NOTICE TO ALL BIDDERS
ADDENDUM NO. 5
TO
SPECIFICATION S-2299-4
FOR
DESIGN, FURNISHING, ERECTION AND
TESTING OF THE
REACTOR DRYWELL AND SUPPRESSION
CHAMBER CONTAINMENT VESSELS
FOR
JERSEY CENTRAL POWER & LIGHT CO.
OYSTER CREEK, NEW JERSEY

GENERAL ELECTRIC COMPANY
ATOMIC POWER EQUIPMENT DEPT.
SAN JOSE, CALIFORNIA

This Addendum contains changes to the requirements of the Technical Specification. Such changes shall be incorporated into the work with the same meaning and force as if they had been included in the original document. Whenever this Addendum modifies a portion of a paragraph of the Technical Specification or any drawing the remainder of the paragraph or drawing affected shall remain in force.

You are requested to acknowledge this Addendum in your proposal.

Prepared By
Burns and Roe, Inc.
160 West Broadway
New York, N. Y.
June 18, 1964

ADDENDUM NO. 5
TO
SPECIFICATION S-2299-4
FOR
DESIGN, FURNISHING, ERECTION AND TESTING OF THE REACTOR DRYWELL AND SUPPRESSION CHAMBER CONTAINMENT VESSELS

ADDENDUM CHANGES:

ADDENDUM NO. 3

PARAGRAPH 9 DESIGN LOADS of the specification, revised in Addendum No. 3, is further revised to delete all reference to the jet force of 38,000 pounds. The 16,000 pound force on 0.09 sq. ft. is the only jet force on the closure head.

SPECIFICATION CHANGES:

PARAGRAPH 9 DESIGN LOADS

In Subparagraph 9.1b, the 3rd sub-subparagraph delete the last sentence beginning "Where the shell is not backed up ---" and substitute the following:

"Where the shell is not backed up by concrete, the primary stresses resulting from this combination of loads shall not exceed 0.9 times the yield point of the material at temperature. However, the combined primary and secondary stresses shall be limited to three times the allowable stress values given in Table UCS-23, Section VIII, ASME Boiler and Pressure Vessel Code."

In Subparagraph 9.1b, the last sub-subparagraph, the jet force on each 24 inch diameter downcomer pipe is revised from 16 kips to 21 kips.

PARAGRAPH 14 WELDING, STRESS RELIEF AND RADIOGRAPHY

In Subparagraph 14.1e, in the second sentence after the words: "applied" insert the words:

"to material 1-1/4" or less in thickness"

PARAGRAPH 22 PROPOSAL PRICES

At the end of Subparagraph 22.3 **Testing Alternate**, add the following: "This price shall include the furnishing and closing of a temporary 24 inch diameter opening in the bottom of the drywell, drilled and tapped for two 2 inch diameter holes for grout line connections."

PARAGRAPH 23 PROPOSAL DATA

Add the following subparagraph:

23.7 The maximum diameter of opening in the drywell at each vent pipe location consistant with no requirement for field stress relief.

PARAGRAPH 24 DRAWING AND DATA REQUIREMENTS

Add the following subparagraph:

24.1 In addition to drawings and data required to be submitted elsewhere in the specification the Vendor shall also furnish:

a. A list of recommended spare parts.

b. A recommended acceptance test procedure for testing the operation of the personnel air lock doors

c. Maintenance and operating instructions for the personnel air lock.

Add the following:

PARAGRAPH 25 SAMPLES

The Vendor shall furnish to the Contractor, approximately one sq. ft. of material in the as-rolled thickness from each heat for additional material tests by the Contractor.

DRAWING CHANGES:

DRAWING SK-1404, Rev. 1

In Section F-F showing baffles in the Suppression Chamber made of three (3) pairs of structural channels, add a continuous structural member backing up each of the channels shown, the top three with 12WF27 beams with web horizontal, the bottom three with 12 inch, 20.7 pound channels with web horizontal. Connections to the Suppression Chamber are to be designed for a net pressure on the baffles of 6 psi.

Revise the load schedule to read as follows:

LOAD	STATIC	EARTH-QUAKE	TOTAL	REMARKS
P1	15.0K	3.8K	18.8K	Refueling Operation Only
P2	14.0K	3.5K	17.5K	" " "
P3	15.0K	3.8K	18.8K	" " "
P4	15.0K	3.8K	18.8K	" " "
P5	43.2K	10.8K	54.0K	Normal (see note) Oper.
P6	6600K	1650K	8250K	Refueling Condition
P6	6040K	1510K	7550K	Normal Operation
P7	13.7K	14.1K	27.8K	All Operating Conditions.
P8	6.1K	1.5K	7.6K	" " "
P9	0K	343K	343K	" " "

NOTE: An additional 20K live load reaction is to be applied to each beam (not simultaneously).

In Section C-C, delete the load designation "P7" and substitute the load designations "P7, 10 places and P8, 10 places".

DRAWING SK-1405, Rev. 1

In Section D-D, add load designations at the drywell wall at the ends of the radial beams as follows: at the ends of pairs of beams 26-1/2 degrees apart each beam to have load designation

"P7"; at the ends of pairs of beams 12 degrees apart each beam to have load designation "P8".

DRAWING SK-1406

The penetration schedule is revised as follows:

No.	Quantity
X-27	Change quantity from 1 to 4
X-32	Change quantity from 8 to 20
X-33	Change quantity from 8 to 1
X-34	Change quantity from 4 to 1
X-37	Change quantity from 3 to 4

The following penetrations are added to the schedule:

No.	Quantity	Nozzle Nom. Dia.	Remarks
X-59	1	3"	Location: Drywell
X-60	7	3"	See Notes 1, 2 and 3
X-61	1	6"	
X-62	1	6"	
X-63	2	12"	

Detail A is revised as follows:

a. Add a 2-1/2" diameter carbon steel sleeve extending from the drywell plate to the exterior face of concrete.

b. The horizontal pitch is revised from 3-3/4", 8-1/4" to 5" and the vertical pitch is revised from 3-1/4" to 5".

JERSEY CENTRAL POWER & LIGHT COMPANY

OYSTER CREEK, NEW JERSEY

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SECTION 1

FORM OF CONTRACT

This agreement, made and entered into this 1st day of July 1964, by and between Burns and Roe, Inc., Engineers-Constructors, hereinafter referred to as the "Contractor", and Chicago Bridge and Iron Company, hereinafter referred to as the Subcontractor.

WITNESSETH THAT, in consideration of the convenants and agreements herein contained, to be performed by the parties hereto and of the payments hereinafter agreed to be made, it is mutually agreed as follows:

1. The Subcontractor shall provide and furnish all materials, equipment and labor and perform all the work required to build, construct, complete and test in a thorough and workmanlike manner Reactor Drywell and Suppression Chamber Containment Vessels Specification S-2299-4 in accordance with the plans, specifications, proposal, General Requirements, and other documents bound herewith, which are made part hereof as fully as if set out herein, and hereby becomes a part of this Contract.

2. It is agreed and understood between the parties hereto that the Subcontractor will accept and the Contractor will pay for the work at the price or prices stipulated in the Proposal dated June 30th, 1964, and letter dated July 13th, 1964, and as further described in Technical Proposal dated June 1st, 1964, and payment shall be made at the time and in the manner set forth in the General Requirements or as mutually agreed upon.

3. The total cost of all the work to be performed under these Contract documents shall be One Million Four Hundred Fifty-two Thousand****** Dollars ($ 1,452,000.00).

4. The Subcontractor agrees to commence work ten (10) days after notification of award of this contract and complete by September 1st, 1965 at the rate and order of progress required by the approved CPM Schedule.

5. The time of completion of the parts as well as the whole of the work is of the essence of the Contract and should the Subcontractor neglect, refuse or fail to complete any phase of the work to be done under the Contract within the time herein agreed upon, after adding all extensions of time granted by the Contractor, then in that event the Contractor shall have and is hereby given the right to initiate any and all remedial actions as provided for in the General Requirements.

6. The Subcontractor agrees to proceed with minor additions or alterations when directed by the Contractor on the basis of direct labor and material cost to the Subcontractor plus overhead of 15 % and profit of 10 %.

IN WITNESS WHEREOF, the said parties hereunto have hereto set their hands and affixed their seals the day and year first above written.

(SEAL)

BURNS AND ROE, INC.
Engineers and Constructors

ATTEST:

By _____

Title _____

(SEAL)

SUB-
CONTRACTOR

ATTEST:

_____

See machine authorization

By _____

Title _____

I, E. J. Keldon do hereby certify that I am the Secretary of CHICAGO BRIDGE & IRON COMPANY, an Illinois corporation, and that as such officer I am duly authorized to make this certificate in behalf of that corporation.

I further certify that a meeting of the Board of Directors of Chicago Bridge & Iron Company was duly called and was held in accordance with the by-laws of that corporation on February 25, 1964, and at that meeting a quorum was present throughout the meeting and the following resolution was unanimously adopted:

> RESOLVED, that any one of the following, namely, the Chairman of the Board or the President or any Vice-President of the Chicago Bridge & Iron Company, or any district contracting manager or contracting engineer heretofore or hereafter appointed by the Chicago Bridge & Iron Company, shall be and he is hereby authorized to sign in the name and on behalf of Chicago Bridge & Iron Company bids, proposals, bonds and contracts for materials to be furnished or work to be done by the Chicago Bridge & Iron Company and also to sign other documents required in connection therewith.

I further certify that the foregoing resolution is in full force and effect and that Buell V. Moore is a ~~vice-president~~ / district contracting manager of Chicago Bridge & Iron Company and Paul R. Grossmann is a contracting engineer / ~~are contracting engineers~~ of Chicago Bridge & Iron Company.

This certificate shall remain in full force and effect for ninety days from the date it bears, unless sooner revoked, but no such revocation shall be effective as to anyone dealing with any individual named in this certificate in reliance hereon unless written notice of such revocation has been received by the person so relying on this certificate.

IN WITNESS WHEREOF, I have hereunto set my hand and the seal of Chicago Bridge & Iron Company this 24th day of July, 1964.

E. J. Keldon

GO 187 REV 3-64

SECTION II

TECHNICAL SPECIFICATIONS

Specification S-2299-4

DESIGN, FURNISHING, ERECTION AND TESTING
OF THE
REACTOR DRYWELL AND SUPPRESSION CHAMBER
CONTAINMENT VESSELS

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Specification S-2299-4

REACTOR DRYWELL AND SUPPRESSION CHAMBER CONTAINMENT VESSELS

JERSEY CENTRAL POWER & LIGHT COMPANY
Oyster Creek, New Jersey

1. SCOPE

This specification covers the complete design, fabrication, erection, painting and testing of the drywell and suppression chamber steel containment vessels with supports, penetrations, jet deflectors, accessories and interconnecting vent system as shown on the drawings, in accordance with this specification and the General Conditions-Erection.

1.1 Work By Others

a. All concrete work for the drywell and suppression chamber vessel supports.

b. Temporary concrete foundations to elevation 23 ft. 0 in. and concrete anchor blocks if required for erection equipment will be constructed. All embedded items other than reinforcing steel to be furnished under this specification.

Vendor shall furnish a drawing showing required locations, dimensions and loads.

c. Furnishing and installation of compressible material for lining the exterior and interior of the drywell.

d. Filling the suppression chamber with 91,000 cu. ft. of fresh water.

e. Structural steel radial beams, water seal support framing and stabilizer bars in the drywell, however connections at the drywell vessel shall be designed and furnished as a part of the work of this specification.

2. DRAWINGS

The below listed drawings form a part of this specification and are intended to describe design conditions only, details in such areas as vessel support shall be as required to suit the Vendor's design.

Drawing No.	Title
SK-1404	Reactor Building - Containment Vessels - Sections and Details
SK-1405	Reactor Building - Containment Vessels - Plans and Details
SK-1406	Reactor Building - Containment Vessels - Penetrations
SK-1410	Site Plan

3. APPLICABLE PUBLICATIONS

The following publications of the issues listed below but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

3.1 American Society of Mechanical Engineers

a. Boiler and Pressure Vessel Code, Sections VIII and IX, latest edition, with all applicable addenda; Nuclear Case Interpretations 1270N5, 1271N, 1272N5 and other applicable case interpretations.

b. Boiler and Pressure Vessel Code, Section II, latest edition with all applicable addenda, for the following material specifications:

Number	Title
SA-201	Carbon-Silicon Steel Plates of Intermediate Tensile Ranges for Fusion-Welded Boilers and Other Pressure Vessels
SA-212	High Tensile Strength Carbon-Silicon Steel Plates for Boilers and Other Pressure Vessels
SA-300	Steel Plates for Pressure Vessels for Service at Low Temperatures

Number	Title
SA-333	Seamless and Welded Steel Pipe for Low Temperature Service
SA-350	Forged or Rolled Carbon and Alloy Steel Flanges, Forged Fittings, and Valves and Parts for Low Temperature Service

Subsequent references in this specification to "the Code" shall be interpreted to mean the ASME Boiler and Pressure Vessel Code.

3.2 American Society for Testing and Materials Standards

Number	Title
A36	Structural Steel

3.3 American Institute of Steel Construction

Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

3.4 Federal Specifications

Number	Title
TT-P-86c	Paint; Red-Lead-Base, Ready-Mixed

3.5 Steel Structures Painting Council Specifications

Number	Title
SSPC-SP-3	Power Tool Cleaning
SSPC-SP-6	Commercial Blast Cleaning

4. RESPONSIBILITY

The Vendor shall be entirely responsible for the design, procurement, fabrication, delivery, erection, inspection, painting and testing of the vessels and appurtenances and for compliance with this specification. No review, approval, inspection or examination by the Purchaser of drawings, procedures, design, materials or fabrication shall relieve the Vendor of this responsibility prior to final acceptance of the work.

5. GENERAL

5.1 Description

The pressure vessels to be furnished under this specification are to house the steam generating system for a 515 MWe nuclear power unit and are to contain, within the vessels and their interconnections, lethal substances which may be released in the event of an operating accident involving the nuclear steam system.

Due to the great potential hazard to the environs from radioactive material, the highest degree of integrity is demanded of the containment vessels throughout the entire life of the plant. All portions and details subject to pressure shall have at least as great a margin of safety as the structure as a whole.

The drywell vessel to be furnished under this specification will house the primary reactor vessel, the reactor coolant recirculating lines and pumps, the control rod drives and other systems.

The suppression chamber vessel to be furnished under this specification will provide storage for a water pool to condenser steam which may be released within the drywell in the event of an operating accident. Steam and/or water is to be conducted to the pool through the system of jet deflectors, vents, header and downcomer pipes, all to be furnished under this specification.

5.2 Principal Dimensions

a. Drywell

The drywell shall be a light-bulb shaped vessel with the spherical portion at the bottom and with the top cylindrical portion closed by a removable, flanged, hemispherical head. The inside diameter of the sphere shall be 70 ft. 0 in. and the inside diameter of the cylinder shall be 33 ft. 0 in. The height from the equator of the sphere to the flange of the cylinder shall be 66 ft. 6 in.

The hemispherical top head shall be flanged and of a type that can be easily opened. Details shall be such that all bolts are permanently hinged to the drywell or head and arranged so that they may be tightened using an impact wrench. A 16 inch diameter inspection opening shall be provided in the head. The top head closure and the inspection opening shall be made leak tight by means of double compression seals with connections to permit leak testing by pressurizing the air space between the seals.

b. Suppression Chamber

The suppression chamber shall be in the general form of a torus; however, in lieu of furnishing a double curved surface, the vessel may be made up of 20, or a greater multiple of 10, mitered cylindrical sections. The major diameter of the torus shall be 101 ft. 0 in.; the minor diameter shall be 30 ft. 0 in. Baffles, catwalk with steel grating floor, and two 36 inch manholes with ladders to the catwalk shall be provided as shown on the drawings. Manholes shall be flanged and bolted with a double compression seal with connections to permit leak testing by pressurizing the air space between the seals. Catwalk shall be capable of supporting a live load of 50 psf.

c. Arrangement

The suppression chamber shall be centered in the 140 ft. square basement of the Reactor Building with its centerline at Elevation minus 2 ft. 6 in. Grade level at the building will be at Elevation 23 ft. 0 in. The vertical axes of the drywell and torus shall coincide. The equator of the spherical portion of the drywell shall be at Elevation plus 37 ft. 3 in.

All required supports for the work of this contract shall be designed by the Vendor and shall provide for movement due to expansion and contraction and differential movement. All permanent supports other than concrete shall be furnished and installed by the Vendor. It is expected that the drywell vessel will be supported on temporary columns during erection; such columns, if used, shall be properly braced and shall be removed by the Vendor after the permanent foundation has been placed unless such supports include provision for movement of the vessel and clear the concrete building columns and beams shown on the drawings.

d. Vent System

The vent system interconnecting the drywell and torus shall consist of vents between the drywell and a common header located within the suppression chamber, and downcomer pipes from the header terminating below the normal water level in the suppression chamber. In order to facilitate design and fabrication of vessel penetrations, it is intended that the vents penetrate the containment vessels with vent centerlines as near to radial to both vessels as practicable.

1. Vents

There shall be 10 vents equally spaced and uniformly sloped between drywell and suppression chamber. Each vent shall have an inside diameter of 6 ft. 6 in. The diameter of the vents at the drywell ends shall be increased as required to accommodate jet deflectors covered elsewhere in this specification. One or more joints, permanently accessible, shall be provided in each vent to allow for relative movement due to expansion and contraction and other differential movements which may occur between the containment vessels.

2. Header

The common header for the vents shall be in the general form of a torus; however, in lieu of furnishing a double curved surface, the header may be made up of 20, or a greater multiple of 10, mitered cylindrical sections. The major diameter of the header torus shall be 101 ft. 0 in.; the minor diameter shall be 4 ft. 7 in.

3. Downcomers

There shall be 120 downcomer pipes arranged in pairs with 6 pairs equally spaced in each length of the header between vents so as to obtain a spacing along the entire circumference of the header as uniform as practicable. Each downcomer shall have an outside diameter of 24 inches and a minimum wall thickness of 1/2 inch. The downcomer pipes shall terminate 4 ft. 0 in. below the water level in the suppression chamber when it contains 80,000 cu. ft. of water.

4. Supports

All parts of the vent system shall be adequately and permanently supported as a part of the work of this contract.

5.3 Tolerance for Shells and Heads

The requirements in Paragraph UG-80 and UG-81 of the ASME Code shall be followed. The average elevation of top head flange shall be kept within ± 3 inches of the theoretical elevation and top flange shall not deviate more than ± 1/2 inch from true horizontal plane. At no place shall the location of the vertical centerline deviate more than 3 inches from the theoretical location.

6. CODES

6.1 Pressure Vessels

The design, fabrication, erection and testing of the vessels shall conform to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section VIII, latest edition and all applicable addenda; Nuclear Case Interpretations 1270N5, 1271N, 1272N5 and all other applicable case interpretations; and the laws, rules and regulations of the State of New Jersey, except as noted herein.

The completed vessels shall be inspected and marked by a recognized inspection agency certifying that the requirements of the applicable standards and codes have been fulfilled. The vessels shall be stamped with the ASME Boiler and Pressure Vessel Code stamp in a permanently visible location.

6.2 Other

The design, fabrication and erection of supports and bracing and like applications not within the scope of the ASME Code shall conform to the requirements of the Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, latest edition, of the American Institute of Steel Construction.

7. MATERIALS

The latest revision to standard specifications referred to herein shall apply. The containment vessels, interconnecting vents and header and all appurtenances shall be as follows:

7.1 Plate

Plate shall conform to ASME SA-201, Grade B, Firebox Quality and SA-300 with fine grain practice or, provided the material alternate called for in the paragraph titled: PROPOSAL PRICES is accepted shall conform to ASME SA-212, Grade B, Firebox Quality aluminum killed, and SA-300. Charpy vee notch impact specimens shall be used instead of keyhole specimens for SA-201 and SA-212 as permitted by Code Case 1317. However impact requirements for SA-212 shall be 20 ft-lbs. rather than 13 ft-lbs. as permitted by Code Case 1317. Test temperature for Charpy vee notch impact values for either material shall be 0°F.

7.2 Forgings

Forgings shall conform to ASME SA-350. In addition to the Charpy keyhole tests required by the above specification, Charpy vee notch impact values when tested at + 0°F shall be 13 ft-lbs for grades LF-1 and LF-4 and 20 ft-lbs. for grades LF-2 and LF-3.

7.3 Carbon Steel Pipe

Pipe shall conform to SA-333, Grade 0. Seam welded pipe shall not be electric resistance welded pipe and shall be fully radiographed. In addition to the Charpy keyhole tests required by the above specification, Charpy vee notch impact values shall be 13 ft-lbs. when tested at 0°F.

7.4 Miscellaneous Materials

Castings, bolting materials, stainless steel and steel for jet deflectors shall be selected by the Vendor in conformance with Code requirements, subject to approval.

7.5 Structural Steel

Structural material for supports bracing and like applications not within the scope of the ASME Code shall conform to ASTM A36 unless otherwise approved.

7.6 Compressible Material

Compressible material will be furnished and applied by others to the exterior of the drywell vessel to allow placement of concrete walls and may also be furnished and applied by others to the interior of the drywell to provide separation between the vessel and a free standing concrete shell which may be constructed within the drywell. The Bidder shall specify with his bid one or more materials suitable for this purpose with the thicknesses required to assure performance of the vessel in accordance with the Vendor's design and shall state the loads transmitted to the surrounding concrete.

7.7 Gasketing Material

Gaskets shall be selected by the Vendor, subject to approval and shall be inflatable or solid or a combination of both, fabricated of silicone or neoprene in continuous rings Gaskets shall have a guaranteed life of not less than 12 months. The sealing pressure on each gasket shall be constant for the life of the gasket. Results of tests performed by an approved testing laboratory demonstrating satisfactory performance of the gaskets proposed for the required service conditions shall be submitted.

8. DESIGN CONDITIONS

Load combinations to be considered in the design shall include, but shall not necessarily be limited to, those listed below. The loads listed are described in the paragraph titled: DESIGN LOADS.

The enclosure shall be so designed that primary membrane stresses resulting from the below listed combinations of loads shall not exceed those permitted by Code Case 1272N-5 except as otherwise specified herein.

The Vendor shall compute secondary membrane and bending stresses in the drywell, suppression chamber and vent system resulting from distortions due to specified internal pressure, loads, and temperature. In the calculation of these stresses all resistances to uniform increase in radius shall be considered. Combined primary and secondary stresses shall be within limits specified in Code Case 1272N-5 except as modified by this specification.

8.1 Drywell and Vent System

a. Initial test condition at ambient temperature at time of test

1. Dead load of vessel and appurtenances
2. Design pressure
3. The weight of contained air
4. Lateral load due to wind or earthquake whichever is more severe. (See Paragraph: DESIGN LOADS for allowable stress increase for temporary wind load).
5. Vent thrusts
6. Vertical earthquake load

b. Final test condition at ambient temperature at time of test

1. Dead load of vessel and appurtenances
2. Gravity loads from equipment supports
3. Gravity load of compressible material
4. Dead load on welding pads
5. Design pressure
6. Loads due to earthquake
7. Effect of unrelieved deflection under temporary concrete load
8. Restraint due to compressible material
9. Vent thrusts

c. Normal operating condition at operating temperature range of 50°F to 150°F

1. Dead load of vessel and appurtenances
2. Gravity loads from equipment supports
3. Gravity load of compressible material
4. Loads due to earthquake
5. Vent thrusts
6. Restraint due to compressible material
7. Dead load on welding pads
8. Effect of unrelieved deflection under temporary concrete load
9. External pressure of 2 psig
10. Live load on personnel air lock

d. Refueling condition with drywell hemispherical head removed at operating temperature range of 50°F to 150°F

1. Dead load of vessel and appurtenances
2. Gravity loads from equipment supports
3. Gravity load of compressible material
4. Dead and live loads on welding pads
5. Water load on water seal at top flange of drywell
6. Loads due to earthquake
7. Effect of unrelieved deflection under temporary concrete load
8. Restraint due to compressible material
9. Vent thrusts
10. External pressure of 2 psig
11. Live load on access opening.

e. Accident condition at temperatures listed below:

1. Dead load of vessel and appurtenances
2. Gravity loads from equipment supports
3. Gravity load of compressible material
4. Dead load on welding pads
5. Loads due to earthquake
6. Design pressure: Maximum positive pressure of 52 psig at 175°F decaying to 35 psig at maximum temperature of 281°F, to maximum negative pressure of 2 psig at 205°F.
7. Effect of unrelieved deflection under temporary concrete load
8. Restraint due to compressible material
9. Vent thrusts
10. Jet forces (See Paragraph: DESIGN LOADS for allowable stress increase for jet forces).

8.2 Suppression Chamber

a. Initial and final test condition at ambient temperature at time of test

1. Dead load of vessel and appurtenances
2. Suppression pool of 91,000 cu. ft. of water
3. Loads due to earthquake
4. Design pressure
5. Vent thrusts

b. Temporary condition at ambient temperature during construction

1. Dead load of vessel and appurtenances

2. Loads due to earthquake

3 Temporary concrete construction loading (See Paragraph: DESIGN LOADS for allowable stress increase for temporary construction load).

c. Normal operating condition at operating temperature range of 50°F to 150°F

1. Dead load of vessel and appurtenances

2. Suppression pool of 80 000 cu. ft. of water

3. Loads due to earthquake

4. Vent thrusts

d. Accident condition at 150°F maximum

1. Dead load of vessel and appurtenances

2. Suppression pool of 91,000 cu. ft. of water

3. Loads due to earthquake

4. Design pressure of 35 psig

5. Vent thrusts

6. Jet forces on downcomer pipes

9. DESIGN LOADS

9.1 Temperature and Pressure

a. Normal Operating Condition

During nuclear reactor operation the vessels will be subject to a sustained operating temperature within the vessels of 150°F at atmospheric pressure. The suppression chamber will also be subject to the loads associated with the storage of 80,000 cu. ft. of water distributed uniformly within the vessel.

b. Accident Condition

The drywell and the vent system shall be designed for an internal pressure of 62 psig coincident with a temperature of 175°F and for an internal pressure of 35 psig coincident with a temperature of 281°F. The drywell shell and closure head shall be designed and constructed to withstand jet forces of the following magnitudes in the locations indicated from any direction within the drywell:

Location	Jet Force (Max)	Interior Area Subjected to Jet Force
Spherical part of drywell	566,000 pounds	3.14 sq. ft.
Cylinder and sphere to cylinder transition	466,000 pounds	2.54 sq. ft.
Closure head	38,000 pounds	0.20 sq. ft.

The spherical and cylindrical parts of the drywell will be backed up by reinforced concrete with space for expansion material between the outside of the drywell and the concrete.

The above listed jet forces consist of steam and/or water at 300°F, maximum. The jet forces listed above do not occur simultaneously. However, a jet force shall be considered to occur coincident with design internal pressure and a temperature of 150°F. Where the drywell shell is backed up by concrete it may be assumed that local yielding will take place but it shall be established that a rupture will not occur. Where the shell is not backed up by concrete, the stresses resulting from this combination of loads shall not exceed 1-1/2 times the allowable stress values given in paragraph UCS-23, Section VIII, ASME Boiler and Pressure Vessel Code.

Consideration is being given to installing a free standing concrete shell, by others, within the drywell, however, since the concrete shell may or may not be constructed, the design of the drywell vessel shall be for the more severe condition, with or without the concrete shell.

The suppression chamber shall be designed for an internal pressure of 35 psig coincident with the loads associated with the storage of suppression pool water increased in volume to 91,000 cu. ft., a temperature of 150°F and a jet force on each 24 inch diameter downcomer pipe of 16 kips.

c. Initial Test Condition

The drywell and the vent system to the lower end of the downcomer pipes, shall be subjected to a test pressure 15 percent in excess of 62 psig at normal ambient temperature at the time of test. The base bid shall include initial testing of the drywell vessel without temporary supports. The Bidder shall submit an alternate price for performing the test while the vessel is on temporary supports. The suppression chamber, without temporary supports, shall be subject to a test pressure 15 per cent in excess of 35 psig at normal ambient temperature at the time of test with the specified 91,000 cu. ft. of water in the vessel.

9.2 Gravity Loads

It is intended that the vertical load of the primary reactor vessel, reactor support concrete and equipment within the drywell shall be supported directly through the concrete fill within the drywell to continuous concrete fill below the drywell except as otherwise shown or specified.

The Bidder shall state the extent of concrete fill required below the drywell consistant with this proposed vessel design and shall recommend procedures to be followed in placing the supporting concrete fill assuming "Two-Stage Construction" for the base bid and modifications, if any, for the alternate bid based on testing before placement of supporting final concrete.

a. Gravity loads to be applied to the drywell vessel include:

1. The weight of the steel shell, jet deflectors, vents and other appurtenances.

2. Loads from equipment support structural members as shown on the drawings.

3. An allowance for the compressible material to be applied to the exterior and interior of the vessel as recommended by the vendor (See "Compressible Material" under the "MATERIALS" paragraph of this specification).

4. The live load on the access opening: 11 tons or 150 psf, whichever is the more severe.

5. The live load shown on the drawings for the depth of water on the water seal at the top flange of the drywell with the drywell hemispherical head removed.

6. The weight of contained air during test.

7. Dead and live loads described in the paragraph titled "WELDING PADS".

8. A temporary load due to the pressure of wet concrete to be placed directly against the exterior compressible material attached to the exterior of the drywell and vents as shown on the drawings. It is intended that the concrete be placed at a rate of 18 inches in depth per hour. It is estimated that this rate of placement will result in a radial pressure on the vessel of 250 psf. Consideration shall be given to the residual stresses due to the unrelieved deflection of the vessel under this load, applied in successive three foot high horizontal bands.

b. Gravity loads to be applied to the suppression chamber include:

1. The weight of the steel shell including baffles, catwalk, header, downcomers and other shell appurtenances.

2. The suppression pool water stored in the vessel as specified above.

3. A temporary load of 200 psf on the horizontal projected area of the vessel due to the weight of wet concrete and concrete forms to be supported from the vessel during the construction of the floor above. The ASME Code allowable stresses may be increased by 33 percent for the combination of this temporary load with other concurrent loads.

4. The weight of contained air during test.

9.3 Lateral Loads

a. Reactor pre-tension tie forces shown on the drawings.

b. Wind Load

The drywell vessel which will be exposed above grade prior to construction of the Reactor Building shall be designed for wind loads on the projected area of the circular shape in accordance with the height zones below in combination with other loads applicable during this stage with stresses limited to 133⅓% of the ASME Code allowable stresses.

Height above grade (ft.)	Wind Load (psf)
0 - 30	15
30 - 50	18
Over 50	24

c. Penetrations

The Vendor will be advised of lateral loads at the blanked off vessel penetrations at a later date. The Vendor shall, as a part of the work of this contract, investigate the effect of these loads on the vessels. Modifications to the penetrations or vessels indicated by this investigation to be required will be made at the expense of the Purchaser, or loads will be reduced to permissible values so that vessel or penetration modifications will not be required.

d. Alternate provision for lateral loads:

The Bidder's base bid for the work shall include provision for resisting all lateral loads in the design of the vessels. The Bidder may also submit an alternate bid on the basis of making provision for transferring lateral loads through the drywell vessel to the concrete structure surrounding the drywell.

9.4 Earthquake Loads

A lateral force equal to 22 per cent, and a vertical force equal to 10 per cent of the permanent gravity load shall be assumed as acting simultaneously with each other and shall be taken concurrently with permanent gravity loads, accident pressure conditions and other lateral loads due to earthquake shown on the drawings. Design stresses under this condition shall not exceed the ASME Code allowable stresses.

10. EQUIPMENT HATCH AND PERSONNEL AIR LOCK

The personnel air lock shall be built into the equipment hatch cover as indicated on the drawings to utilize a common opening in the drywell vessel.

10.1 Equipment Hatch

One 10 ft. diameter equipment access opening with flanged and bolted cover containing an integral personnel lock shall be provided. The closure shall be made leak tight by means of a double compression seal with connections arranged to permit leak testing by pressurizing the air space between the seals. Bolts shall be fastened in such a way that they swing clear of the head after the nuts are loosened. The barrel of the hatch shall not project more than 1 ft. 0 in. inside the drywell and shall be sufficient in length to clear the concrete wall outside and to provide space for the personnel air lock. A removable floor made up of steel shapes and plate shall be provided within the full length of the barrel at an elevation to allow a 6 foot clear width at the floor surface. The floor shall be capable of supporting a uniform live load of 150 psf and, non-currently, four wheel loads of 5.5 kips each spaced at 3 ft. on center in each direction. The removable floor shall be made up of sections weighing not more than 100 lbs. each.

If the barrel of the hatch cannot be supported entirely by the drywell shell without excessive reinforcement, it may be supported at its outer end by an auxiliary support. Such support shall be so designed that it will not restrain the movement of the lock or containment vessel and shall have provisions for adjustment to account for relative horizontal and vertical motions.

10.2 Personnel Air Lock

One personnel air lock shall be furnished and built into the head of the equipment hatch. The diameter of the lock barrel shall be adequate to allow a minimum clear opening through the lock of 2 ft. 6 in. wide by 6 ft. 0 in. high. The clear length within the lock shall be 6 ft. 0 in. A fixed steel floor, 2 ft. 6 in. wide, shall be provided and shall be capable of supporting a uniform live load of 150 psf.

The lock shall have two gasketed doors in series, and the doors shall be mechanically interlocked such that one door cannot be opened unless the second door is sealed. Provision shall be made for deliberately violating the interlock by use of special tools and procedures. The locking and swing of the doors shall be manual only, without power assist.

The lock shall be so designed and constructed that either door may be operated from:

a. inside the containment vessel

b. inside the lock, or

c. outside the containment vessel.

Bidder shall state the estimated amount of manual effort required to operate the doors and locking mechanism. Each door shall be equipped with a valve for equalizing the pressure across the door and doors shall not be operable unless pressure is equalized. Each valve shall be operable from every point at which the associated door can be operated. The valves for the two doors of the lock shall be properly interlocked so only one valve can be open at a time, and only when opposite door is closed and sealed.

Each door shall be designed so that, with the other door open, it will withstand and seal against the internal and external design and test pressures for the drywell vessel. Doors and locking devices shall also be adequate for and seal against a design pressure of 10 psig or vacuum of 2.0 psig inside the lock with the vessel at atmospheric pressure.

There shall be a positive indication outside the lock at each door showing whether the opposite door is open or closed and whether its valve is open or closed.

In addition, limit switches shall be provided to indicate remotely whether either or both doors or valves are open or closed. The Purchaser will make all connections.

The lock shall have nozzles installed, which will permit pressure testing of lock at any time without interfering with normal operation of the plant.

In addition, penetrations and nozzles shall be provided for limit switch circuits, telephone and lighting system conductors.

The assembly of the lock and the equipment hatch cover shall be provided with wheels and shall be installed on tracks in such a manner that the assembly may be rolled clear of the barrel of the hatch. Attachments shall be provided for lifting and handling the assembly.

11. PENETRATIONS

Access openings and vessel penetrations shall be provided as shown on the drawing.

The locations of penetrations shown on the drawings are approximate; final locations will be designated by the Purchaser at a later date. The Bidder shall state the latest date on which this information must be made available in order to avoid delay in the scheduled progress of the work.

In general the minimum center to center distance between any two penetrations shall be twice the average diameter of the finished openings in the shell except as otherwise shown on the drawings.

Vendor shall design, furnish and install suitable temporary caps for use during the pressure and leakage rate tests. After completion of specified overload pressure and leak rate tests, caps, except where specifically noted to remain, shall be removed and nozzles shall be prepared for welding as approved by the Purchaser.

The design and construction of all shell penetrations, any permanent covers therefore, and reinforcement around such openings and penetrations shall comply with the ASME Code as a minimum requirement.

12. JET DEFLECTORS

A jet deflector similar to that indicated on the drawings or other approved means of deflecting the jet force specified under the Paragraph: DESIGN LOADS, shall be furnished and installed at the drywell end of each vent. The baffle or deflector shall provide a minimum clear area equal to approximately 150 per cent of the vent area. Working stress in the deflector members may be the minimum yield stress for the material used. It is intended that the enlargement of the vents to accommodate the deflectors be held to the minimum consistant with providing the specified clear area through and/or around the deflectors such that field stress relief at the drywell vent and hatch reinforcements will not be required. In order to provide the maximum working space within the drywell, jet deflectors not occupying space within the drywell are preferred. However, as a limit the deflector shall project not more than 2 ft. 0 in. into the drywell.

13. WELDING PADS

Welding pads of SA-300 material shall be provided on the inside of the containment sphere shoulders, from the 30° parallel to the vertical cylinder wall. These pads will be used by the Purchaser for the attachment of temporary or permanent scaffolds, pipe hangers, etc. Vendor shall advise the Purchaser of any precautions or restrictions he believes should be observed in performing this work. The pads shall be 8" diameter of 3/8" minimum thickness and shall be spaced at approximately 8 foot centers in each direction. Design permanent load shall be 200# on each pad, with 800# live load on each of any two adjacent pads.

14. WELDING, STRESS RELIEF AND RADIOGRAPHY

14.1 General

All seam welds in the shell of the containment vessels shall be of the double bevel butt type. All butt joints in any accessories subject to the Code shall be of the double welded type or equivalent, and all tee

joints shall be full penetration welds. Welding details at nozzles shall be of an approved type. All welds subject to the Code shall be radiographed or otherwise examined in accordance with Code Case 1272N5. All mandatory provisions of the Code shall be followed, and all recommended provisions shall be followed where practical. All welders and welding procedures shall be qualified in strict accordance with and meet the requirements of Section IX of the Code and of this specification.

In addition to these requirements:

a. The design, methods, and sequence of welding shall be subject to the review and approval of the Purchaser prior to performance of welding.

b. Prior to welding, all protective coatings, if present, shall be chemically or mechanically removed from all areas within 2 inches from a seam to be welded.

c. In manual arc-welding the electrodes shall be of the low-hydrogen type, and shall be such that the physical and chemical properties of the resulting welds shall meet the full requirements of the physical and chemical properties of the base metal.

d. All automatic welding shall be done by the submerged arc process, and the welds shall have physical and chemical properties that meet the full requirements of the physical and chemical properties of the base metal.

e. Preheat at 200°F minimum shall be applied to all seams whose thickness exceeds 1-1/4" regardless of surrounding air temperature. Preheat at 100°F shall be applied if the surrounding air temperature falls below 40°F. The above requirements are minimum and if the Bidder proposes to employ more rigid practices he should describe the proposed procedure in his bid.

14.2 Impact Testing

Test plates shall be made and tested in accordance with Paragraph UG-84 of the ASME Code as modified by Code Case 1317, employing a test temperature of 0°F and using the same material and thickness range as in the shell for each welding position to be used in construction for:

a. Each brand of low-hydrogen electrode to be used in construction.

b. Each combination of wire and flux for automatic welding to be used in construction.

Only those low-hydrogen electrodes and combinations of wire and flux that produce welds that at least meet the impact values of the parent material as specified shall be permitted in the construction.

14.3 Stress Relief

a. Any plate segment wholly containing a penetration, nozzle, or column connection shall be furnace stress relieved in the shop after insertion of the penetration.

b. All large penetrations which must necessarily intersect more than one shell plate shall be stress relieved as follows: Any portion of a penetration containing seams joining metal over 1-1/2" thick at the joint shall be furnace stress relieved as a unit before welding into a penetration assembly or into the shell.

14.4 Radiography

Vendor is completely responsible for all radiography or its equivalent. All shop welds shall be radiographed in the shop. Vendor shall radiographically examine all welds in those parts of the work subject to the Code by methods complying with Paragraph UW-51 of the Code. Any unsatisfactory negatives shall be rejected and Vendor shall again radiograph those portions of the work covered by

the unsatisfactory negatives until satisfactory results are obtained. Vendor shall examine all negatives and shall cut out, reweld and reradiograph all welds which fail to meet the standards of radiographic quality set forth in the Code. This procedure shall be followed until all such welds satisfy the standards of the Code.

The radiographic film shall be fine grain, high contrast, equivalent to Eastman Kodak AA. Lead intensifying screens shall be used. The film density shall be within the range of 1.5-2.5 as determined by either film density specimen or densitometer.

Welds on which it is not practical to radiograph shall be examined for cracks by the magnetic particle method of inspection in accordance with Appendix VI of the Code.

All negatives and certified interpretations thereof shall be submitted to the Purchaser for further examination. Where, in the Purchaser's opinion, a question as to the quality of the negatives or the work remains, he may require that any negatives he deems unsatisfactory be repeated or any seams he deems unsatisfactory removed, rewelded and reradiographed.

No acceptance by the Purchaser of the radiographs or of the welds shall relieve, in any manner, the responsibilities of Vendor.

15. DRAWINGS AND DESIGN CALCULATIONS

The Vendor shall prepare and submit for approval all necessary calculations and design, plate layout shop detail, and erection drawings. Plate layout shall be submitted prior to ordering of material; detail drawings for each phase of the work shall be submitted before start of fabrication of that phase. Preliminary design calculations shall be submitted not later than submittal of the plate layout; final calculations shall be submitted prior to start of fabrication. Upon completion, the drawings shall be revised as required to reflect as-built conditions and shall be resubmitted.

16. PROCEDURES AND QUALIFICATIONS

16.1 Welding

The Vendor shall prepare all welding procedures and shall qualify all procedures and welders in accordance with the ASME Code. Qualified procedures and welder qualifications shall be submitted for approval before start of fabrication.

16.2 Stress Relief

Thermal stress relief shall be performed as required by and in accordance with the ASME Code. Where stress relief in the shop is not practicable the Vendor shall submit his proposed stress relief procedure for approval.

17. INSPECTION BY PURCHASER

The material and workmanship to be furnished under this specification shall be subject to inspection in the mill, shop and field by the Purchaser. The Vendor shall provide sufficient notice and shall make proper arrangements so that the Purchaser may, at his discretion, witness all operations and tests.

18. MATERIAL TESTS

Certified copies of mill test reports of the specified physical and chemical requirements for each heat of the steel to be used in the work shall be submitted before fabrication is started.

19. TESTING FOR LEAK AND PRESSURE TIGHTNESS

19.1 General

Pneumatic proof tests will be required to demonstrate the integrity of the containment vessel and the vent system. The Vendor shall perform all tests on the vessel and vent pipes as listed below.

The Vendor shall provide all personnel, equipment and instruments necessary to perform and record the tests, except filling of the suppression chamber with water to the extent required for the test condition will be done by others.

The Vendor shall be fully responsible for the integrity of containment structure during testing.

19.2 Tests at Completion of Containment Structures

a. Soap Bubble Tests

Upon completion of the containment vessels and vent pipe system, a soap bubble test at 5 psig shall be applied to all welds and seals. The test shall also be applied to each door of the lock. The soap bubble test shall be repeated at design pressure upon completion of the overload pressure test.

b. Overload Pressure Test

After successful completion of the soap bubble test a pressure proof test shall be made on each vessel at a pressure equal to 115% of the design internal pressure for that vessel for one hour. The inner as well as the outer door of the personnel lock shall be tested at this pressure. The drywell and vent system may be pressurized during the suppression chamber overload pressure test and leak rate test.

c. Leak Rate Test

Leakage tests shall be performed on the drywell and vent system at the design pressure for the drywell and on the suppression chamber at its design pressure following the successful completion of the overload pressure tests. Continuous hourly readings shall be taken and their reliability shall be determined by the Vendor's and Purchaser's Inspectors. Readings shall continue until it is satisfactorily shown that the leakage rate in a twenty-four hour period does not exceed 0.2 percent of the total contained weight of air at design pressure at ambient temperature.

Leakage shall be determined by the "Reference System Method" which consists of measuring the pressure differential between the containment vessel and a gas-tight reference chamber system placed within the vessel. Prior to the test, Vendor shall submit his proposed test setup and procedure to the Purchaser for approval.

Pressure decay in the containment vessel shall be indicated by a manometer connected between the vessel and the reference system. Consideration shall be taken of the temperature, barometric pressure and humidity insofar as they affect the test results.

19.3 Equipment for Leakage Test

a. The gas-tight reference chamber system shall be suitably located within the vessel to reflect average internal air temperature. The reference chamber system shall be checked by the Halide Leak Detection Method at a pressure equal to the leak test pressure. Material and wall thickness shall be such as to minimize air temperature differences inside and outside the chamber.

b. A differential water manometer shall connect the reference chamber system and the vessel. The line on the vessel side of the water manometer shall be furnished with an open end mercury manometer for determining pressure in the vessel. A barometer for measuring outside pressure shall be provided.

c. In order to account for temperature effects, thermocouples shall be attached to the reference chambers and to the inside of the vessels and vent system. Calibrated temperature indicators for these thermocouples shall be provided, as well as two (2) thermometers for measuring the ambient outside temperature at the top and bottom of the drywell vessel. A minimum accuracy of one quarter on one degree Fahrenheit is required for all temperature measuring devices.

d. A recording air hygrometer shall be placed within the vessel to provide relative humidity information.

e. Leakproof stuffing boxes shall be provided for all lines passing through walls of the drywell vessel.

19.4 Review of Leakage Test Results

The Purchaser, or his designated representative, shall review the data immediately after each test to:

a. Determine the adequacy of the test

b. Authorize termination or continuation of the test as required.

19.5 Safety Precautions

Prior to the performance of the proof test, an area around the vessel and vent pipes shall be cleared of all persons by the Purchaser and the Vendor, and during the performance of such test only such persons shall be allowed within the area as shall be mutually agreed upon.

20. SURFACE PREPARATION AND PRIMING

20.1 All surfaces shall be cleaned. All oil, grease, dirt, loose rust, loose mill scale, and other foreign substances shall be removed. The removal of oil and grease shall be accomplished before mechanical cleaning is started, using mineral spirits or other paraffin-free solvents having a flash point higher than 100°F. Clean cloths and clean fluids shall be used to avoid leaving a film of greasy residue. The use of chipping tools which produce cuts, burs, and other forms of excessive roughness will not be permitted.

a. The areas described below shall receive one shop coat of Amercoat Corporation Dimetcote #4 or other approved primer which is compatible with finish paint consisting of either Carboline Company "Phenoline 300" or Amercoat Corporation "Amercoat #66". Surface preparation and application shall be in accordance with the paint manufacturer's recommendations. As a minimum, the steel shall be blast cleaned in accordance with Steel Structures Painting Council Specification SSPC-SP6 for Commercial Blast Cleaning. Surfaces to be primed in the above manner are the interior surfaces of the drywell, including jet deflectors, above the concrete floor, the exterior of the drywell above the water seal support bracket, the interior surfaces of the torus and interior and exterior surfaces of downcomers and header, interior surface of the vent and the exterior surface of the vent within the torus.

b. The interior surface of the drywell below elevation plus 12 ft. 3 in. and the exterior surface of the drywell in direct contact with final support concrete shall not be painted.

c. All other surfaces of the drywell, the torus and the vent pipes shall be wire brushed in accordance with SSPC-SP3 and, after cleaning, given one coat of primer conforming to TT-P-86c Type 1 or 2 or approved equivalent.

20.2 After erection and testing, all field welds and abraded places on the shop paint shall be prepared and painted as specified above.

21. SITE CONDITIONS AND SCHEDULE

21.1 All work required by these specifications shall be completed not later than September 1, 1965 and in accordance with the schedule to be submitted by the Vendor, as approved, in accordance with the General Conditions.

21.2 Storage and field fabrication area at the site will be made available to the Vendor November 1, 1964.

21.3 The building site with foundation mat and basement walls constructed to the extent indicated on the drawings will be made available to the Vendor March 1, 1965.

21.4 Foundations and anchors as required for the Vendor's erection equipment, and as approved the Purchaser, will be completed by the Purchaser December 15, 1964, provided complete information regarding the Vendor's requirements is submitted to the Purchaser not later than August 1, 1964. The Vendor will not be permitted access to the excavated area for concurrent construction of the T. G. Building Foundation by others.

22. PROPOSAL PRICES

22.1 Base Bid: The Bidder shall submit a lump sum price for all the work as specified using steel conforming to ASME SA201 B and SA300.

22.2 Material Alternate: The Bidder shall submit a lump sum to be deducted from or added to the base bid for all the work as specified using steel conforming to ASME SA212 B and SA300.

22.3 Testing Alternate: The Bidder shall submit a lump sum price to be added to or deducted from the base bid for performing overload pressure test and leak rate test of the drywell vessel while the vessel is on temporary supports in lieu of testing on permanent foundations as specified for the base bid.

22.4 Dimension Alternate: The Bidder shall submit a single lump sum price to be added to or deducted from the base bid for a change in the diameter of the spherical portion of the drywell vessel of 2 ft. 0 in.

22.5 Alternate Method of Supporting Internal Concentrated Loads: The Bidder may, at his option, submit a lump sum price to be added to or deducted from the base bid for making provision for transferring concentrated vertical and/or horizontal loads to the concrete surrounding the drywell, in lieu of resisting these loads by the drywell vessel.

22.6 Vendor's Alternate: The above prices shall be for the work in accordance with this specification and the drawings including such amendments or revisions as may be issued by the Purchaser during the bidding period. Changes or clarifications necessary to the submittal of the required prices shall be brought to the attention of the Purchaser in sufficient time for the issuance of an amendment or revision.

The Bidder may propose other changes, however, such other changes shall be submitted as alternate bid prices accompanied by a complete description of the change and not as exceptions to the bid items listed herein.

22.7 Final Leak Rate Test Prices: The Bidder shall submit prices for performing final leak rate tests on drywell and suppression chamber vessels in accordance with the requirements specified herein for initial leak rate test, except that halogen shall not be used, starting on or about April 1, 1967, as follows:

a. A per diem rate for all required personnel and equipment and

b. A lump sum price for all other costs associated with performance of the tests.

22.8 Penetrations Unit Prices: All penetrations shown on the drawings shall be included in the lump sum price for the work. In addition, the Bidder shall submit a price or prices for each added or deleted penetration of each size shown on the penetration schedule; additional penetrations will be located at

a minimum center to center distance from any other penetration of twice the average diameter. For penetrations of such size that cost would be affected by the status of the work, the Bidder shall submit additional prices identified as to when, during the progress of the work, each price is to apply.

23. PROPOSAL DATA

In addition to the Proposal Prices required the Bidder shall furnish, with his bid, the following information:

23.1 Recommended material and thickness of compressible material to be applied to the exterior and interior of the drywell (material to be furnished and installed by others).

23.2 Loads to be transmitted to the concrete surrounding the drywell due to expansion of the drywell vessel under the specified loads.

23.3 Details of proposed personnel air lock insofar as they affect concrete structure by others.

23.4 Latest date at which the Purchaser may furnish final locations of penetrations without delaying the scheduled progress of the work.

23.5 Concentrated vertical and/or horizontal internal loads proposed to be transferred to the concrete surrounding the drywell under Proposal Price 22.5.

23.6 Information regarding proposed jet deflectors as follows:

a. Projection into drywell

b. Diameter of drywell penetration

c. Free flow area provided

d. Clearance between deflector envelope and concrete beams and columns shown on the drawings.

24. DRAWING AND DATA REQUIREMENTS

Drawings, calculations, all procedures and all test reports shall be submitted in accordance with the requirements of the GENERAL CONDITIONS - ERECTION pertaining to drawing submittals.

11. In GPU's presentation to the staff in September, 1990, it was indicated that GPU would have an on-line thickness measurement capability in the critical area of thickness measurement. GPU has a current commitment to make UT measurements at outages of opportunity. State clearly what on-line thickness measurement program GPU will have during the fuel cycle starting in early 1991.

Response:

During our meeting on September 19, 1990 at the NRC offices, the GPUN presentation on Drywell Inspection Plans included reference to our evaluation of a concept for on-line monitoring of drywell corrosion. At that point, the concept had been discussed in-house and with General Electric but detailed engineering for an on-line monitoring system had not yet been initiated.

The concept seemed to be a potentially attractive way to monitor corrosion at a selected point on the shell surface during plant operation, when the drywell is not accessible for other means of examination. At the same time, it was recognized early on that the value of such a system would be limited at best, in view of the large size and complex geometry of the drywell structure and the varying conditions and non-uniform corrosion we have observed over the years. Also, the harsh drywell environment presents some obstacles to the design of an adequately reliable system. Nonetheless, the on-line monitoring system concept was considered to have potential merit as a diagnostic tool at least, and therefore we proceeded with engineering and development work of a prototype installation.

As the design developed, it became apparent that the system involved greater complexity and cost than was originally envisioned. As an example, we concluded that each monitor location would require 102 cables, with attendant termination, testing, routing, support, protection, qualification for the environment, etc. As a result, the practical limitations on the number of such monitor locations which could be employed after the prototype phase were such that we no longer saw likelihood that the system could ever have significant operational value.

At this point, the engineering package is complete, and we have procured some of the equipment which would be used if we go ahead with the prototype installation. However, because of the complexity of the installation, the implications on installation time, cost, personnel exposure, and possible conflict with other major outage activities in the drywell, we have put this job on hold. As our overall drywell program proceeds, we will consider installing the prototype on-line monitor system during a future outage of opportunity that would permit access to the drywell for an adequate time period. We will keep you informed of our deliberations on this.

Please note that the on-line monitor has never been a major or essential part of our overall corrosion abatement program. We will continue to monitor drywell corrosion via UT examinations at our Priority I and Priority II locations, on the frequencies established, along with the augmented inspection program, all as described to you in our November submittal.