines from No. 6 Heaters to condenser (Operating and start-up).
3. Heater No. 6 relief valve inlet piping.
4. Heater No. 6 shell drain.
5. Heater No. 6 instrument piping through first stop valve.
6. Extraction steam trap header to drains collecting tank.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS D-2A
SYMBOL 6HD

Date December 16, 1968
Rev. 1) Sept. 15, 1969

DESIGN PRESS. 450 psig.
DESIGN TEMP. 450°F.

UE&C WELDING SPEC. No. 5 & No. 20

PIPE

10" & smaller, A-335, Gr. P5, Sch. 40

FITTINGS

2-1/2" & larger, A-234 WP5, Butt weld, Sch. 40

FLANGES

2-1/2" & larger, A-182 F5, 300# ASA R.F. Weld Neck, Bore to suit pipe

VALVES

2-1/2" & larger, A-217 WC6, 300# ASA, Butt weld ends, S.S. trim

BOLTING A-193 Gr. B-7, Full threaded bolt studs
A-194 Cl. 2H , Semi-finished Hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS None

BACKING RINGS None. Use consumable insert and TIG welding.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS D-2 A

SYMBOL 6HD

SERVICE

No. 6 heater drains from level control valve to heater drain tank.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS D-3
SYMBOL 5HD

Date December 16, 1968
Rev.

DESIGN PRESS. 250 psig
DESIGN TEMP. 400° F

prior was 5EX

UE&C WELDING SPEC. No. 1

PIPE

10" & larger, A-53 Seamless or ERW, Gr. B, Sch. 20 –
3" to 8" , A-53 Seamless or ERW, Gr. B, Sch. 40 – same
2-1/2" & smaller, A-106 Gr. B, Sch..40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-105 Gr. II, 300# ASA R.F. weld neck, Bore to suit pipe
2" & smaller , A-105 Gr. II, 300# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 300# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A, Square head bolts, A-307 hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, F.S. S.W. 2000# steel to stainless ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS D-3

SYMBOL 5HD

SERVICE

1. Drain lines from No. 5 heaters to heater drain tank.
2. Vent lines from No. 5 heaters to condenser.
3. Heater No. 5 relief valve inlet piping.
4. Heater No. 5 shell drain.
5. Heater No. 5 instrument piping through first stop valve.
6. Heater drain tank drain to condenser.
7. Heater drain tank vent to No. 5 heaters.
8. Heater drain tank relief valve inlet piping.
9. Heater drain tank instrument piping through first stop valve.
10. Line vents and drains and instrument piping through first stop valve.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS D-4
SYMBOL HD

Date December 16, 1968
Rev.

DESIGN PRESS. 730 psig
DESIGN TEMP. 400° F

UE&C WELDING SPEC. No. 1

PIPE

16" to 24"	A-106 Gr. B, Sch. 60
10" to 14"	A-106 Gr. B, XS wall
8" & smaller	A-106 Gr. B, Sch. 40

same

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-105 Gr. II, 400# ASA R.F. Weld neck, Bore to suit pipe
2" & smaller , A-105 Gr. II, 400# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 400# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-193 Gr. B-7, Full threaded bolt studs
A-194 Cl. 2H , Semi-finished Hex. nuts
GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS None

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS D-4

SYMBOL HD

SERVICE

Heater drain pump discharge to boiler feed pump suction header including line vents and drains and instrument piping through first stop valve.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS D-5
SYMBOL 5HD

Date December 16, 1968
Rev.1) July 25, 1969
2) Sept. 15, 1969

DESIGN PRESS. 250 psig
DESIGN TEMP. 400° F

UE&C WELDING SPEC. No. 1

PIPE

10" & larger, A-53 Seamless, Gr. B, Sch. 20
3" to 8" , A-53 Seamless, Gr. B, Sch. 40
2-1/2" & smaller, A-106 Gr. B, Sch. 40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 2000# socket weld

FLANGES

2-1/2" & larger, A-105 Gr. II, 300# ASA R.F. Weld neck, Bore to suit pipe
2" & smaller , A-105 Gr. II, 300# ASA R.F. Socket weld.

VALVES

2-1/2" & larger, A-216 WCB, 300# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A, Square head bolts, A-307 Hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, F.S. S.W. 2000# steel to stainless ground joint.

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

CLASS D-5

SYMBOL 5HD

SERVICE

1. Heater drain pump suction from heater drain tank.
2. Moisture separator drain to heater drain tank.
3. Moisture separator drain to level control valve at drains collecting tank.
4. Moisture separator drain tank vent to moisture separator.
5. Heater drain pump vents to heater drain tank.
6. Vents and drains and instrument piping through first stop valve on above lines.
7. Moisture separator and moisture separator drain tank instrument piping through first stop valve.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS D-5A
SYMBOL 5HD

Date December 16, 1968
Rev.1) Sept. 15, 1969

DESIGN PRESS. 250 psig
DESIGN TEMP. 400° F.

UE&C WELDING SPEC. No. 5 & No. 20

PIPE

4" - 6" A-335 Gr. P-22,Sch. 40

FITTINGS

4 - 6" A-182 F-22, Butt weld, Sch. 40
A-234 WP22

FLANGES

4 - 6" A-182 F-22, 300# ASA R.F. Weld neck, Bore for Sch. 40

VALVES

4 - 6" A-217 WC6, 300# ASA, Butt weld ends, S.S. trim

BOLTING A-193 Gr. B7 Full threaded bolt studs
A-194 Cl. 2H Semi-finished hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type.

UNIONS None

BACKING RINGS None - Use consumable insert ring and TIG welding.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS D-5A

SYMBOL 5HD

SERVICE

Moisture separator drain from level control valve to drains collecting tank.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS D-6
SYMBOL 4HD

Date December 16, 1968
Rev.

DESIGN PRESS. Full vacuum to 100 psig
DESIGN TEMP. 400° F

prefix was 4EX

UE&C WELDING SPEC. No. 1

PIPE

8" & larger, A-53 Seamless or ERW, Gr. B, Sch. 20
3" to 6" , A-53 Seamless or ERW, Gr. B, Sch. 40
2-1/2" & Smaller, A-106 Gr. B, Sch. 40

same

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA R.F. Weld neck, Bore to suit pipe
2" & smaller , A-181 Gr. I, 150# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S. S. trim

BOLTING A-307 Gr. A, Square head bolts, A-307 Hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, F.S. S.W. 2000# integral ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS D-6

SYMBOL 4HD

SERVICE

1. No. 4 heater drains to No. 3 heaters
2. No. 4 heater drains to condenser
3. Vent lines from No. 4 heaters to condenser (operating and start-up)
4. No. 4 heater relief valve inlet piping.
5. No. 4 heater shell drain.
6. No. 4 heater instrument piping through first stop valve.
7. Vents and drains and instrument piping through first stop valve on above lines.
8. Gland steam condenser drains.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS D-7 Date December 16, 1968
SYMBOL 3HD, 2HD, 1HD Rev.

DESIGN PRESS. Full vacuum to 50 psig
DESIGN TEMP. 300° F, 210°, 175°, 105° F

prefixes were 3EX, 2EX, 1E,

UE&C WELDING SPEC. No. 1

PIPE

8" & larger, A-53 Seamless or ERW, Gr. B, Sch. 20
3" - 6" , A-53 Seamless or ERW, Gr. B, Sch. 40
2-1/2" & smaller, A-106 Gr. B, Sch. 40

same

FITTINGS

2-1/2" & larger, A-234 WPB, Buttweld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA R.F. Weld neck, Bore to suit pipe
2" & smaller , A-181 Gr. I, 150# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, F.S. S.W. 2000# Integral ground joint.

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs

CLASS D-7

SYMBOL 3HD, 2HD, 1HD

SERVICE

1. No. 3 heater drains to No. 2 heaters and to condenser. (3HD)
2. No. 3 heater shell drain, relief valve inlet piping and instrument piping through first stop valve. (3HD)
3. Flash evaporator brine heater drain pump suction, discharge, vent and recirculation lines including line vents and drains and instrument piping through first stop valve. (3HD)
4. Boiler feed pump turbine exhaust cylinder drain to boiler feed pump turbine drip tank. (3HD)
5. Boiler feed pump turbine drip tank drain pump suction. (3HD)
6. Boiler feed pump turbine drip tank vent and instrument piping through first stop valve and drip tank drain pump vent. (3HD)
7. No. 2 heater drains to No. 1 heaters and to condenser. (2HD)
8. No. 2 heater high level dump lines to condenser. (2HD)
9. No. 2 heater shell drain and instrument piping through first stop valve. (2HD)
10. No. 1 heater drains and high level dump to condenser. (1HD)
11. No. 1 heater shell drain and instrument piping through first stop valve. (1HD)
12. Vents from No. 1, 2 and 3 heaters to condenser. (1HD, 2HD, 3HD)
13. Vents and drains and instrument piping through first stop valve on above lines.
14. Steam jet air ejector inter and after condenser drains. (1HD)

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS D-8
SYMBOL V

Date December 16, 1968
Rev.1) July 25, 1969

DESIGN PRESS. 100 psig
DESIGN TEMP. 340° F

UE&C WELDING SPEC. No. 1

PIPE

14" & larger,	A-53 Seamless or ERW, Gr. B, Sch.20
8" to 12"	A-53 Seamless or ERW, Gr. B, Sch. 30
3" to 6"	A-53 Seamless or ERW, Gr.B, Sch.40
2½ & smaller	A-106 Gr.B, Sch.40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 2000# Socket weld.

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA R.F. Weld Neck, Bore to suit pipe
2" & smaller , A-181 Gr. I, 150# ASA R.F. Socket weld

VALVES

None

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS 1/16" thick compressed asbestos

UNIONS 2" & smaller, F.S. S.W. 2000# Integral ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS D-8

SYMBOL V

SERVICE Class 1 Seismic

1. Steam generator safety valve vent piping.
2. Auxiliary feedwater pump turbine steam supply relief valve vent piping.
3. Auxiliary feedwater pump turbine exhaust piping.
4. Diesel engine exhaust piping.

SERVICE Class 3 Seismic

1. Steam seal regulator safety valve vent piping and rupture disc vent piping.
2. Feedwater heater relief valve piping beyond valve to flash tank.
3. Scavenging steam relief valve piping beyond valve.
4. Flash evaporator vacuum pump discharge to atmosphere.
5. Steam generator blowdown tank vent to atmosphere.
6. Safety valve drainage piping.
7. H.P. turbine cylinder relief valve exhaust piping.
8. Heater drain tank relief valve piping beyond valve to flash tank.
9. Safety valve flash tank vent to atmosphere.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS E-1
SYMBOL CV

Date December 16, 1968
Rev. 1) July 25, 1969

DESIGN PRESS. 50 psig max.
DESIGN TEMP. 400° F.

UE&C WELDING SPEC. No. 1

PIPE

14" & larger,	A-53 Seamless or ERW, Gr. B, Sch.20
8" to 12"	A-53 Seamless or ERW, Gr. B, Sch.30
3" to 6"	A-53 Seamless or ERW, Gr.B, Sch.40
2½" & smaller	A-106, Gr.B, Sch.40

FITTINGS

2-1/2" & larger,	A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller ,	A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger,	A-181 Gr. I, 150# ASA R.F. Weld neck, Bore to suit pipe
2" & smaller ,	A-181 Gr. I, 150# ASA R.F. Socket weld

VALVES

2-1/2" & larger,	A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller ,	A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS 1/16" thick compressed asbestos

UNIONS 2" & smaller, F.S. S.W. 2000# Integral ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

CLASS E-1

SYMBOL CV

SERVICE Class 1 Seismic

1. Steam jet air ejector vent from the containment isolation valves into the Containment Building.

SERVICE Class 3 Seismic

1. Steam jet air ejector vents to atmosphere (Priming and holding).
2. Steam jet air ejector vent blower discharge to containment isolation valve outside Containment Building.
3. Circulating water priming ejector vents to atmosphere.
4. De-icing steam jet vacuum pump vents to atmosphere.
5. Discharge tunnel vents to atmosphere.
6. Gland steam condenser exhauster suction and discharge.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS E-2
SYMBOL CA

Date December 16, 1968
Rev. 1) July 25, 1969

DESIGN PRESS. Full vacuum to 50 psig
DESIGN TEMP. 100° F

UE&C WELDING SPEC. No. 1

PIPE

14" to 20"	A-53 Seamless or ERW, Gr. B, Sch.10
8" to 12"	A-53 Seamless or ERW, Gr. B, Sch.20
3" to 6"	A-53 Seamless or ERW, Gr.B, Sch.40
2½" & smaller	A-106 Gr.B, Sch.40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA R.F. Weld neck, Bore to suit pipe
2" & smaller , A-181 Gr. I, 150# ASA R.F. Socket weld.

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld end, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS 1/16" thick compressed asbestos

UNIONS 2" & smaller, F.S. S.W. 2000# Integral ground joint.

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

CLASS E-2

SYMBOL CA

SERVICE

1. Air removal piping from condensers to steam jet air ejectors (priming and holding).

2. Air removal piping from condenser water boxes through ~~circulating~~ water priming ejectors including barometric leg from drop-out tank. box

3. Air removal piping from circulating water piping to water box priming ejectors.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS E-3 Date December 16, 1968
SYMBOL CW Rev.

DESIGN PRESS. Full vacuum to 50 psig
DESIGN TEMP. 100° F

UE&C WELDING SPEC. No. 1 not in -01-

PIPE

3" & larger, A-53 Seamless or ERW, Gr. B, Sch. 40
2-1/2" & smaller, A-106 Gr. B, Sch. 40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 40
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA R.F. Weld neck, Bore to suit pipe
2" & smaller , A-181 Gr. I, 150# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 hex. nuts

GASKETS 1/16" thick compressed asbestos

UNIONS 2" & smaller, F.S. S.W. 2000# Integral ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

CLASS E-3

SYMBOL CW

SERVICE

1. Circulating water piping priming system to water-box air removal line.

2. Deicing priming system to steam jet vacuum pumps.

3. Instrument piping through first stop valve on above lines.

4. Instrument piping on circulating water and deicing lines.

Note: Symbol CW also applies to circulating water and deicing piping. (Spec. 9321-05-248-4)

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS F-1 Date December 16, 1968
SYMBOL LO Rev.

DESIGN PRESS. 50 psig
DESIGN TEMP. 170° F. max.

UE&C WELDING SPEC. No. 1

PIPE

2-1/2" & larger, A-106 Gr. B, Sch. 40
2" & smaller , A-106 Gr. B, Sch. 80 same

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 40
2" & smaller , A-105 Gr. II, 3000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA R.F. Weld neck, Bore to Sch. 40
2" & smaller , A-105 Gr. II, 150# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Flanged, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS 1/16" thick Vellumoid, Ring type

UNIONS None, use flanges

BACKING RINGS Shop welds - None
Field welds - 2-1/2" & larger, Split commercial type with short nubs.

SPECIAL REQUIREMENTS - All piping is to be cleaned, acid pickled and internally coated with a rust preventative (Gulf Coat TD or equal)

CLASS F-1

SYMBOL LO

SERVICE

Lube oil conditioning and transfer piping including vapor extractor vents and drains.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS G-1
SYMBOL HS

Date December 16, 1968
Rev.

DESIGN PRESS. 150 psig
DESIGN TEMP. 130° F

UE&C PIPING SPEC. No. 1

PIPE

2" & smaller, A-106 Gr. B, Sch. 80 same

FITTINGS

2" & smaller, A-105 Gr. II, 3000# socket weld

FLANGES

2" & smaller, A-181 Gr. I, 150# ASA R.F. Socket weld

VALVES

2" & smaller, A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-193 Gr. B-7, Full threaded bolt studs
A-194 Cl. 2H , Semi-finished Hex. nuts

GASKETS 1/16" thick Vellumoid, Ring type

UNIONS None

CLASS G-1

SYMBOL HS

SERVICE

Generator hydrogen supply.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS G-2
SYMBOL PG

Date December 16, 1968
Rev.

DESIGN PRESS. 150 psig
DESIGN TEMP. 100° F

UE&C WELDING SPEC. No. 1

PIPE

3" & larger, A-53 Seamless Gr. B, Sch. 40
2-1/2" & smaller, A-106 Gr. B, Sch. 80

3" & larger was sch. 20

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. to suit pipe
2" & smaller , A-105 Gr. II, 3000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA F.F. Weld neck, Bore to suit pipe
2" & smaller , A-181 Gr. I, 150# ASA F.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB 150# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-193 Gr. B-7, Full threaded bolt studs
A-194 Cl. 2H , Semi-finished Hex. nuts
GASKETS 1/16" thick Compressed asbestos, Full face type

UNIONS None

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

CLASS G-2

SYMBOL PG

SERVICE

1. Carbon dioxide supply system.
2. Hydrogen and carbon dioxide vent piping.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS H-1
SYMBOL CF

Date December 16, 1968
Rev. 1) July 17, 1972

DESIGN PRESS. Full vacuum to 1440 psig
DESIGN TEMP. 600° F max.

UE&C WELDING SPEC. No. 8

PIPE

2" & smaller, A-312 TP-304, Sch. 80S

TUBING

3/8" A-269 seamless TP-304, 0.065" wall

FITTINGS

2" & smaller, A-182 F-304, 3000# Socket weld

TUBING FITTINGS

3/8" 304 S.S. S.W. Tube

FLANGES

2" and smaller, A-182 F304, 1500# ASA RF Socket Weld

VALVES

3/8" - 1/2" A-182 F-304, 6000# Socket weld ends, S.S. trim

BOLTING A-193 Gr. B-7 Full threaded bolt studs
A-194 Cl. 2H Semi-finished hex. nuts
GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS None

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS H-1
SYMBOL CF

Date December 16, 1968
Rev. 1) July 17, 1972

DESIGN PRESS. Full vacuum to 1440 psig
DESIGN TEMP. 600° F max.

UE&C WELDING SPEC. No. 8

PIPE

2" & smaller, A-312 TP-304, Sch. 80 S

TUBING

3/8" A-269 seamless TP-304, 0.065" wall

FITTINGS

2" & smaller, A-182 F-304, 3000# Socket weld

TUBING FITTINGS

3/8" 304 S.S. S.W. Tube

FLANGES

2" & smaller, A-182 F304, 1500# A.S.A. R.F. Socket Weld
~~A694~~

VALVES

3/8" - 1/2" A-182 F-304, 6000# Socket weld ends, S.S. trim

BOLTING ~~None~~ (from pg. 8.14)

GASKETS ~~None~~

UNIONS None

CLASS H-1

SYMBOL CF

SERVICE

1. Phosphate feed system from relief valve tee connection to main feedwater lines including instrument piping through first stop valve on above lines.

2. Phosphate feed tank drains.

3. Hydrazine and morphaline feed systems from relief valve tee connection to condensate line including instrument piping through first stop valve on above lines.

4. Hydrazine and morphaline feed tank drains.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS H-2
SYMBOL CL

Date December 16, 1968
Rev. 1) July 17, 1972

DESIGN PRESS. 35 psig
DESIGN TEMP. 100° F

PIPE

2" & smaller, Saran lined steel, Std. wall with 5/32" lining thick

FITTINGS

2" & smaller, Saran lined cast steel, 150# ASA Flanged

FLANGES

2" & smaller, Forged Steel, 150# ASA F.F. Screwed

VALVES

2" & smaller, Saran lined cast iron, 125# ASA Flanged, Diaphragm type

BOLTING A-307 Gr. B, Square head bolts, A-307 Hex. nuts

GASKETS Standard Hypalon half or full

UNIONS None

SPACERS Saran

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS H-2
SYMBOL CL

Date December 16, 1968
Rev. #1) July 17, 1972

DESIGN PRESS. 35 psig
DESIGN TEMP. 100° F

PIPE

2" & smaller, Saran lined steel, Std. wall with 5/32" lining thick

FITTINGS

2" & smaller, Saran lined cast steel, 150# ASA Flanged

FLANGES

2" & smaller, Forged Steel, 150# ASA F.F. (Slip-on) Screwed

VALVES

2" & smaller, Saran lined cast iron, 125# ASA Flanged, Diaphragm type

BOLTING A-307 Gr. B, Square head bolts, A-307 Hex. nuts

GASKETS Standard (Saran) HYPALON half or full

UNIONS None

SPACERS Saran

CLASS H-2

SYMBOL CL

SERVICE

Chlorination system

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS H-3
SYMBOL AF

Date December 16, 1968
Rev.

DESIGN PRESS. 150 psig
DESIGN TEMP. 100° F

UE&C WELDING SPEC. No. 1

PIPE

2" & smaller A-106 Gr. B, Sch. 80 same

FITTINGS

2" & smaller A-105 Gr. II, 3000# Socket weld

FLANGES

2" & smaller A-181, Gr. I, 150# ASA R.F. Socket weld

VALVES

2" & smaller, Alloy 20 150# ASA Flanged body, S.S. trim, Dipolyene seat

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS 1/16" thick solid Teflon or Teflon covered asbestos, ring type

UNIONS None

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS H-3

SYMBOL AF

SERVICE

Flash evaporator acid feed system to mixing section.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS H-4
SYMBOL AF

Date December 16, 1966
Rev.

DESIGN PRESS. 150 psig
DESIGN TEMP. 100° F

UE&C WELDING SPEC. No. 8

PIPE

4" A-312 TP-304, Sch. 40S

same

FITTINGS

4" A-403 WP-304, Butt weld, Sch. 40S

FLANGES

None

VALVES

None

BOLTING None

GASKETS None

UNIONS None

CLASS H-4

SYMBOL AF

SERVICE

Flash evaporator feed line from mixing section to flash evaporator.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS J-1
SYMBOL CC

Date December 16, 1968
Rev.

DESIGN PRESS. 100 psig
DESIGN TEMP. 145° F. max.

UE&C WELDING SPEC. No. 1

PIPE

3" & larger A-53 Seamless or ERW, Gr. B, Sch. 40
2-1/2" & smaller A-106 Gr. B, Sch. 40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 40
2" & smaller , A-197 M.I., Screwed

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA F.F. Weld neck
2" & smaller , A-181 Gr. I, 150# ASA F.F. Slip-on

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller , B-62 , 150# ASA, Screwed ends, Bronze trim

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS 1/8" Thick red rubber, Full face type

UNIONS 2" & smaller, 300# M.I. Screwed, ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS J-1

SYMBOL CC

SERVICE Class 3 Seismic

1. Closed cooling water system for turbine-generator plant including instrument piping through first stop valve.

2. Overflow from closed cooling water expansion tanks in heater bay and control building.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS J-1

SYMBOL CC

SERVICE Class 3 Seismic

1. Closed cooling water system for turbine-generator plant including instrument piping through first stop valve.

2. Overflow from closed cooling water expansion tanks in heater bay and control building.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS J-2
SYMBOL PW

Date December 16, 1968
Rev. 1) Sept. 15, 1969

DESIGN PRESS. 150 Psig
DESIGN TEMP. 260° F

UE&C WELDING SPEC. No. 8

PIPE

12" & smaller, A-312 TP-304, Sch. 40S

FITTINGS

2-1/2" & larger, A-403 WP-304, Butt weld, Sch. 40S
2" & smaller , A-182 F-304, 2000# Socket weld

FLANGES

2-1/2" & larger, A-182 F-304, 150# ASA R.F. Weld neck, Bore for Sch. 40S
2" & smaller , A-182 F-304, 150# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-351 CF8, 150# ASA, Butt weld ends, S.S. trim
2" & smaller , A-182 F-304, 150# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A, Square head bolts, A-194 Gr. 2H Hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS None

CLASS J-2

SYMBOL PW

SERVICE Class 1 Seismic

1. Primary water make-up pump suction from primary water storage tank.
2. Primary water make-up pump discharge to component cooling surge tank and all branch lines up to and including first isolation valve.
3. Primary water make-up to primary water storage tank and to make-up pump suction.
4. Primary water make-up pump recirculation.
5. Primary water from second isolation valve in to Containment Building.
6. Primary water tank vent, overflow and drain.
7. Primary water tank sample and instrument piping through first stop valve.

SERVICE Class 2 Seismic

1. Primary water to nuclear plant services beyond Class 1 limits.

SERVICE Class 3 Seismic

1. Primary water make-up from flash evaporator including distillate pump suctions and discharge.
2. Distillate pump vents and recirculation to flash evaporator.
3. Flash evaporator vents to vacuum pump and condenser.
4. Flash evaporator vent condenser drains.
5. Instrument piping through first stop valve on above lines.
6. Demineralized water tie-in from Unit No. 1.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS J-3
SYMBOL CC

Date December 16, 1968
Rev.

DESIGN PRESS. 100 psig
DESIGN TEMP. 145° F

UE&C WELDING SPEC. No. 1 & No. 20

PIPE

3" & Larger, A-106 Gr. B, Sch. 40
2-1/2" & smaller, A-106 Gr. B, Sch. 40

same

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 40
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA R.F. Weld neck, Bore for Sch. 40
2" & smaller , A-181 Gr. I, 150# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, F.S. S.W. 2000# integral ground joint

BACKING RINGS None, use consumable insert and TIG welding.

CLASS J-3

SYMBOL CC

SERVICE - CLASS 1 SEISMIC

1. Closed cooling water system for instrument air compressors.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS J-4
SYMBOL MW

Date December 16, 1968
Rev. 1) Sept. 15, 1969

DESIGN PRESS. 100 psig
DESIGN TEMP. 100° F

PIPE

2" & smaller, B-88, Type K, Drawn temper, nominal wall.

FITTINGS

2" & smaller, wrought copper, solder joint.

FLANGES - None

VALVES

2" & smaller, B-62, 150# screwed ends.

BOLTING - None

GASKETS - None

UNIONS - 2" & smaller, cast copper, solder joint.

Brazed joints

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS J-4

SYMBOL MW

SERVICE Class 1 Seismic

✓ 1. Above ground* city water make-up to closed cooling water system expansion tank in control room.

✓ 2. Above ground* city water make-up to diesel generator jacket water expansion tanks.

SERVICE Class 3 Seismic

1. Above ground* city water make-up to closed cooling water system expansion tank in heater bay.

✓ 2. Above ground* city water supply to nuclear services.

* Below ground city water lines are cement lined, coated and wrapped carbon steel piping as specified in UE&C Specification 9321-05-248-35.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS K-1
SYMBOL SA

Date December 16, 1968
Rev.

DESIGN PRESS. 150 psig
DESIGN TEMP. 100° F

UE&C WELDING SPEC. No. 1

PIPE

3" & larger, A-53 Seamless or ERW Gr. B, Sch. 40
2-1/2" & smaller, A-106 Gr. B, Sch. 80

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 40
2" & smaller , A-105 Gr. II, 3000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA R.F. Weld neck, Bore for Sch. 40
2" & smaller , A-181 Gr. I, 150# ASA R.F. Socket Weld

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller , B-61, 200# Screwed ends, Bronze stem, S.S.disc & seat

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS 1/16" Thick Red rubber, Ring type

UNIONS 2" & smaller, 300# M.I. Screwed, ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS - K-1

SYMBOL SA

SERVICE Class 1 Seismic

1. Station air from second isolation valve into Containment Building.

SERVICE Class 3 Seismic

1. Station air system except portion noted above.

2. Station air connection to Unit No. 1.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS K-2
SYMBOL 1A

Date December 16, 1968
Rev.

DESIGN PRESS. 150 psig
DESIGN TEMP. 100° F

UE&C WELDING SPEC. No. 1 & No. 20

PIPE

3" & larger, A-53 Seamless Gr. B, Sch. 40
2-1/2" & smaller, A-106 Gr. B, Sch. 80

same

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 40
2" & smaller , A-105 Gr. II, 3000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA R.F. Weld neck
2" & smaller , A-181 Gr. I, 150# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS 1/16" Thick Red rubber duck insert, Ring type

UNIONS 2" & smaller, F.S. S.W. 2000# steel to stainless ground joint.

BACKING RINGS None, use consumable insert with TIG welding.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS K-2

SYMBOL IA

SERVICE Class 1 Seismic

1. Instrument air system, including air intake to compressor and compressor discharge through aftercooler, reciever, refrigerant dryer, dessicant dryer and air filter set.

2. Instrument air supply to conventional plant to and including restriction orifice FE-1112.

3. Instrument air supply to penetration and weld channel pressurization system from inlet of check valve IA-13.

4. Emergency station air make-up to penetration and weld channel pressurization system from inlet of check valve IA-17.

5. Emergency station air make-up to instrument air system from inlet of check valve IA-20.

6. Instrument air from inlet of control valve PCV-1228 through penetration of Containment Building.

SERVICE Class 3 Seismic

1. Emergency station air make-up to penetration and weld channel pressurization system from station air header through oil filter set, dessicant dryer and air filter set to check valve IA-17.

2. Emergency station air make-up to instrument air system through oil and air filter set to check valve IA-20.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS K-3
SYMBOL IA

Date December 16, 1968
Rev. 1) Sept. 15, 1969

DESIGN PRESS. 150 psig
DESIGN TEMP. 100° F

PIPE

3" & smaller, B-88 Type "K", Nom. Wall

TUBING

1/4" O.D. & 3/8" O.D. B-68 Soft Annealed, 0.035" wall
1/2" O.D. & 3/4" O.D. B-68 Soft Annealed, 0.049" wall

FITTINGS

1/4" - 3" Wrought copper solder joint for intermediate fittings
1/4" Swaged compression type for terminal conn. at instrument

FLANGES

None

VALVES

1/2" & smaller, B-62, 3000# Screwed ends, Bronze stem, Composition seat
3/4" & larger , B-62, 150# Screwed ends, Bronze stem, Composition seat

BOLTING None

GASKETS None

UNIONS None

Brazed joints on Class 1

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS K-3

SYMBOL IA

SERVICE Class 1 Seismic

1. Instrument air supply to nuclear plant services from air filter set.

2. Instrument air supply to Auxiliary Feed Pump House and to Intake Structure.

3. Instrument air supply to Diesel Generator Building.

SERVICE Class 3 Seismic

1. Instrument air supply to Turbine Generator Plant from restriction orifice FE-1112.

2. Instrument transmitted air lines from instrument to control room panels and local instruments.

3. Multiple conductor runs from junction boxes to control room. ("Dekoron Metl-Cor" or equal).

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS K-3

SYMBOL IA

SERVICE Class 1 Seismic

1. Instrument air supply to nuclear plant services from air filter set.

2. Instrument air supply to Auxiliary Feed Pump House and to Intake Structure.

3. I.A. supply to Diesel Gen. Building

SERVICE Class 3 Seismic

1. Instrument air supply to Turbine Generator Plant from restriction orifice FE-1112.

2. Instrument transmitted air lines from instrument to control room panels and local instruments.

3. Multiple conductor runs from junction boxes to control room. ("Dekoron Metl-Cor" or equal).

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS K-4 Date December 16, 1968
SYMBOL IH Rev.

DESIGN PRESS. 1440 psig max.
DESIGN TEMP. 600° F. max.

UE&C WELDING SPEC. No. 1

PIPE

1/2" & smaller, A-106 Gr. B, Sch. 80

same

TUBING

1/2" O.D. & smaller, A-83 Gr. A, 0.065" wall

FITTINGS

1/2" & smaller Pipe, A-105 Gr. II, 3000# Socket Weld
1/2" & smaller Tube, A-105 Gr. II, Socket weld to suit tube
1/2" & smaller Tube, A-105 Gr. II, Swagelok tube ends

FLANGES

None

VALVES

1/2" & smaller, A-105 Gr. II, 6000# Socket weld ends, S.S. trim

BOLTING None

GASKETS None

UNIONS None

NOTE: Source and intermediate fittings on tubing runs shall be tube socket weld fittings. Terminal connection at instrument shall be swaged tube compression fitting.

CLASS K-4

SYMBOL IH

SERVICE

Instrument piping from first valve to primary element - turbine generator plant equipment and piping systems at pressures above 100 psig.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS K-5
SYMBOL IL

Date December 16, 1968
Rev.

DESIGN PRESS. Full vacuum to 100 psig
DESIGN TEMP. 100° F. Max.

PIPE

1" & smaller, B-43, Standard wall

same

TUBING

1/4" O.D., B-62, Soft annealed, 0.035" wall

1/2 & 3/4 use instead

FITTINGS

See note

FLANGES

None

VALVES

1/4" B-62, 150# Screwed ends, Bronze stem, Composition seat
1/2" & 3/4" B-62, 3000# Screwed ends, Bronze stem, Composition seat

BOLTING None

GASKETS None

UNIONS See Note

NOTE: Source and intermediate fittings on tubing runs shall be wrought copper solder fittings. Terminal connection at instrument shall be swaged tube compression fittings. Outdoor runs shall be pre-insulated, pre-wired traced, 3/8" O.D. carbon steel tubing, "Dekoron 2150" or equal.

CLASS K-5

SYMBOL IL

SERVICE

Instrument piping from first valve to primary element - turbine generator plant equipment and piping systems at pressures below 100 psig.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS L-1
SYMBOL PCA

Date December 16, 1968
Rev.

DESIGN PRESS. 150 psig
DESIGN TEMP. 150° F

UE&C WELDING SPEC. No. 1

PIPE

3" & larger , A-53 Seamless or ERW, Gr. B, Sch. 40
2-1/2" & smaller, A-106 Gr. B, Sch. 40

same

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 40
2" & smaller, A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA F.F. Weld Neck, Bore for Sch. 40
2" & smaller , A-181 Gr. I, 150# ASA F.F. Socket weld

VALVES

2-1/2" & larger Butterfly, A-126 Gr. A, Flanged ends
2" & smaller Butterfly, A-126 Gr. A, Screwed ends
2" & smaller, A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. B Square head bolts, A-307 Hex. nuts

GASKETS 1/16" Compressed Asbestos, Ring type

UNIONS 2" & smaller, F.S. S.W. 2000# steel to stainless steel joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS L-1

SYMBOL PCA

SERVICE Class 1 Seismic

Hot penetration cooling air system.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS M-1 Date December 16, 1968
SYMBOL SP Rev.

DESIGN PRESS. Full vacuum to 1440 psig max.
DESIGN TEMP. 600° F. Max.

UE&C WELDING SPEC. No. 8

PIPE

1-1/2" & smaller A-312 TP-304 Sch. 80S same

TUBING

1/4" O.D., 1/2" O.D. A-269 Seamless TP-304, 0.035" wall same

FITTINGS

1-1/2" & smaller, A-182 F-304, 3000# Socket weld for pipe
1/4" to 1" , 304 S.S. Socket weld for tube
1/8" to 1/2" , 304 S.S. Swagelok (See note)

FLANGES

None

VALVES

1-1/2" & smaller A-182 F-22, 6000# Socket weld ends, S.S. trim

BOLTING None

GASKETS None

UNIONS None

NOTE: Source and intermediate fittings on tubing runs shall be tube socket weld fittings, Cajon or equal. Terminal connection at sampling coil shall be swaged tube compression fitting.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS N-1
SYMBOL DF

Date December 16, 1968
Rev.

DESIGN PRESS. 50 psig
DESIGN TEMP. 100° F

UE&C WELDING SPEC. No. 1 & No. 20

PIPE

3" & larger, A-106 Gr. B, Sch. 80
2-1/2" & smaller, A-106 Gr. B, Sch. 80 same

FITTINGS

2-1/2" & larger, A-234, WPB, Butt weld, Sch. 80
2" & smaller , A-105 Gr. II, 3000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA F.F. Weld Neck, Bore for Sch. 80
2" & smaller , A-181 Gr. I, 150# ASA F.F. Socket Weld

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. Nuts

GASKETS 1/16" Vellumoid, Full face

UNIONS None

BACKING RINGS None

SPECIAL REQUIREMENTS - All piping is to be cleaned, acid pickled and internally coated with a rust preventative (Gulf Coat TD or equal)

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS M-1

SYMBOL SP

SERVICE

Sampling System

CLASS N-1

SYMBOL DF

SERVICE - CLASS 1 SEISMIC

Diesel generator fuel oil system, except truck unloading line.

SERVICE CLASS 3 SEISMIC

Truck unloading line to fuel oil storage tanks.

UNITED ENGINEERS & CONSTRUCTORS INC.

CLASS N-1

SYMBOL DF

SERVICE - CLASS 1 SEISMIC

Diesel generator fuel oil system, except truck unloading line.

SERVICE - CLASS 3 SEISMIC

Truck unloading line to fuel oil storage tanks.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS N-2 Date December 16, 1968
SYMBOL DA Rev.

DESIGN PRESS. 350 psig
DESIGN TEMP. 200° F

UE&C WELDING SPEC. No. 1

PIPE

2" & smaller, A-106 Gr. B, Sch. 80

FITTINGS

2" & smaller, A-105 Gr. II, 3000# Socket weld

FLANGES

2" & smaller, A-105 Gr. II, 300# ASA R.F. Socket weld

VALVES

2" & smaller, A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS 1/16" thick Compressed asbestos

UNIONS 2" & smaller, F.S. S.W. 2000# steel to stainless ground joint

CLASS N-2

SYMBOL DA

SERVICE - CLASS 1 SEISMIC

Diesel generator starting air system.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS N-3 Date December 16, 1968
SYMBOL JW Rev.

DESIGN PRESS. 50 psig
DESIGN TEMP. 200° F

UE&C WELDING SPEC. NO. 1

PIPE

2" & smaller, A-106 Gr. B, Sch. 80

FITTINGS

2" & smaller, A-105 Gr. II, 3000# socket weld

FLANGES

2" & smaller, A-181 Gr. I, 150# ASA R.F. Socket weld

VALVES

2" & smaller, A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 Hex. nuts

GASKETS 1/16" thick Red rubber, Ring type

UNIONS 2" & smaller, F.S. S.W. 3000# steel to stainless ground joint.

CLASS N-3

SYMBOL JW

SERVICE - CLASS 1 SEISMIC

Diesel generator jacket water system.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS P-1
SYMBOL SB

Date December 16, 1968
Rev.

DESIGN PRESS. 300 psig
DESIGN TEMP. 420° F

UE&C WELDING SPEC. NO. 1

PIPE

3" & larger, A-53 Seamless, Gr. B, Sch. 40
2-1/2" & smaller, A-106 Gr. B, Sch.40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 40
2" & smaller , A-105 Gr. II, 2000# Socket weld

FLANGES

2-1/2" & larger, A-181 Gr. I, 300# ASA R.F. Weld neck
2" & smaller , A-181 Gr. I, 300# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 300# ASA, Butt weld ends, S.S. trim
2" & smaller , A-105 Gr. II, 600# ASA, Socket weld ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, F.S. S.W. 2000# steel to stainless ground joint

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

CLASS P-1

SYMBOL SB

SERVICE

1. Service boiler steam supply
2. Steam to circulating water priming ejectors
3. Steam to de-icing steam jet vacuum pumps.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS P-2
SYMBOL UE

Date December 16, 1968
Rev. 1) Sept. 15, 1969

DESIGN PRESS. 60 psig max.
DESIGN TEMP. 260° F

UE&C WELDING SPEC. No. 1

PIPE

3" & larger, A-53 Seamless, Gr. B, Sch. 40
2-1/2" & smaller, A-106 Gr. B, Sch. 40

FITTINGS

2-1/2" & larger, A-234 WPB, Butt weld, Sch. 40
2" & smaller, A-105 Gr. II, 2000# Screwed

FLANGES

2-1/2" & larger, A-181 Gr. I, 150# ASA R.F. Weld neck
2" & smaller, A-181 Gr. I, 150# ASA R.F. Socket weld

VALVES

2-1/2" & larger, A-216 WCB, 150# ASA, Flanged ends, S.S. trim
2" & smaller, A-105 Gr. II, 600# ASA, Screwed ends, S.S. trim

BOLTING A-307 Gr. A Square head bolts, A-307 hex. nuts

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type

UNIONS 2" & smaller, 300# F.S. Screwed ends.

BACKING RINGS 2-1/2" & larger, Split commercial type with short nubs.

CLASS P-2

SYMBOL UH

SERVICE Class 1 Seismic

1. Process and heating steam supply from isolation valve UH-43 in to Containment Building.

2. Condensate return through Containment Building penetration to isolation valve UH-44.

SERVICE Class 3 Seismic

1. Process and heating steam supply except containment penetration.

2. Condensate return lines except containment penetration.

UNITED ENGINEERS & CONSTRUCTORS INC.

PIPING SCHEDULE & MATERIAL

CLASS P-3
SYMBOL SBF

Date Sept. 15, 1969
Rev.

DESIGN PRESS. 450 psig
DESIGN TEMP. 220°F

PIPE

2" & smaller, A-106 Gr. B. Sch. 40

FITTINGS

2" & smaller, A-105 Gr. II, 2000# Socket weld.

FLANGES

2" & smaller, A-181 Gr. I, 300# ASA R.F. Socket weld.

VALVES

2" & smaller, A-105 Gr. II, 600# ASA Socket weld ends, S.S. trim.

BOLTING A-307 Gr. A Square head bolts, A-307 hex. nuts.

GASKETS Asbestos filled, spiral wound 304 S.S. Flexitallic type.

UNIONS 2" & smaller, F.S.S.W. 2000# steel to stainless ground joint.

CLASS P-3

SYMBOL SBF

SERVICE

Spray water to auxiliary steam desuperheater from service boiler feed pump discharge in Unit No. 1.

EQUIPMENT SPECIFICATION COVER SHEET

WESTINGHOUSE FORM 54341

EQUIPMENT SPECIFICATION	DATED	REVISION NO.	DATED	ORIGINAL ISSUE	SUPERSEDES PREVIOUS REVISIONS
G-569866	8-18-64	4	3-1-68	☐	☒

ATTACHMENTS

EQUIPMENT Material Specification Pipe and Fittings

Spec 430V008

SHOP ORDER NO. 225

SYSTEM: MULT (AC, AFW, ASC, CF, COND, CV, CVCS CW, EDG, EX, FW, HL, HD HPC, HSB, IA, INST, IVSW. MS, MTG, MW, PG, PW, RCS, SA, SG, SI, SP, SS, WD, & WCCPP)

QA CAT: 1

FILE #: —

COMP. PRINTOUT LOC: —

APPLICABLE PLANTS ONLY:

WEP
FPL
CPL
KEP
INT - Indian Point Unit No. 3
VPA
WIS
PSE
FLA

FOR SUPPLIER'S CONVENIENCE

REV. NO.	REVISION ENTERED BY & DATE

WESTINGHOUSE ELECTRIC CORPORATION
Atomic Power Division
P.O. Box 355
Pittsburgh, Pennsylvania, 15230

APPROVAL

	ORIGINAL ISSUE	REV. 1	REV. 2	REV. 3	REV. 4
SHOP ORDER HOLDER	J. R. Santoro				3-1-68
MANAGER Aux. Equipment	W. B. Seth				4/23/68

SECT. 9 ONLY

PIPING SYSTEM SERVICE DESIGNATIONS

	Designation	Service
*	~~CS~~ CH	Chemical & Volume Control
	SS	Sampling
	WD	Waste Disposal
	RC	Reactor Coolant (Eng. Safeguard)
	SI	Safety Injection (Eng. Safeguard)
	RH	Residual Heat Removal (Eng. Safeguard)
	SF	Spent Fuel Pit Cooling and Cleanup
	IV	Isolation Valve Seal Water (Eng. Safeguard)
	PP	Penetration Pressurization (Eng. Safeguard)

PIPING CLASSIFICATION

Design Conditions

Class*	Pressure Psig	Temperature** °F	Material
077	75	200	Aluminum Alloy
151	150	500	Stainless Steel
152	150	500	Carbon Steel
153	150	400	Stainless Steel Tubing
154	150	650	Carbon Steel Tubing
155	150	150	Copper Tubing
301	370	650	Stainless Steel
302	300	650	Carbon Steel
601	600	600	Stainless Steel
602	600	650	Carbon Steel
901	900	650	Stainless Steel
902	1095	200	Stainless Steel
903	900	650	Carbon Steel
1501	1400	650	Stainless Steel
1502	1030	650	Carbon Steel
2501	2580	650	Stainless Steel
2502	2500	400	Stainless Steel
2503	2500	650	Carbon Steel
2505	2500	650	Stainless Steel Tubing
2506	2500	650	Carbon Steel Tubing

*The suffix N or R may be added to a piping specification Class No. (such as 151N or 151R) to signify non-radioactive or radioactive service, respectively. The piping materials within the scope of this piping specification for any Class No. are in no way affected by the choice of these suffixes N or R.

**Temperature corresponds to design pressure indicated. Other pressure-temperature relationships are noted on individual specification sheets.

GENERAL NOTES

1. Stainless Steel pipe shall conform to USAS B36.19 for sizes 1/2" through 12" and wall thickness schedules 10S through 80S. Stainless steel pipe outside of the scope of USAS B36.19 shall conform to USAS B36.10.

2. Carbon steel pipe shall conform to USAS B36.10.

3. Flanges shall conform to USAS B16.5.

4. Socket weld fittings and socket joints shall conform to USAS B16.11.

5. Where welded pipe or fittings are permitted under a given piping classification, the thickness has been based on a joint service factor of 100% for the longitudinal weld. The weld integrity shall be verified by radiographic, ultrasonic, or equivalent volumetric examination as approved by WAPD.

6. Stainless steel materials of carbon content less than 0.04 percent shall not be substituted for materials specified herein without specific and written approval from WAPD.

7. Tubing may be purchased of either seamless or welded construction; however, welded tubing is acceptable to WAPD only if the following requirements are met and certified with the purchase of welded tubing.

   a. The longitudinal weld seam shall be inspected, as described in paragraph five, for freedom from all defects and subsequently drawn to exact size similarly as in seamless tube manufacture.

   b. The finished longitudinal weld seam has a 100 percent joint efficiency and has been cold reduced a minimum of 15%.

   c. The finished tubing material shall be soft annealed and suitable for uniform flaring and bending.

8. As this specification is based on USAS B31.1 1955 code therefore, no additional wall thickness need be added for bending provided the bends are 5D or greater.

9. Materials of ASTM A105 Grade I and II may be substituted where ASTM A181 Grade I is specified.

10. THE WAPD PIPING SPECIFICATION CLASS NUMBERS SUCH AS 151, 601, 901, 1501, 2501, ETC. ARE NOT NECESSARILY COMPATIBLE WITH THE PRIMARY SERVICE RATINGS 150#, 600#, 900#, 1500#, 2500#, ETC. ASSOCIATED WITH USAS B16.5. FOR EXAMPLE WAPD PIPING CLASS 2501 SPECIFIES 1500# USAS B16.5 FLANGES - NOT 2500# FLANGES.

11. Pipe schedules were determined by first calculating the ratio of operating pressure to the temperature dependent allowable stress of a given type of steel. The value of the P-S ratios for stainless steel and carbon steel piping were based on the following:

    1. Reference
       ASME Boiler and Pressure Vessel Code, Section I, and American Standard Code for Pressure Piping, USAS B31.1 - 1955 (including Code Case 37). Code Case N-7 (allowable stresses).

    2. Basic Equation

$$t = \left[\frac{1}{0.875}\right] \left[\frac{PD}{2S + 2YP} + C\right]$$

    or rearranging

$$\frac{P}{S} = \frac{1.75\,t - 2C}{D + 2YC - 1.75\,Yt}$$

    Where P = operating pressure
    S = allowable stress
    t = thickness of pipe wall
    C = 0.065 for pipe $\leq$ 3 1/2"
    C = 0.00 for pipe > 3 1/2"
    Y = 0.4 (valid up to 900°F)
    D = Actual O.D. of Pipe
    1/0.875 = commercial tolerance for wall thickness

Knowing the P-S ratio and the nominal outside diameter of the pipe, one can refer to tabulated values of pipe size versus P-S ratio versus pipe schedule. At a given outside diameter, the pipe schedule to be selected would be that one which has a P-S ratio equal to or greater than the design P-S ratio.

12. The pressure - temperature relationships following the primary design pressure - temperature relationship represent operating conditions which yield similar P-S ratios. Hence, the same pipe schedules can be used for all pressure - temperature combinations shown.

13. The insulation material(s) selected shall be subject to WAPD approval. All insulations intended for application to austenitic stainless steel surfaces shall be evaluated and qualified for this use in order to assure freedom from stress corrosion cracking of piping materials. The qualification test shall be approved by WAPD. Those materials listed in Appendix "A" are considered suitable for use as, thermal insulation, cements, cloth covers, adhesives, etc. with austentic stainless steels by WAPD.

PIPING SPECIFICATION
CLASS 077

Design Conditions

Pressure 75 psig
Maximum Temperature 200 °F

Material: Aluminum of ASTM specification listed below for each item.

Pipe

Size	All sizes
Construction	Seamless
ASTM Spec	B 241 alloy 6063 Temper T6
Schedule	40

Fittings

Size	2" and smaller	2-1/2" to 12"
Type	Wrought	Wrought
Joint	Socket Weld	Butt Weld
ASTM Spec	B 361, WP 6063	B 361, WP 6063
Rating	125#	Schedule 40

Flanges

Size	All Sizes
Type	Forged
Joint	Lap Joint
ASTM	A 181 Gr.1
Rating	150#

PIPING SPECIFICATIONS
CLASS 151

Design Conditions

Pressure	150 psig	210 psig	240 psig
Maximum Temperature	500°F	300°F	200°F

Material: Stainless Steel of ASTM Specification listed below for each item.

Pipe

Size	*	4" and smaller	5" to XXX 10"	12" XXX to 24"
Construction		Seamless	Seamless	Welded
ASTM Spec		A 312 Type 304	A 312 Type 304	A 358 Class I TP 304
Schedule	*	XXX 40S	XXX 40S	XXX XXX 3/8" Wall

Fittings

Size	*	2" and smaller	2-1/2" to 4"	5" to XX" 10"	12" XX" to 24"
Type		Forged	Seamless	Seamless	Welded
Joint		Socket Weld	Butt weld	Butt weld	Butt weld
ASTM Spec		A 182 F 304	A 403 WP 304	A 403 WP 304	A 403 WP 304
Rating	*	XXXXX 2000#	Schedule XXX 40S	Schedule XXX 40S	XXX" XXXX 3/8" Wall

Flanges

Size	*	2" and smaller	2-1/2" to 4"	5" to XX" 10"	12" XX" to 24"
Type		Forged	Forged	Forged	Forged
Joint		Socket weld	Weld neck	Weld neck	Weld neck
ASTM Spec		A 182 F 304	A 182 F 304	A 182 F 304	A 182 F 304
Rating		150# RF	150# RF	150# RF	150# RF
Bored to	*	Schedule XXX 40S	Schedule XXX 40S	Schedule XXX 40S	XXX" XXXX 3/8" Wall

Note: "Speedline" fittings (except aligning connectors and insert flanges) - as manufactured by Horace T. Potts Company of Philadelphia, Pa., may be used in sizes 4" and smaller. Should "Speedline" fittings be employed, only butt weld "Speedline" fittings shall be employed above 2-1/2 inches to 4 inches.

PIPING SPECIFICATION
CLASS 152

Design Conditions

Pressure	150 psig
Maximum Temperature	500°F

Material: Carbon Steel of ASTM Specification listed below for each item.

Pipe

Size	1/2" to 10"	12" to 24"
Construction	Seamless or welded	Seamless or welded
ASTM Spec	A 53 or A 106 Grade A or B	A 53 Grade A or B
Schedule	40	Std. Wall

Fittings

Size	2" and smaller	2-1/2" to 10"	12" to 24"
Type	Forged	Seamless	Seamless or welded
Joint	Socket weld	Butt weld	Butt weld
ASTM Spec	A 105 Grade II	A 234-WPB	A 234-WPB
Rating	~~XXXXX~~ 2000#	Schedule 40	Std. Wall

Flanges

Size	2" and smalller	2-1/2" to 10"	12" to 24"
Type	Forged	Forged	Forged
Joint	Socket Weld	Weld neck	Weld neck
ASTM Spec	A 181 Grade I	A 181 Grade I	A 181 Grade I
Rating	150# RF	150# RF	150# RF
Bored to	Schedule 40	Schedule 40	Std. Wall

A53 shall have carbon = 0.35% maximum

PIPING SPECIFICATION
CLASS 153

Design Conditions

Pressure	150 psig
Maximum Temperature	400°F

Material: Stainless Steel Tubing, ASTM A213, A249 soft annealed suitable for bending and flaring.

Sizes:

Actual O.D. inch	Wall Thickness inches
1/4	.065
3/8	.065
1/2	.065
3/4	.065

For Swaged Fitting Joints HiSeal or approved equal. Crawford Swagelok, Ermeto, Gyrolok and Imperial (Stainless Steel TP 316)

For Socket Welded Joints (Stainless Steel TP 316) Cajon socket weld tube fitting or approved equal.

PIPING SPECIFICATION
CLASS 154

Design Conditions

Pressure	150 psig
Maximum Temperature	650°F

Material: Carbon Steel Tubing, soft annealed seamless, A 83, or A 179.

Sizes:

Actual Tube Size inch (O.D.)	Wall Thickness inches (MIN.)
1/4	.065
3/8	.065
1/2	.065
3/4	.065

For Swaged Fitting Joints Crawford Swaglok, Ermeto, Gyrolok and Imperial HiSeal or approved equal.

For Socket Welded Joints Cajon socket weld tube fitting or approved equal.

PIPING SPECIFICATION
CLASS 155

Design Conditions

Pressure	150 psig
Maximum Temperature	150°F

Material: Copper Tubing, ASTM B 68, or B 75 Type DHP, soft annealed, suitable for bending and flaring.

Sizes:

Actual O.D. inch	Wall Thickness inch (Nom.)
1/4	0.032
3/8	0.032
1/2	0.032
3/4	0.032

For Swaged Fitting Joints Crawford Swaglok, Ermeto, Gyrolok and Imperial HiSeal or approved equal.

PIPING SPECIFICATION
CLASS 301

Design Conditions

Pressure	370 psig	495 psig	550 psig
Maximum Temperature	650°F	300°F	200°F

Material: Stainless Steel of ASTM Specification listed below for each item.

Pipe

Size	1/2" to 12"
Construction	Seamless
ASTM Spec	A 312 Type 304
Schedule	40S

Fittings

Size	2" and smaller	2-1/2" to 12"
Type	Forged	Seamless or welded
Joint	Socket weld	Butt weld
ASTM Spec	A 182 Type 304	A 403 Type 304
Rating	~~3000#~~ 2000#	Schedule 40S

Flanges

Size	2" and smaller	2-1/2" to 12"
Type	Forged	Forged
Joint	Socket weld	Welding neck
ASTM Spec	A 182 - F 304	A 182 - F 304
Rating	300#RF	300# RF
Bored to	Schedule 40S	Schedule 40S

PIPING SPECIFICATION
CLASS 302

Design Conditions

Pressure 300 psig
Maximum Temperature 650°F

Material: Carbon Steel of ASTM Specification listed below for each item.

Pipe

Size	1/2" to 10"	12" to 18"
Construction	Seamless or welded	Seamless or welded
ASTM Spec	A 53 Grade A or B	A 53 Grade A or B
Schedule	40	Std. Wall

Fittings

Size	2" and smaller	2-1/2" to 10"	12" to 18"
Type	Forged	Seamless or welded	Seamless or welded
Joint	Socket weld	Butt weld	Butt weld
ASTM Spec	A 105 Grade II	A 234 - WPB	A 234 - WPB
Rating	~~XXXXX~~ 2000#	Schedule 40	Std. Wall

Flanges

Size	2" and smaller	2-1/2" to 10"	12" to 18"
Type	Forged	Forged	Forged
Joint	Socket weld	Welding neck	Weld neck
ASTM Spec	A 181 Grade I	A 181 Grade I	A 181 Grade 1
Rating	300# RF	300#RF	300#RF
Bored to	Schedule 40	Schedule 40	Std. Wall

A53 shall have carbon = 0.35% maximum

PIPING SPECIFICATION
CLASS 601

Design Conditions

Pressure	600 psig	700 psig	875 psig	500 psig
Maximum Temperature	600°F	400°F	200°F	400°F (See Note Below)

Material: Stainless Steel of ASTM Specification listed below for each time.

Pipe

Size	1/2" to 10"	12" only	14" and 16"
Construction	Seamless	Seamless or welded plate	
ASTM Spec	A 312 Type 304	A 312 or A 358 Type 304	
Schedule	40S	Sch. 40S	Sch. 40

Fittings

Size	2" and smaller	2-1/2" to 10"	12" only	14" and 16"
Type	Forged	Seamless or welded	Seamless or welded	
Joint	Socket weld	Butt weld	Butt weld	Butt weld
ASTM Spec	A 182 F 304	A 403 WP 304	A 403 WP 304	A 403 WP 304
Rating	~~XXXXX~~ 2000#	Schedule 40S	Sch. 40S	Sch. 40

Flanges

Size	2" and smaller	2-1/2" to 10"	12" only	14" and 16"
Type	Forged	Forged	Forged	Forged
Joint	Socket weld	Welding neck	Welding neck	Welding neck
ASTM Spec	A 182 F 304	A 182 F 304	A 182 F 304	A 182 F 304
Rating	600# RF	600# RF	600# RF	600# RF
Bored to	Schedule 40S	Schedule 40S	Sch. 40S	Sch. 40

Note: A 300# RF Flange of Grade F 316 may be substituted for the 600# RF flange of Grade F 304 specified above, when the system requirements fall within the 300# ASA F316 temperature and pressure conditions.

PIPING SPECIFICATION
CLASS 602

Design Conditions

Pressure	600 psig
Maximum Temperature	650°F

Material: Carbon Steel of ASTM Specification listed below for each item.

Pipe

Size	2" and smaller	2-1/2" to 10"	12" only
Construction	Seamless	Seamless	Seamless
ASTM Spec	A 106 Grade A	A 106 Grade B	A 106 Grade B
Schedule	40	40	Std. Wall

Fittings

Size	2" and smaller	2-1/2" to 10"	12" only
Type	Forged	Seamless	Seamless
Joint	Socket weld	Butt weld	Butt weld
ASTM Spec	A 105 Grade II	A 234 - WPB	A 234 - WPB
Rating	~~3000#~~ 2000#	Schedule 40	Std. Wall

Flanges

Size	2" and smaller	2-1/2" to 10"	12" only
Type	Forged	Forged	Forged
Joint	Socket weld	Welding neck	Welding neck
ASTM Spec	A 105 Grade II	A 105 Grade II	A 105 Grade II
Rating	600# RF	600# RF	600# RF
Bored to	Schedule 40	Schedule 40	Std. Wall

PIPING CLASSIFICATION
CLASS 901

Design Conditions

Pressure	900 psig	1100 psig	1300 psig
Maximum Temperature	650°F	400°F	300°F

Material: Stainless Steel of ASTM Specification listed below for each item.

Pipe

Size	1/2" to 10"	12"	14" to 16"
Construction	Seamless	Seamless	Seamless or welded plate
ASTM Spec	A 312 Type 304	A 312 Type 304	A 312 or A358 Type 304
Schedule	80S	120	120

Fittings

Size	2" and smaller	2-1/2" to 10"	12" to 16"
Type	Forged	Seamless or welded	Seamless or welded
Joint	Socket weld	Butt weld	Butt weld
ASTM Spec	A 182 F 304	A 403 WP 304	A 403 WP 304
Rating	3000#	80S	120

Flanges

Size	2" and smaller	2-1/2" to 10"	12" to 16"
Type	Forged	Forged	Forged
Joint	Socket weld	Welding neck	Welding neck
ASTM Spec	A 182 F 304	A 182 F 304	A 182 F 304
Rating	1500#	900# RF	900# RF
Bored to	Schedule 80S	Schedule 80S	Schedule 120

Note: A 600# RF flange of Grade F 316 may be substituted for the 900# RF flange of Grade F 304 specified above for all the pressure/temperature design conditions listed above.

PIPING SPECIFICATION
CLASS 902

Design Conditions

Pressure	1095 psig
Maximum Temperature	200°F

Material: Stainless Steel of ASTM Specification listed below for each item.

Pipe

Size	1/2" to 8"	10" to 12"
Construction	Seamless	Seamless
ASTM Spec	A 312 Type 304	A 312 Type 304
Schedule	40S	80S

Fittings

Size	2" and smaller	2-1/2" to 8"	10" to 12"
Type	Forged	Seamless	Seamless
Joint	Socket weld	Butt weld	Butt weld
ASTM Spec	A 182 F 304	A 403 WP 304	A 403 F 304
Rating	~~9000#~~ ~~XXXXX~~ 2000#	Schedule 40S	Schedule 80S

Flanges

Size	2" and smaller	2-1/2" to 8"	10" to 12"
Type	Forged	Forged	Forged
Joint	Socket weld	Welding neck	Welding neck
ASTM Spec	A 182 F 304	A 182 F 304	A 182 F 304
Rating	600# RF	600# RF	600# RF
Bored to	Schedule 40S	Schedule 40S	Schedule 80S

PIPING SPECIFICATION
CLASS 903

Design Conditions

Pressure	900 psig
Maximum Temperature	650°F

Material: Carbon Steel of ASTM Specification listed below for each item.

Pipe

Size	1/2" to 10"	12"
Construction	Seamless	Seamless
ASTM Spec	A 106 Grade B	A 106 Grade B
Schedule	40	80

Fittings

Size	2" and smaller	2-1/2" to 10"	12"
Type	Forged	Seamless	Seamless
Joint	Socket weld	Butt weld	Butt weld
ASTM Spec	A 105 Grade II	A 234 - WPB	A 234 - WPB
Rating	~~3000#~~ 2000#	Schedule 40	Schedule 80

Flanges

Size	2" and smaller	2-1/2" to 10"	12"
Type	Forged	Forged	Forged
Joint	Socket weld	Welding neck	Welding neck
ASTM Spec	A 105 Grade II	A 105 Grade II	A 105 Grade II
Rating	600# RF	600# RF	600# RF
Bored to	Schedule 40	Schedule 40	Schedule 80

PIPING CLASSIFICATION
CLASS 1501

Design Conditons

Pressure	1400 psig	1500 psig	1575 psig
Maximum Temperature	650°F	350°F	200°F

Material: Stainless steel of ASTM Specification listed below for each item.

Pipe

Size	1/2" to 8"		10" to 16"
Construction	Seamless		Seamless or welded plate
ASTM Spec	A 312 TP 316		A 312 or A 358 TP 304
Schedule	80S		120

Fitting

Size	2" and smaller	2-1/2" to 8"	10" to 16"
Type	Forged	Seamless	Seamless or welded
Joint	Socket weld	Butt weld	Butt weld
ASTM Spec	A 182 F 304	A 403 WP 316	A 403 WP 304
Rating	3000#	Schedule 80S	Schedule 120

Flanges

Size	2" and smaller	2-1/2" to 8"	10" to 16"
Type	Forged	Forged	Forged
Joint	Socket weld	Weld neck	Weld neck
ASTM Spec	A 182 F 316	A 182 F 316	A 182 F 316
Rating	1500# RF	1500# RF	1500# RF
Bored to	160	80S	120

PIPING SPECIFICATION
CLASS 1502

Design Conditions

Pressure	1030 psig
Maximum Temperature	650°F

Material: Carbon Steel of ASTM Specification listed below for each item

Pipe

Size	1/2" to 10"
Construction	Seamless
ASTM Spec	A 106 Grade B
Schedule	80

Fittings

Size	2" and smaller	2-1/2" to 10"
Type	Forged	Seamless
Joint	Socket weld	Butt weld
ASTM Spec	A 105 Grade II	A 234 - WPB
Rating	3000#	Schedule 80

Flanges

Size	2" and smaller	2-1/2" to 10"
Type	Forged	Forged
Joint	Socket weld	Butt weld
ASTM Spec	A 105 Grade II	A 105 Grade II
Rating	600# RF	600# RF
Bored to	Schedule 80	Schedule 80

PIPING CLASSIFICATION
CLASS 2501

Design Conditions

Pressure	2580 psig	2510 psig
Maximum Temperature	650°F	680°F

Material: Stainless Steel of ASTM Specification listed below for each item.

Pipe

Size	1/2" to 3"	4" to 8"	10" to 16"
Construction	Seamless	Seamless	Seamless
ASTM Spec	A 376 TP 316	A 376 TP 316	A 376 TP 316
Schedule	160	120	140

Fittings

Size	1/2" to 2"	3"	4" to 8"	10" to 16"
Type	Forged	Seamless	Seamless	Seamless
Joint	Socket Weld	Butt Weld	Butt Weld	Butt Weld
ASTM Spec	A 182 F 316	A 403 WP 316	A 403 WP 316	A 403 WP 316
Rating	6000#	Schedule 160	Schedule 120	Schedule 140

Flanges

Size	1/2" to 2"	3"	4" to 8"	10" to 16"
Type	Forged	Forged	Forged	Forged
Joint	Socket weld	Weld neck	Weld neck	Weld neck
ASTM Spec	A 182 F 316	A 182 F 316	A 182 F 316	A 182 F 316
Rating	1500# RF	1500# RF	1500# RF	1500# RF
Bored to	Schedule 160	Schedule 160	Schedule 120	Schedule 140

NOTES:
1. Piping of sizes 3" and larger purchased to A 376 for the surge line and all branch piping connected to the main reactor coolant loops and up to the first and second isolation stop valves shall include the supplementary requirements S6 listed under the A 376 specification.
2. Design of sizes 18" O.D. and larger subject to WAPD approval.
3. Quality control requirements of the fittings 3 inch and larger shall be similar to ultrasonic supplementary requirements S6 of A376 specification.

PIPING CLASSIFICATION
CLASS 2502

Design Conditions

Pressure	2500 psig	2100 psig	2800 psig
Maximum Temperature	400 F	650°F	200°F

Material: Stainless Steel of ASTM Specification listed below for each item.

Pipe

Size	1/2" to 3"	4" to 8"	10" to 16"
Construction	Seamless	Seamless	Seamless
ASTM Spec	A 376 TP 316	A 376 TP 316	A 376 TP 316
Schedule	160	120	140

Fittings

Size	1/2" to 2"	3"	4" to 8"	10" to 16"
Type	Forged	Seamless	Seamless	Seamless
Joint	Socket Weld	Butt Weld	Butt Weld	Butt Weld
ASTM Spec	A 182 F 316	A 403 WP 316	A 403 WP 316	A 403 WP 316
Rating	6000#	Schedule 160	Schedule 120	Schedule 140

Flanges

Size	1/2" to 2"	3"	4" to 8"	10" to 16"
Type	Forged	Forged	Forged	Forged
Joint	Socket weld	Weld neck	Weld neck	Weld neck
ASTM Spec	A 182 F 316	A 182 F 316	A 182 F 316	A 182 F 316
Rating	1500# RF	1500# RF	1500# RF	1500# RF
Bored to	Schedule 160	Schedule 160	Schedule 120	Schedule 140

Note: Design of ~~Sizes~~ 18" O.D. and larger subject to WAPD approval.

PIPING SPECIFICATION
CLASS 2503

Design Conditions

Pressure	2500 psig
Maximum Temperature	650°F

Material: Carbon Steel of ASTM Specification listed below for each item.

Pipe

Size	1/2" to 12"
Construction	Seamless
ASTM Spec	A 106 Grade B
Schedule	160

Fittings

Size	2" and smaller	2-1/2" to 12"
Type	Forged	Seamless
Joint	Socket weld	Butt weld
ASTM Spec	A 105 Grade II	A 234 - WPB
Rating	6000#	Schedule 160

Flanges

Size	2" and smaller	2-1/2" to 12"
Type	Forged	Forged
Joint	Socket weld	Welding neck
ASTM Spec	A 105 Grade II	A 105 Grade II
Rating	1500# RF	1500# RF
Bored to	Schedule 160	Schedule 160

PIPING SPECIFICATION
CLASS 2505

Design Conditions

Pressure	2500 psig
Maximum Temperature	650°F

Material: Stainless Steel Tubing, A 249 or A 213, Soft annealed suitable for bending. TP316

Nominal Tube Size inch (Actual O.D.)	Wall Thickness inches
1/4	.065
3/8	.065
1/2	.065
3/4	.065

For Swaged Fitting Joints: Crawford Swaglok, Ermeto, Gyrolok and Imperial HiSeal or approved equal. (Stainless Steel TP 316)

For Socket Welded Joints: Cajon socket weld tube fitting or approved equal. (Stainless Steel TP 316)

PIPING SPECIFICATION
CLASS 2506

Design Conditions

Pressure 2500 psig
Maximum Temperature 650°F

Material: Carbon Steel Tubing, Soft Annealed, Seamless or Welded, ASTM A-192 and A-178 and A-179.

Nominal Tube Size inch (Actual O.D.)	Wall Thickness inches (Min.)
1/4	.065
3/8	.065
1/2	.065
3/4	.065

For Swaged Fitting Joints Crawford Swaglok, Ermeto, Gyrolok and Imperial HiSeal or approved equal.

For Socket Welded Joints Cajon socket weld tube fitting or approved equal.

GASKETS

Type of Joint	Flange Material	ASA Flange Rating	Gasket
Raised Face	Stainless Steel	150# to 1500#	Flexitallic gasket style CG, Type 304 stainless steel and asbestos filler
Raised Face	Carbon Steel	300# to 1500#	Flexitallic Gasket style CG, Type 304 stainless steel and asbestos filler
Raised Face	Carbon Steel	150#	Compressed asbestos, rubber bonded flat ring, 1/16" thick, dimensions to ASA B 16.21
Flat Face	Carbon Steel & Aluminum	75#	Compressed asbestos, rubber bonded full face, 1/16" thick, dimensions to ASA B 16.21 or Red rubber flat ring, 1/16" thick, dimensions to ASA B 16.21 for temperature below 220°F for water service only
Lap Joint	Steel Flange with Aluminum Stub End	75#	Use roofing felt (or Equivalent) and bolt insulators to prevent cathodic action between aluminum stub and steel flange

BOLTS AND NUTS

Flange Rating	300 to 2500 pounds
Type	Stud bolts with two nuts
Stud	ASTM A-193 Grade B7, continuously threaded per ASA B 1.1 Class 2A fit, sizes 1 inch and smaller in diameter - coarse thread series, sizes 1-1/8 inch and larger in diameter - 8 pitch thread series, length to ASA B 16.5.
Nut	ASTM A-194 Grade 2H, Hexagon semi-finished, American Standard heavy series threaded to ASA B 1.1 Class 2B; coarse thread series for sizes 1 inch in diameter and smaller, and 8 pitch threads for sizes 1-1/8 inches and larger in diameter.
Flange Rating	150 pounds
Type	Machine bolt and nut
Bolt	ASTM A-307 Grade B, unfinished regular square head, threaded to ASA BL.1 coarse thread series Class 2A fit; length to ASA B 16.5.
Nuts	ASTM A-194 Grade 2H (same as used with studs)

ADDENDUM "A"

The following thermal insulations, cements, cloth covers, adhesives, etc., have been approved by WAPD for use with austentic stainless steels. No other materials may be used for these applcations without the approval of WAPD.

VENDOR	TRADENAME
Pittsburgh-Corning	Unibestos
Fiberboard Paper Products	Caltemp
Johns-Manville	Min-K
John-Manville	Thermobestos
Owens-Corning	Kaylo
Ruberoid	Calsilite Special
John-Manville	Thermobestos
Keasby and Mattison	Kaytherm
Union Asbestos & Rubber Co.	Insubestos
H. K. Porter	Amosite
Baldwin-Ehert-Hill	Mineral Wool
John-Manville	Banroc Mineral Wool
Owens-Corning	I.S. Board Fiberglass
Owens-Corning	Marine Hi-Temp.
Owens-Corning	Fiberglass AF-AU-300
H. K. Porter	Thermal Tape
Union Asbestos & Rubber Co.	Thermal Tape
Union Asbestos & Rubber Co.	Woven Glass Felt
H. K. Porter	Asbestos
David Lea	Asbestos

Addendum "A" Continued

VENDOR	TRADENAME
S.O. Newport News	Asbestos Cloth
H. K. Porter	95% Asbestos
H. K. Porter	Asbestos
Cary Canadian Mines	7M5
Ruberoid	Finishing Cement
Phillip Carey	MW-50
John-Manville	450 Hi-Tomp
48 Insulations Company	Webers S 48
Eagle-Picher	#66
Baldwin-Ehret Hill	#1
Stain-Hall	Adhesive Coating 23-2
Benjamin-Foster	30-36
Benjamin-Foster	81-27
Pecora	Sodium-Silicate Adhesive
Arabol	Sodium-Silicate Adhesive

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SERIAL NUMBER: _ _ - _ _ _ - _ _ _
DESCRIPTION TITLE
(0 CHAR. MAX.)

DOCUMENT #: 5-569866

REVISION: 04
DATE: 03 / 01 / 68

UNIT: 3

SYSTEM: AJ | DH | EN | DL | DW | DU | EE | EQ
STRUCTURE:
TOPIC: AN
KEYWORD(S): GE CH

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DESCRIPTION TITLE
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DATE: _ _ / _ _ / _ _

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TOPIC: _ _
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TOPIC: _ _
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