William J. Cahill, Jr.
Vice President

Consolidated Edison Company of New York, Inc.
4 Irving Place, New York, N Y 10003
Telephone (212) 460-3819

July 27, 1979

re: Indian Point Unit No. 2
Docket No. 50-247

Director of Nuclear Reactor Regulation
ATTN: Mr. D. Eisenhut, Acting Director
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Eisenhut:

In accordance with our June 18, 1979 submittal, Attachment A to this letter provides our supplemental response to Mr. Stello's May 25, 1979 information request. This information is being submitted pursuant to 10 CFR 50.54(f) and forty (40) copies of this submittal are being provided.

In addition, the supplemental response to Design-Staff Request 2 presented on pages A-1 through A-5 of Attachment A also provides the information requested in Mr. A. Schwencer's July 6, 1979 letter.

Should you or your staff have any additional questions, please contact us.

Very truly yours,

William J. Cahill, Jr.
Vice President

attach.

Subscribed and sworn to before me this 27 day of July, 1979.

Notary Public

THOMAS LOVE
Notary Public State of New York
No. 31-2409638
Qualified In New York County
Commission Expires March 30, 1981

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ATTACHMENT A

Supplemental Response to
Information Requested on
PWR Feedwater Lines

(May 25, 1979 letter - Mr. V. Stello, Jr.
to All Pressurized Water Reactor Licensees)

Consolidated Edison Company of New York, Inc.
Indian Point Unit No. 2
Docket No. 50-247
July, 1979

Design-Staff Request 2:

Provide the results of any stress or fatigue analyses which were performed for this system.

Response:

The Indian Point Unit No. 2 feedwater piping within containment was analyzed using the United Engineers and Constructors (UE&C) MEL 21 P thermal piping code. The analyses were performed for both the startup condition (i.e., feedwater piping cold and steam generator hot) and the normal operating condition (i.e., both feedwater piping and steam generator hot). The results of the analyses for the maximum stress point in each of the four (4) feedwater lines are presented in Table SR-2a. In addition, the analytical results at each of the four steam generator nozzles are presented in Table SR-2b. As indicated in these Tables, the maximum stress (i.e., 13, 506 psi) occurs during normal operation in feedwater line no. 23 at the steam generator nozzle/feedwater piping junction. Note that this stress value is well within the allowable stress of 26,250 psi for expansion stresses. This allowable stress is calculated using a stress range reduction factor which accounts for cyclical loading of the material.

In addition, a special parametric evaluation of the dynamic response of feedwater line no. 22 to postulated water/steam hammer effects was performed following the feedwater line incident which occurred on November 13, 1973. This analysis was performed by UE&C as part of the full investigation of the incident and was intended to predict the hydraulic forces and stress conditions that existed during the incident. A description of the analysis and its results are contained in Appendix VI of the Indian Point Unit No. 2 Feedwater Line Incident Report, dated January 14, 1974.

Design-Staff Request 2 (Cont'd):

The Indian Point Unit No. 2 feedwater piping system inside containment is a Seismic Category I system. The four (4) main feedwater lines were originally designed (as were all Seismic Category I lines) using conservative static design criteria and span tables that limited the maximum seismic stress to 3000 psi. No computer codes (i.e., dynamic analyses) were used for the seismic design evaluation of the Unit No. 2 feedwater lines. As discussed in our June 18, 1979 submittal and as indicated in Tables SR-2a and SR-2b, only feedwater line no. 22 has been modified from the original design. This modification reduced the length of horizontal pipe leading to the steam generator nozzle. The effect of the modification on the seismic capability of the feedwater line was insignificant and the supporting of the modified feedwater line still satisfied the original static design criteria. As indicated earlier, the effect of the modification on the piping thermal analysis was not insignificant and thermal reanalysis was performed to demonstrate acceptable stress levels.

In addition, further verification of the acceptability of the feedwater line no. 22 modification could be provided by a comparison to the Indian Point Unit No. 3 feedwater line to steam generator no. 32. Following the Unit No. 2 water/steam hammer incident of November, 1973 and subsequent modification of feedwater line no. 22, the same piping modification was made as a preventative measure to the comparable line no. 32 of Unit No. 3. In fact, a piping review indicates that the pipe run geometry and piping supports for these feedwater lines are identical for both units. Accordingly, the results obtained from the Unit No. 3 dynamic analysis of this line could be applied to the Unit No. 2 line.

The total maximum stress calculated for line no. 32 in Unit No. 3 is 15,695 psi. This total maximum stress is conservatively determined by adding the maximum stress values calculated for each of the loading conditions (i.e., deadweight, pressure and seismic) independent of actual point of occurrence in the line. The calculated total maximum stress of 15, 695 psi for this line is well within the maximum allowable stress of 21,000 psi.

Finally, as discussed in our June 18, 1979 submittal, "J" tubes were installed in the feedwater sparger rings of all four (4) steam generators following the November, 1973 water/steam hammer incident. This installation effectively precludes rapid draining of the feedwater spargers and lines, and has since become a generic revision for Westinghouse steam generators. Seismic analyses are not required by Westinghouse for "J" tube installations. The failure of a "J" tube(s) does not breach any pressure boundary nor does it affect the delivery of feedwater to the steam generator(s). In addition, the "J" tube(s) could not enter the tube bundle area of the steam generator since the feedwater flow restrictor located below the feedwater sparger in the steam generator would effectively trap the "J" tube(s). Consequently, "J" tube installations are performed in accordance with quality assurance practices for modification or repair of feedwater sparging rings and no seismic analysis is required.

TABLE SR-2a

IP2 Feedwater Piping - Maximum Stress Points

Startup Condition:

Feedwater Line Location (nodal pt.)	21 110 (tangent)	22 (1) 20	23 105	24 70 (tangent)
Forces (lbs.): Fx	1,890	-1,876	611	-2,533
Fy	-12,320	-8,714	-8,276	-16,394
Fz	-2,536	-3,088	2,318	1,611
Moments(ft-lbs): Mx	-75,950	-58,546	87,789	17,734
My	10,582	-17,539	11,362	-21,386
Mz	-43,208	97,601	24,827	-145,536
Pipe Stress (psi)	6,993	8,211	6,555	10,565

Normal Operating Condition:

Feedwater Line Location (nodal pt.)	21 30 (bend)	22 (1) 80 (tangent)	23 105	24 70 (tangent)
Forces(lbs): Fx	-2,557	3,902	-4,623	4,331
Fy	-791	9,904	18,004	10,335
Fz	2,136	4,353	-8,487	-4,586
Moments(ft-lbs): Mx	1,647	-84,314	-92,621	21,233
My	-92,643	64,599	-90,040	63,349
Mz	-7,424	-60,086	-138,530	126,384
Pipe Stress (psi)	6,628	8,702	13,506	10,193

(1) Results presented for feedwater line no. 22 are from the reanalysis performed following modification of this line in 1973. Results presented for feedwater lines nos. 21, 23 and 24 are from original analyses.

TABLE SR-2b

IP2 Feedwater Piping/S.G. Nozzle Stress

Startup Condition:

Steam Generator/Feedline Location (nodal pt.)		21 105	22[1] 20	23 105	24 120
Forces (lbs):	Fx	1,890	-1,876	611	2,533
	Fy	-12,320	-8,714	-8,276	-14,130
	Fz	-2,536	-3,088	2,318	2,736
Moments (ft-lbs.):	Mx	-82,727	-58,546	87,789	127,856
	My	10,348	-17,539	11,362	22,516
	Mz	-47,122	97,601	24,827	16,539
Pipe Stress (psi)		6,829	8,211	6,555	9,332

Normal Operating Condition:

Steam Generator/Feedline Location (nodal pt.)		21 105	22[1] 20	23 105	24 120
Forces (lbs.):	Fx	-4,404	3,902	-4,623	-4,331
	Fy	10,590	9,143	18,004	15,536
	Fz	3,700	4,353	-8,487	-5,692
Moments (ft-lbs.):	Mx	33,618	34,659	-92,621	-56,946
	My	2,855	14,112	-90,040	-47,568
	Mz	-26,569	-48,200	-138,530	-56,140
Pipe Stress (psi)		3,062	4,351	13,506	6,634

(1) Results presented for feedwater line No. 22 are from the reanalysis performed following modification of this line in 1973. Results presented for feedwater lines Nos. 21, 23, and 24 are from original analyses.

Fabrication History-Staff Request 2:

Provide the details of the welding process(es) used to make the nozzle-to-pipe, pipe to sparger and piping welds. Include details of welding such as preheat, joint configuration (include with or without backing ring), and post weld treatment, if any.

Response:

The details of the welding process(es) used to make the nozzle-to-pipe and piping girth welds for the feedwater system within containment are described below. Note that the pipe-to-sparger connection is a slip-joint rather than a weld and, therefore, not addressed.

All welding for the the feedwater system within containment was performed in accordance with Section 6, Chapter 4 of the American Standard Code for Pressure Piping ASA-B31.1-1955. The welding satisfied the following specified requirements:

1. PROCESS: The welding shall be done using the inert-gas-tungsten arc process (TIG) or the metal inert-gas arc process (MIG) with filler metal for the root passes (joints 3/8" and under completed with TIG or MIG), balance of welding with metal arc welding. Welding with consumable insert rings shall be done using TIG or MIG for fusing the consumable insert ring (Grinnell or EB ring) and the root passes with filler metal, balance with metal arc welding. No backing rings are to be used.

2. JOINT PREPARATION:

   (a) Before Assembly-Dimensional: The root details of the weld preparations of the parts to be welded shall be in accordance with designs as shown on Drawings 5000-LL-1147 and 5000-L-1338 for the type of root joint selected.

   (b) Consumable Insert Rings: The material specifications for the consumable insert ring shall be similar to the parent metal.

   (c) Without Consumable Insert Ring: The joint to be welded shall have a minimum of 3/32" root opening. Tack welds shall be approximately 3/4" long and 3" apart. The edges and surfaces of the parts to be welded shall be prepared by machining or grinding. Flame cutting or carbon-arc gouging are permitted, provided at least 1/32" of kerf material is subsequently removed from all kerf surfaces.

3. ASSEMBLY OF THE JOINT WITH THE CONSUMABLE INSERT RING:

(a) All of the parts assembled shall be free from dirt, scale, grease, or any other condition which may be detrimental to the quality of the completed joint.

(b) The parts shall be assembled in such a manner that the tolerances as shown on Fig. 3 of Drawing 5000-L-1338 or Fig. 2 of Drawing 5000-LL-1147 are not exceeded.

(c) The joint shall be rigged in slight compression in order to minimize the tendency of cracking in the inert gas arc root bead.

(d) Using the consumable insert as shown on Drawing 5000-L-1338, the top of the tang of the consumable insert ring shall be flush or preferably above the nominal 0.045 inch adjacent weld preparation lips. When available, consumable insert ring material with 5/64" height tang should be used.

(e) Where the I.D. of the joint is accessible after completion of welding, No. 40 Kraft paper dams, secured with cellophane tape, placed 6 to 12 inches on each side of the joint, may be used. Other acceptable methods such as purge balloons may also be used. A bleed hole 1/4" diameter shall be provided and shall be placed on the high side of the joint.

(f) Where the I.D. of the joint is not accessible, the ends of the pipe will be blocked off and the entire line purged. A bleed hole of 1/4" diameter shall be provided in the discharge end and shall be placed on the high side of the joint.

(g) Purge time will be governed by the size and length of the pipe to be purged and shall be approximately 3 to 5 volume displacements prior to welding.

4. PREHEATING:

(a) Preheating shall be required:

(1) When one or more parts to be welded is casting.

(2) When the ambient temperature is 60°F or below, and the parts to be welded at this temperature have a wall thickness 1/2" or more.

(b) Preheating shall be performed as follows:

(1) Preheating shall be by electric induction or resistance method. Where physical size and/or contour does not permit the use of either of those methods, then preheat shall be accomplished by torch.

(2) Temperature shall be brought up gradually and uniformly.

(3) Preheat temperature shall be measured by attached thermocouples, contact pyrometer, or by use of "tempil sticks".

(4) Minimum preheat for low carbon steels (.15% to .20% c.) 200 F. Minimum preheat for high carbon steels (.20% to .35% c.) 500 F.

(5) The welding process may be interrupted at any time, provided that a minimum of at least 3/8" thickness of weld deposit or 25% of the welding groove is filled (whichever is the greater), and the weld is wrapped with asbestos material before permitting to cool slowly from welding temperature to room temperature.

5. CLEANING: All slag or flux shall be removed from each end crater by means of a light cleaning hammer before proceeding with the next electrode. Each completed bead or layer shall be thoroughly cleaned with a hand hammer and wire brush, or with an Ingersoll-Rand scaling hammer or equal, removing all weld splatter from pipe ends or surface or weld before laying down next successive bead or layer.

All defects or irregularities disclosed by inspection which would prevent proper deposition of succeeding bead, shall be removed.

6. DEFECTS: Any cracks or blowholes that appear on the surface of any bead of welding shall be completely removed by chipping or grinding before depositing the next successive bead of welding.

7. STRESS RELIEVING:

(a) The stress relieving of completed welds, when required, shall be performed in accordance with requirements of the specific construction code under which the work is conducted:

(1) Welded joints covered by ASA Power Piping Code 3/4" and over.

(2) Welded joints covered by ASME Nuclear Code 3/4" and over.

(3) Welded joints covered by ASME Power Boiler Code 3/4" and over.

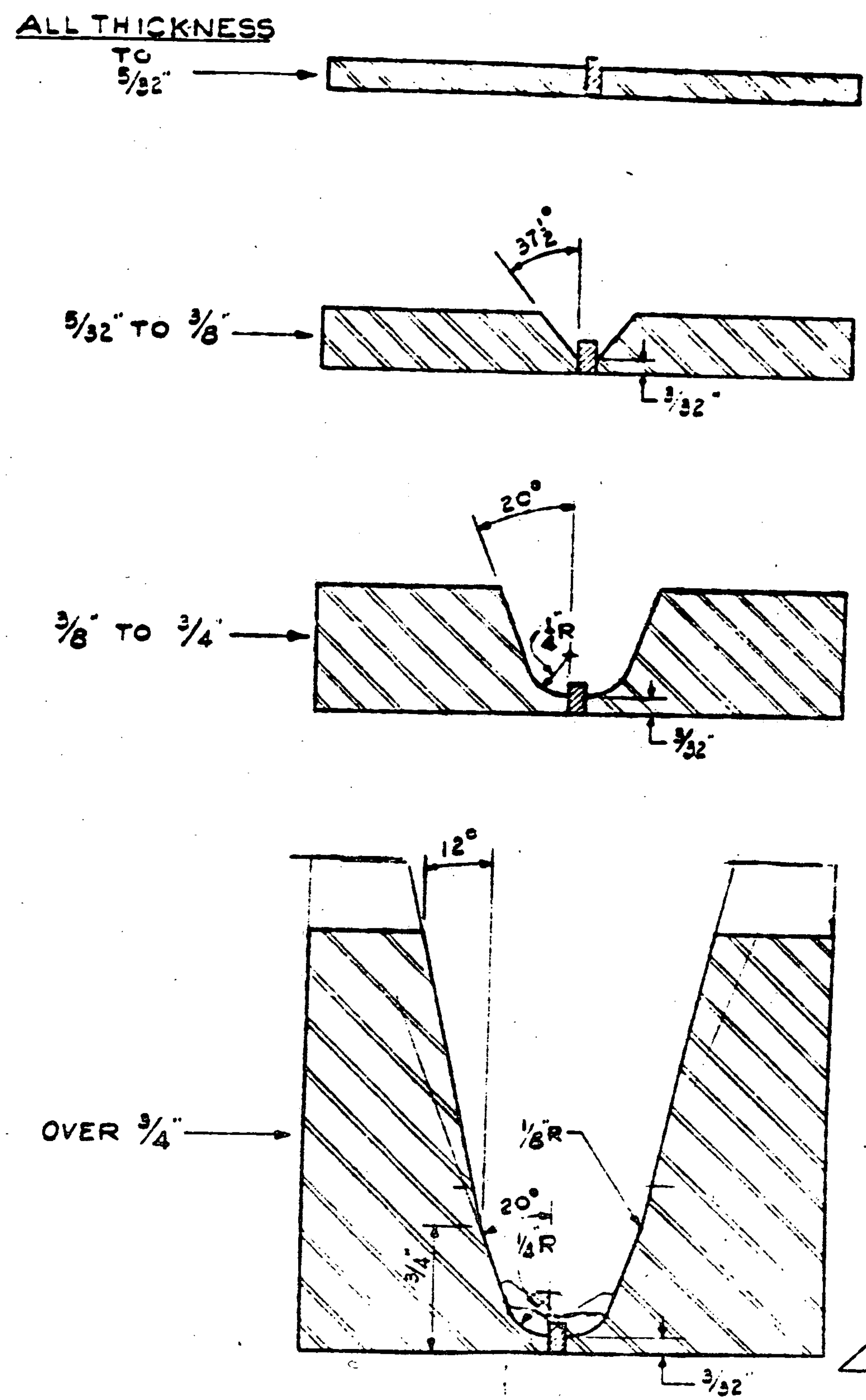
(b) Stress Relieving shall be performed as follows:

(1) The stress relieving temperature shall be 1000°F to 1200°F for carbon steel. Stress relieving shall consist of uniformly heating a circumferential band having a minimum width, on each side of the welded joint, of at least three times the width of the widest part of the welding groove but in no case less than twice the width of the weld reinforcement.

(2) The welded joint shall be brought up slowly, 400°F per hour maximum, to the required temperature and held at the soaking temperature for a period of time proportioned to one hour per inch of wall thickness but not less than one half hour and shall be allowed to cool at the rate of 200°F per hour to 900°F then to room temperature without removing the wrapping.

(3) Induction or resistance method shall be used to complete the stress relieving and a recording instrument shall be used to obtain a record of the stress relieving operation.

PIPE TO PIPE WELDS



PIPE TO FORGING OR CASTING WELDS

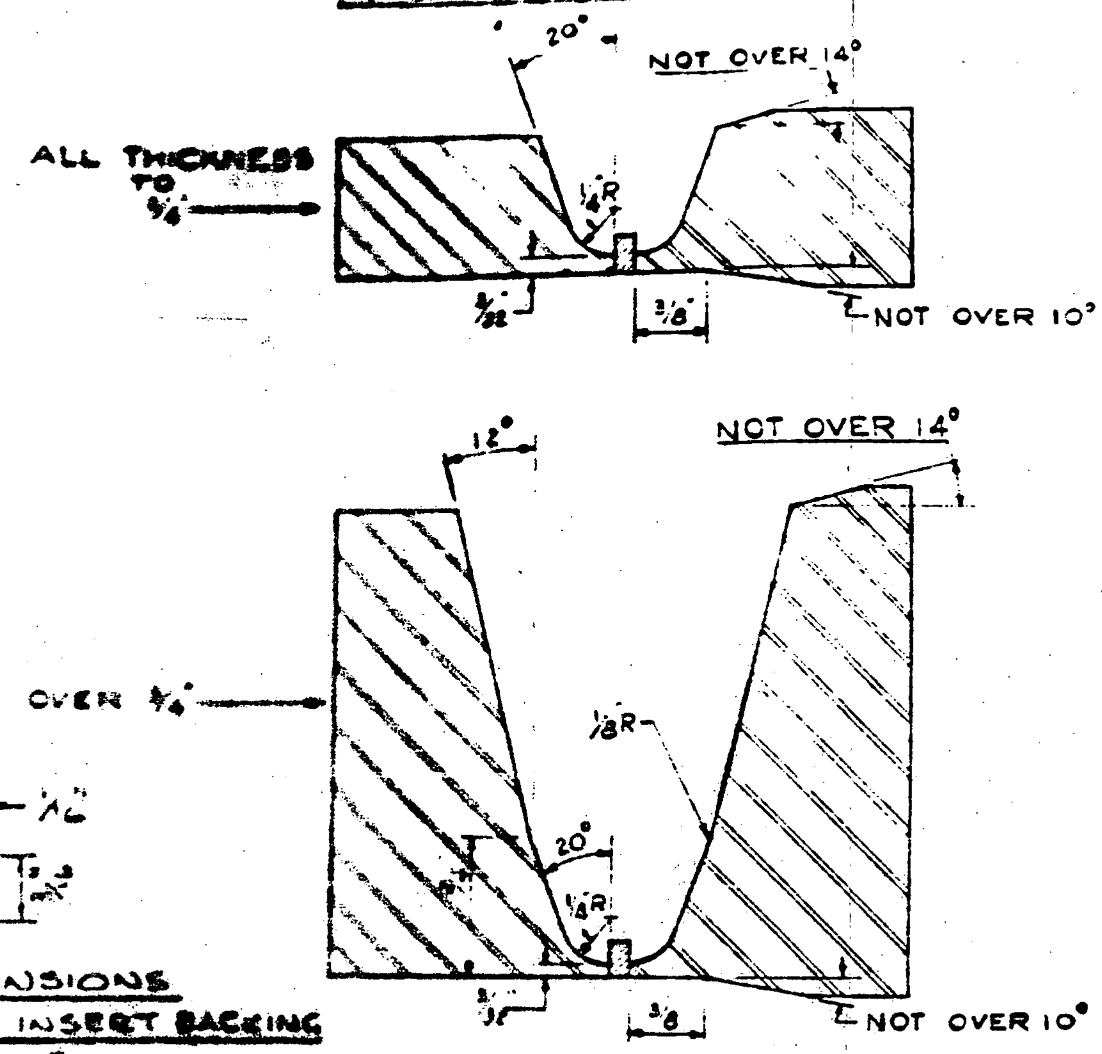


FIG 1 DIMENSIONS OF CONSUMABLE INSERT BACKING RING

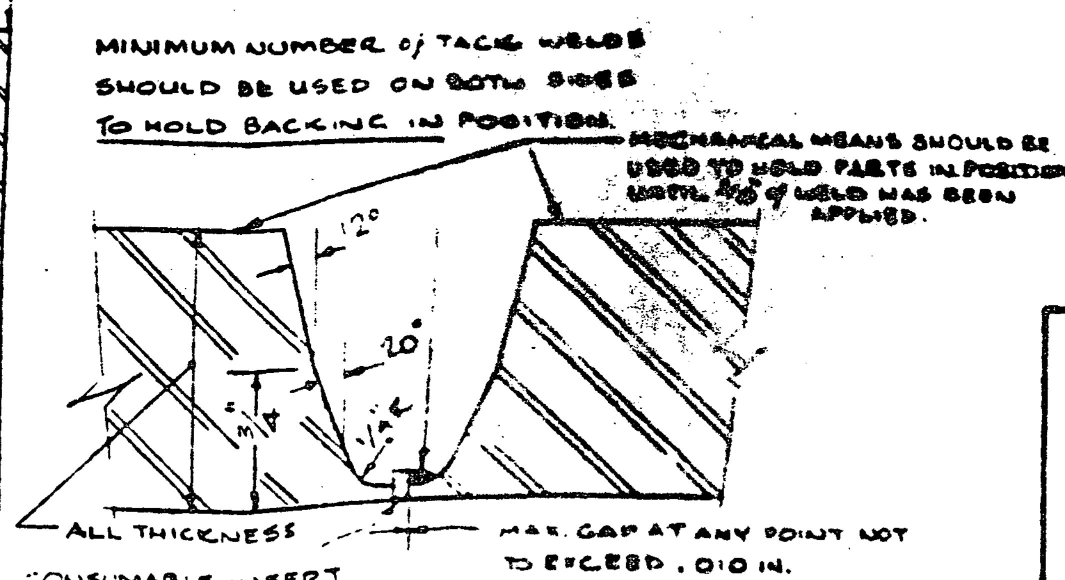


FIG. 2 PARTS ASSEMBLY

NOTES:

RING I.D. = PIPE I.D. − 0.094"
RING O.D. = PIPE I.D. + 0.375"

PIPE I.D. SHALL BE "C" DIMENSION CALCULATED IN ACCORDANCE WITH P.F.I. STD. ES-21 (1966).

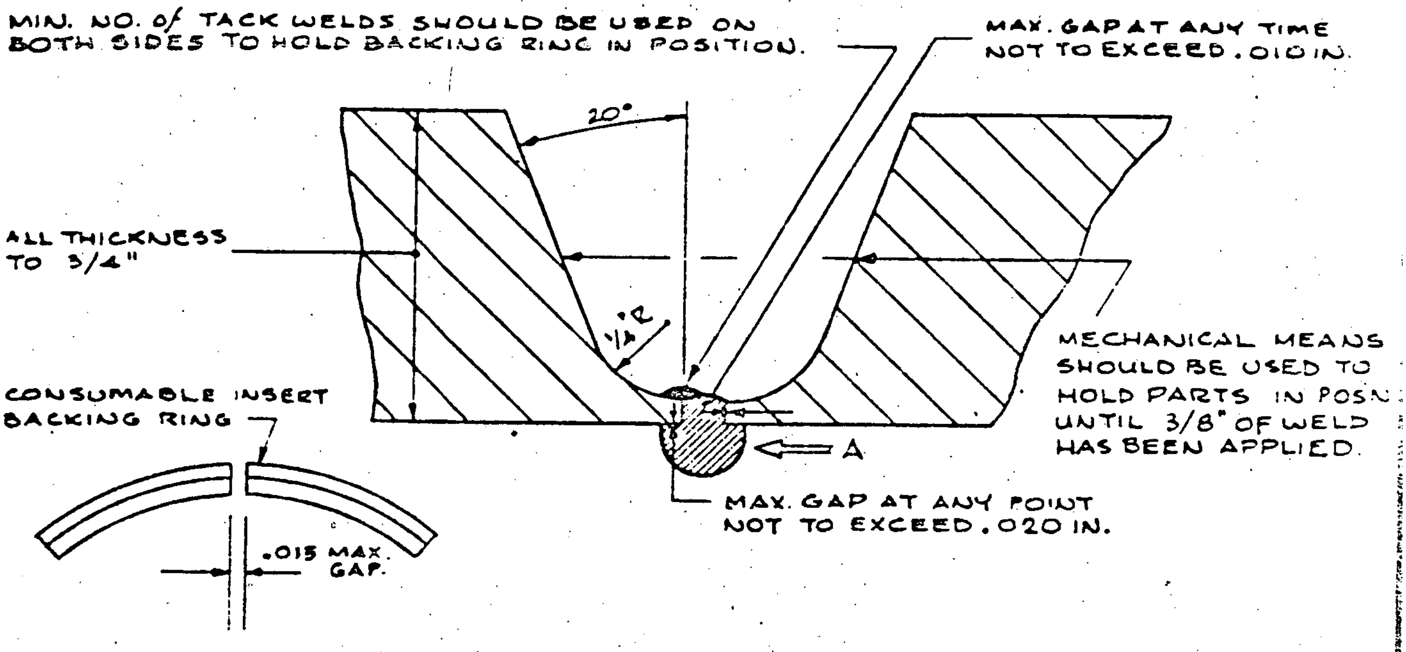
MACHINE INSIDE of CASTINGS AND FORGINGS TO MATCH I.D. of PIPE AS SHOWN.

JOINT DESIGNS RECOMMENDED FOR INERT - GAS TUNGSTEN - ARC WELDING WITH GRINNELL CONSUMABLE SOLID INSERT RINGS

UNITED ENGINEERS & CONSTRUCTORS INC
PHILADELPHIA

CHECKED Lg	INSPECTED RRW	CORRECT CLN	APPROVED JHG
DATE 10-30-57	ESTIMATE	ORIGINATING OFFICE PHILA.	
SCALE FULL	ACCOUNT	5000-LL-1147	
REV 11-27-64	ITEM		

REVISED 2/12/68 JB JHG



VIEW "A"

FIG. 3 PARTS ASSEMBLY

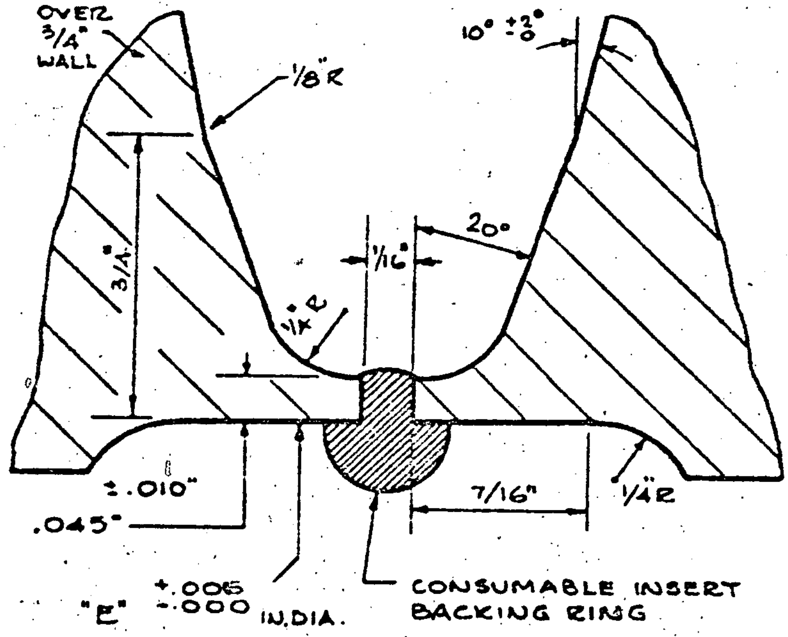


FIG 1 JOINT PREPARATION

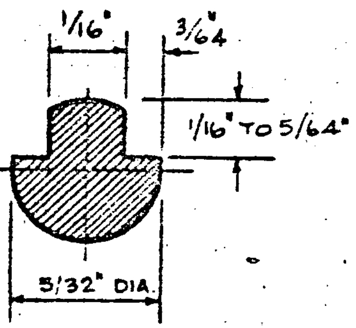


FIG. 2 DIMENSIONS OF CONSUMABLE INSERT BACKING RING

JOINT DESIGNS RECOMMENDED FOR INERT - GAS TUNGSTEN - ARC WELDING WITH THE E-B CONSUMABLE INSERT RINGS

UNITED ENGINEERS & CONSTRUCTORS INC
PHILADELPHIA

CHECKED	INSPECTED	CORRECT	APPROVED
DATE 11/30/64	ESTIMATE	ORIGINATING OFFICE	PHILA
SCALE N T S	ACCOUNT	5000-L-1338	

Fabrication History-Staff Request 3:

Provide the NDE performed during and after fabrication of the weld joints requested in question 2.

Response:

One hundred percent of the feedwater piping girth welds within containment were non-destructively examined by radiography following fabrication. These radiographic examinations were performed and evaluated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, paragraph UW-51.

In addition, random magnetic particle and liquid penetrant examinations were conducted on the feedwater piping girth welds within containment. The magnetic particle examinations were performed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Appendix VI. The liquid penetrant examinations were performed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Appendix VIII, and the acceptance standards were as defined in ASA Code Case N-10.