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SUBJECT: Forwards response to 790801 ltr requesting info on SEP Structural Topics III-2,III-3.A & III-7.B.Relevant articles from NY State Bldg Const Code & subcontracter 1966-67 Tech Specs encl. See Reports

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LEON D. WHITE, JR.
VICE PRESIDENT

TELEPHONE
AREA CODE 716 546-2700

November 14, 1979

Director of Nuclear Reactor Regulation
Attention: Mr. Dennis L. Ziemann, Chief
Operating Reactors Branch No. 2
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Systematic Evaluation Program - Topics III-2, III-3.A, III-7.B
R. E. Ginna Nuclear Power Plant
Docket No. 50-244

Dear Mr. Ziemann:

Enclosed please find our response to your letter of August 1, 1979 in which you requested information on SEP structural topics III-2, III-3.A and III-7.B.

If there are any questions regarding this information, please contact us.

Very truly yours,

L. D. White, Jr.

Enclosures

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Enclosure

III-2 Wind and Tornado Loads

Question: For each safety related structure,

1. Describe the procedures to transform wind data into design pressure and gust factors.
2. Provide design basis, if any, for tornado loading including:
   a. translational wind speed
   b. radius of maximum rotational wind speed
   c. procedures to transform tornado data into design pressure.

Response: The original design of Ginna Station did not include tornado effects. Wind loads were applied as specified by Section C304-4 of the New York State Building Construction Code. This code is based on a wind speed of 75 miles per hour at a 30 ft. height. The wind speed is converted to a pressure loading and applied as shown in the Code tables which are included as Attachment I.

An evaluation of the plant's capability to withstand tornado effects was performed in 1968. This evaluation, which is included in the FSAR as Appendix 14A, was based on a tangential wind velocity of 300 mph and an external vacuum of 3 psig. The portion of Appendix 14A that discusses the tornado effects on structures is provided as Attachment II.

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In 1976 an addition was made to the auxiliary building for a standby auxiliary feedwater system. The design criteria for the standby auxiliary feedwater pump building were submitted to the NRC by letter dated May 20, 1977. Further information was supplied with our letter dated July 28, 1978. Staff approval of the standby auxiliary feedwater system, including the building, was issued by letter dated August 24, 1979. This building addition was designed in accordance with the provisions of Reg. Guide 1.76. As indicated in Attachment III, the building was designed for a wind velocity of 360 mph, a 3 psig external pressure drop, plus missile loading. The design wind velocity was converted to a pressure equivalent by the equations of paragraph 6.3.4 of ANSI A58.1.

III-3.A Effects of High Water Level on Structures

Question: For each safety-related structure,

1. Describe the water loads considered in the design and the extent to which dynamic effects due to flooding were considered.
2. Clarify the water level for each load combination discussed in Topic III-7.B.
3. Explain how the ground water pressure, on the embedded part of the containment, was considered.

Response: The highest instantaneous still water lake level recorded for Lake Ontario was 250.2 feet USGS (FSAR Section 2.6.4). The maximum still water level of Lake Ontario at the Ginna site was established as 250.78 feet USGS in Appendix 2C of the FSAR. The probable maximum stillwater level was revised on May 10, 1973 to 253.28 feet USGS or LSD 1935 datum. The reasons for this revision and subsequent addition of cap stones to the breakwall were explained in our letter dated May 15, 1973 to Mr. Donald J. Skovholt, Assistant Director for Operating Reactors, USAEC. Also, our letter of May 31, 1973 to Mr. Skovholt describes additional flood protection measures.

The plant is protected from wind driven waves by a breakwater with a top elevation of 261.0 feet (initially constructed to 254.0 feet) and by the discharge canal which runs parallel to the lakeshore between the breakwater and the plant. Design details of the breakwall are presented in question 3 in Supplement I to the Technical

Supplement Accompanying Application for a Full-Term Operating License, dated December 20, 1973. The general plant grade is about elevation 270 feet, with the exception of the area between the lake and the turbine building which is at elevation 253 feet. Because of the breakwater, the discharge canal orientation and the elevation of the general plant, flooding is not a problem and the plant structures are, therefore, not designed for the dynamic affects of flooding.

Normal water loads from ground water are considered in the design of the plant structures which are supported below the ground water table (elev. 250'-0"). Of the safety class structures, only the Containment, Auxiliary Building and Screen House are supported below the ground water table. The walls of the Auxiliary Building were designed for a lateral hydrostatic water pressure and the base mat was designed for a hydrostatic uplift pressure. The Screen House was designed for a full hydrostatic and uplift pressure assuming complete dewatering of the facility.

The Containment design provides for no backfill against the containment wall. As such no lateral ground water pressure on the embedded part of the containment was considered (FSAR page 5.1.2-36 - "Absence of Backfill Around Containment"). However, the base slab of the containment is designed to withstand the full hydrostatic head of water, equivalent to 7.16 psi (16.5 ft. of water).

III-7.B Design Codes, Design Criteria and Load Combinations

Question: For each safety-related structure (except the containment shell),

1. List the codes and standards (including edition date) used for design and construction of concrete and steel elements (containment internal structures, auxiliary building, intermediate building, turbine building, control room, battery room, diesel generator room).
2. Provide the loads, load combination and acceptance criteria employed for the design.
3. Provide the design and/or actual material properties (fy and f$\acute{c}$) used for steel and concrete elements. For concrete, provide the age specified and any admixtures used.
4. Provide a copy of design specifications used for design and construction.
5. Provide representative stress level (compression, tension and shear) at the critical location of each structure (e.g., at base of containment internal structures) for each of the load combinations provided in response to (2) above. (For this question, information at the base of the containment shell is also needed.)

Response: 1. The codes and standards (including edition date) used for design and construction of concrete and steel elements are given in FSAR Section 5.1.1.5 "Codes and Classifications", pages 5.1.1-10 through 5.1.1.-16. This listing is included as attachment IV.

2. The following loads have been considered in the structural design of the safety related structures.

A. Dead loads

B. Live loads (uniform loads/sq. ft. to allow for any hung loads from floor framing system, which may include piping, H&V ducts, electrical cable trays, ceiling, etc. where applicable, and also snow loads for roof)

C. Permanent equipment loads

D. Seismic loads

E. Wind loads

The specific loads, loading combinations, and acceptance criteria for each safety related structure are listed below:

(1) <u>Containment Shell</u>

The design loads are described in Section 5.1.2.3 of the FSAR. The fundamental loads for the containment structure are tabulated in Table 5.1.2-4A.

The load combinations for the containment structure are given in Table 5.1.2-4I.

The acceptance criteria is described in the FSAR Section 5.1.2.3 under the headings of "Design Stress Criteria" and "Load Capacity."

(2) Containment Internal Structures

a. Loads

1. Operating Floor
   Live Load 1000 psf with appropriate dead load (D.L.)
2. Intermediate Floor
   Live Load 200 psf with appropriate D.L.
3. Air Filter Platform
   Live Load 200 psf with appropriate D.L.
4. Foundation Mat
   For upward water pressure = 1030 psf.
5. Load generated by the Operating Basis Earthquake (OBE).
6. Load generated by the Safe Shutdown Earthquake (SSE).
7. Compartment pressure differential due to accident.

8. Equivalent static load generated by the reaction on the broken reactor coolant system pipe during the postulated break.

9. Overhead Crane

Lifted Load = 200^k

Trolley = 150^k

Bridge Girder = 100^k

Vertical, lateral and longitudinal loads are used as per AISC or N.Y. code, whichever governs.

b. Load Combinations

1. $D + L + T_o = S$

2. $D + L + T_o + E = 1.33S$

3. $D + L + T_o + P + Y_r + E' = U$ or Y

T_o = Thermal effects and loads during normal operating condition.

E = Load generated by the Operating Basis Earthquake (0.08g) at 2% damping (maxm. acceleration = 0.19g)

E′ = Load generated by the Safe Shut-down Earthquake (0.20g) at 2% damping (maxm. acceleration = 0.47g)

U = The required section strength based on Ultimate Strength design described in ACI-1963.

Y = For Structural Steel, Y is the section strength based on yield strength of material using elastic design.

P = Pressure equivalent static load within the compartment generated by postulated break.

D = Dead load including any permanent equipment loads and hydrostatic loads

L = Live loads.

Y_r = Equivalent static load due to postulated high energy pipe break.

S = For concrete structure, S is the required section strength based on working stress design method as per ACI 1963. For structural steel, S is the required section strength based on the elastic design methods as per AISC. "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", adopted April 17, 1963.

(3) Diesel Generator Building

a. Loads

Roof decking	2.5 lbs/sq ft
Roofing & insulation	10.0 lbs/sq ft
Fire protection	7.5 lbs sq/ft
Piping	5.0 lbs sq/ft
Miscellaneous	3.0 lbs sq/ft
	28.0 lbs/sq ft
Snow load	40.0 lbs/sq ft

b. Load Combinations

$D + L + E' = S$ (for roof bracing and column foundation)

For wall panels

$D + L + E = 1.33S$

$D + L + E' = U$

where,

E = Load generated by the operating basis earthquake (0.08g) at 5% damping (maximum acc. = 0.13g).

E′ = Load generated by the safe shut-down earthquake (0.2g) at 5% damping (maximum acc. = 0.32g).

S = For concrete structure, S is the required section strength based on working stress design method as per ACI 1963. For structural steel, S is the required section

strength based on the elastic design methods as per AISC. "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", adopted April 17, 1963.

U = The required section strength based on Ultimate Strength design described in ACI-1963.

(4) Control Building

a. Loads

1. Roof

Concrete slab	250 lbs/sq ft
Snow	40 lbs/sq ft
Truss	15 lbs/sq ft
Roof & Insulation	8 lbs/sq ft
Ceiling & Misc.	15 lbs/sq ft

2. Floor at Elev. 289'-6"

D.L. + L.L. = 500 lbs/sq ft

3. Floor at Elev. 271'-0"

D.L. + L.L. = 400 lbs/sq ft

b. Load Combinations

1. For Roof Truss

D + L + E′ = S

2. Building columns are designed by applying lateral load in the mid span of the column equivalent to (D + 1/2 L) x .20g in addition to vertical dead load and live load carried by the column. The resulting allowable stresses from the seismic load are increased by 33 1/3%.

3. Concrete walls are designed by applying lateral load in the mid span of the wall panel equivalent to (panel weight) x 0.20g. The design is based on working stress method without increase in allowable stresses.

E′ = Load generated by the Safe Shutdown Earthquake (0.20g).

(5) Auxiliary Building

a. Loads

1. Roof

Roofing	6 lbs/sq. ft.
Insulation and decking	7 lbs/sq. ft.
Misc.	7 lbs/sq. ft.
Snow loads	40 lbs/sq. ft.

2. Foundation

a) Foundation mat for upward water pressure = 1000 psf

b) Sump bottom for upward water pressure = 2250 psf

c) Walls below grade

(1) Above el. 250'-0" for equivalent fluid pressure 50 #/sq ft/ft of height

(2) Below el. 250'-0" for equivalent fluid pressure 80 #/sq ft/ft of height

(3) Intermediate Floor
Liveload 220 psf with appropriate D.L.

(4) Operating Floor
Live load 200 psf with appropriate D.L.

(5) Crane Loads

Lifted load	80^k
Trolley weight	14^k
Crane bridge	28.8^k

Lateral, longitudinal and vertical loads increased by 25% to include effect of impact and braking.

b. Load Combinations

D + L = S

D + L + W or E′ = 1.33S

(6) Screen House

Below Grade

The entire screenhouse-service water building is founded in or on bedrock with the exception of the basement of the electric switchgear portion which is founded approximately four feet above bedrock. Since the building is founded in bedrock the basement will not realize any spectral acceleration and the seismic loading is equivalent to the ground motion of 0.08g and 0.20g.

The basement is designed to be dewatered. The full height of the wall is designed for an external hydrostatic pressure plus a seismic load equal to a percentage of the dead load of the wall and the hydrostatic pressure. For the portion of the wall below grade and above bedrock an active earth pressure based on a saturated soil weight is applied.

Internal walls, such as pump baffles and the wing walls between the traveling screens were designed for a full height hydrostatic pressure on either side plus a seismic load due to the water movement during a seismic event.

Above Grade

1) Design loadings:

a) Dead Loads

1) Built-up roof 14 psf

2) Piping hung from roof 10 psf

3) Siding 5 psf

b) Live loads

1) Snow load to roof 40 pfs
(New York State Bldg. Code Para. C-304-5)

2) Wind load

a) Walls (SBC Para.304-4) 20 pfs

b) Roof (SBC Para. 304-5)
Down 5 pfs
Up 17 pfs

3) Crane loads (inc-live, dead & impact) @ support points 20,000#

a) Lateral to runway 20% 4,000#

b) Longitudinal to runway 10% 2,000#

c) Seismic loadings

1) 0.08g ground motion @ 1.33 working stress

2) 0.20g ground motion @ yield stress

2) Design loading combinations for analysis:

a) Dead loads + snow load + crane load @ working stress

b) Dead load + snow load + crane load + wind load @ 1.33 times working stress

c) Dead load + snow load + crane load + 0.08g vert. seismic + 0.08g E-W horiz. seismic @ 1.33 working stress

d) Dead load + snow load + crane load + 0.08g vert. seisic + 0.08g N-S horiz. seismic @ 1.33 working stress

e) Dead load + snow load + crane load + 0.20g vert. seismic + 0.20g E-W horiz. seismic @ yield stress

f) Dead load + snow load + crane load + 0.20g vert. seismic + 0.20g N-S horizontal seismic @ yield stress

3. The concrete, reinforcing steel and structural steel requirements are as listed below.

/

a. The minimum ultimate compressive strength used for designing concrete structures is as follows:

1. Containment Shell - 5000 psi in 28 days
2. All Other Structures - 3000 psi in 28 days

All structural concrete is considered subject to potentially destructive exposure and contains air in amounts conforming with Table 304 (b) of ACI 301. An air entraining admixture was used conforming to "Specifications for Air Entraining Admixture for Concrete", ASTM C 260-63T. A water reducing densifier was added to all structural concrete with a required ultimate compressive strength equal to or greater than 3000 psi at 28 days. (FSAR page 5.1.2-70a)

b. Reinforcement:

The concrete reinforcement used is deformed bar of intermediate grade billet-steel conforming to the requirements of "Specification for Billet-Steel Bars for Concrete Reinforcement", ASTM A 15-64, with deformations conforming to "Deformed Bars for Concrete Reinforcement", ASTM A 305-56T. Special large size concrete reinforcing bars are deformed bars of intermediate grade billet-steel conforming to "Specifications for Special Large

Size Deformed Billet-Steel Bars for Concrete Reinforcement", ASTM A 408-64. Reinforcing steel conforming to these specifications has a tensile strength of 70,000 psi to 90,000 psi and a minimum yield point of 40,000 psi. The principal mild steel reinforcement used in the vicinity of the large opening (i.e., personnel lock and equipment access hatch) has a 60,000 psi yield stress.

c. Structural Steel:

All structural steel used in the work and not otherwise designated on the drawing conformed to "Specification for Structural Steel (Tentative)", ASTM A 36-63T, with 36,000 psi minimum yield strength.

4. The following specifications for structural steel and concrete were used for construction and are included as Attachment V.

a. Technical Specifications for Furnishing, Fabricating and Erecting Structural Steel, Grating, Stair Treads, and Hand Rail.

b. Technical Specifications for Structural Concrete (includes reinforcement) with Addendum No. 1 to Addendum No. 9.

5. The representative stress levels in the containment shell can be found in Appendix 5D of the FSAR. The stresses for the 48 load combinations identified in Table 5.1.2-4I are provided as stress resultants and stress couples in the meridional and the hoop direction, including meridional shear and radial displacements.

Unit stresses in the different structural components of the shell are described in the FSAR as shown below:

(1) Stresses in the hinge tension bars are shown on page 5.1.2-37.

(2) Stresses in the liner knuckle plate are described on page 5.1.2-37A.

(3) Stresses in the elastomer bearing pads are described on page 5.1.2-37B through 5.1.2-41.

(4) Radial shear in the shell, see page 5.1.2-42 through 5.1.2-43.

(5) Longitudinal shears in the shell, see page 5.1.2-44.

(6) Horizontal shears in the shell, see page 5.1.2-45 through 5.1.2-46.

(7) Tendon anchorage stresses, see page 5.1.2-46a through 5.1.2-46d.

(8) Liner stresses, see page 5.1.2-46e through 5.1.2-51a.

(9) Longitudinal liner shear stresses, see page 5.1.2-51b through 5.1.2-51g.

(10) Stresses in the concrete and reinforcing steel during the pressure test, see Table B on page 5.1.2-51h.

(11) Large openings, see page 5.1.2-62, and the Third Supplement of the FSAR "Design of Large Opening Reinforcement for Containment Vessel."

ATTACHMENT 1
2/2

NYS BUILDING CODE

C 304-4 (833.4) **Wind Loads**

Minimum wind loads shall be in conformity with tables C 304-4a and C 304-4b, and shall be applied normal to the surface. These loads are based on a design wind velocity of 75 miles per hour at a height of 30 feet above grade level. Minimum wind loads on signs shall be in conformity with generally accepted standards.

TABLE C 304-4a. (III-833)—WIND LOADS: WALLS, EAVES, CORNICES, TOWERS, MASTS AND CHIMNEYS
In pounds per square foot

At height above grade in feet	Walls[1,4]	Eaves and cornices[2]	Towers, masts and chimneys[4]
501 to 600[3]	34	68	60
401 to 500	33	66	58
301 to 400	32	64	56
201 to 300	30	60	53
101 to 200	28	56	49
61 to 100	24	48	42
41 to 60	21	42	37
26 to 40	18	36	32
0 to 25	15	30	26

1 Exterior walls shall be capable of withstanding wind load on both the interior and exterior surfaces, acting non-simultaneously.
2 Load acting upward.
3 For heights above grade greater than 600 feet, add 1 psf to load for walls for each interval or part of interval of 200 feet above 600 feet; for eaves and cornices, and towers, masts and chimneys, corresponding loads are in proportion to those for walls.
4 Tabular values are for square and rectangular structures. For structures hexagonal or octagonal in plan, use projected area and multiply tabular values by 0.8; for structures round or elliptical in plan, use projected area and multiply values by 0.6.

C 304-5 (833.5) **Overturning Force and Moment Due to Wind**

a——The overturning force shall be the wind load. The wind load shall be the load set forth in table C 304-4a, and shall be applied only to the windward vertical surface above the horizontal plane under consideration, and to the rise of the roof. The resisting force shall be the dead load of the structure above the horizontal plane under consideration, plus the strength of material and fastenings establishing continuity with the structure below.

b——The moments of stability and overturning shall be computed about the leeward edge of the horizontal plane under consideration.

NYS BUILDING CODE

2/2

TABLE C 304-4b. (IV-833)—WIND LOADS: ROOFS
In pounds per square foot

Mean elevation of roof above grade level in feet	Direction of load[1]	Slope from horizontal[2]			
		0° to 20°	20° to 30°	30° to 60°	Over 60°
501 to 600[3]	Downward	8	8	8 to 24	24
	Upward	29	29 to 24	24	24
401 to 500	Downward	8	8	8 to 23	23
	Upward	28	28 to 23	23	23
301 to 400	Downward	7	7	7 to 22	22
	Upward	27	27 to 22	22	22
201 to 300	Downward	7	7	7 to 21	21
	Upward	25	25 to 21	21	21
101 to 200	Downward	6	6	6 to 20	20
	Upward	24	24 to 20	20	20
61 to 100	Downward	5	5	5 to 17	17
	Upward	20	20 to 17	17	17
36 to 60	Downward	5	5	5 to 15	15
	Upward	19	19 to 15	15	15
21 to 35	Downward	5	5	5 to 14	14
	Upward	17	17 to 14	14	14
0 to 20	Downward	5	5	5 to 11	11
	Upward	14	14 to 11	11	11

1 Downward and upward loads act non-simultaneously.
2 For slopes between 20° and 30° with wind acting upward, and between 30° and 60° with wind downward, compute loads by straight-line interpolation.
3 For heights above grade greater than 600 feet, add 1 psf to upward load for 0° to 20° slope for each interval or part of interval of 200 feet above 600 feet; for upward loads on other slopes, and downward loads on all slopes, corresponding loads are in proportion to those for upward load for 0° to 20° slope.

c——The moment of stability of the structure above the horizontal plane under consideration shall be not less than 1½ times the overturning moment due to wind.

C 304-6 (833.6) **Sliding Force Due to Wind**

The sliding force due to wind load, equal to the overturning force, determined in conformity with section C-304-5, shall be resisted by the dead load of the structure above the horizontal plane under consideration, by anchors, and where applicable, by soil friction, providing a total resisting force equal to not less than 1½ times the sliding force. Anchors used to resist overturning may also provide resistance to sliding.

3. TORNADO EFFECTS ON STRUCTURES

3.1 GENERAL

All structures have been designed for wind loads in accordance with the requirements of the State of New York - State Building Construction Code. The wind loads tabulated in this code are based on a design wind velocity of 75 miles per hour at a height of 30 feet above grade level. The stresses resulting from these loads were considered on the basis of a working strength design approach.

For purposes of this study the design of all critical structures has been checked on the basis of a limiting load factor approach wherein the loads utilized to determine the required limiting capacity of any structural element are computed as follows:

$$C = (1.00 \pm 0.05)D + 1.0\ W_t + 1.0\ P_t$$

Symbols used in this equation are identified as follows:

- C - required load capacity of section
- D - dead load of structure
- W_t - wind loads based upon 300 mph tangential wind velocity
- P_t - pressure load based upon an internal pressure 3 psi higher than the external pressure.

3.2 REACTOR CONTAINMENT

Although tornado loads were not considered in the original design, this structure is capable of resisting the full strength tornado loads.

3.3 AUXILIARY BUILDING

Although tornado loads were not considered in the original design, this structure up to and including the Operating Floor (elev. 271"-0") is capable of resisting tornado loads. The siding on superstructure would blow outward, thus relieving the pressure and wind load. Components and systems on the operating floor and above are susceptible to impact by falling debris and potential missiles. The equipment, on the auxiliary building operating floor, required to maintain the plant in a hot shutdown condition is as follows:

a) Boric Acid Tanks, Pumps and Filter; and
b) 480V Switchgear - Bus 14

The equipment in a) is surrounded by a radiological shield wall as shown in Figure 14A-1. This wall offers significant lateral protection against potential missiles. Furthermore, the two tanks and pump are redundant. Hence, there is reasonable assurance that there will be no loss of boration function. More details are given in Section 4.2.1 - Boration System.

Damage to Bus 14 will not cause loss of power supply since an independent and redundant bus (Bus 16) is provided on the intermediate floor of the auxiliary building. This floor, as previously mentioned, will not be exposed to the weather. More details are given in Section 4.4.

In addition, the Spent Fuel Pit has been evaluated. Potential missiles may puncture the spent fuel pit liner but will not penetrate through the concrete walls or base causing gross leakage of water.

3.4 INTERMEDIATE BUILDING

This structure, as shown in Figure 14A-2, is significantly confined by other buildings, i.e., Service Building, Turbine Building, Reactor Containment and Auxiliary Building. Consequently, a direct exposure

to a tornado funnel is extremely remote. Due to the relative vacuum which might be created by a tornado outside of the intermediate building lateral walls may blow outward. This will relieve the pressure differential and prevent gross failure of the structural steel framing, columns and floors. Therefore, the two floors which house critical equipment, i.e., floors at elevations 253' 6" and 278' 4", are afforded significant shielding by the adjoining structures and higher floor/roof elevations.

The critical components in this structure consist of the following:

a) On floor elevation 253' 6": two motor driven and one turbine driven auxiliary feedwater pumps; and

b) On floor elevation 278' 4": the cross connection on main steam and feedwater lines to the two steam generators.

As previously mentioned, no damage is anticipated to the equipment located on these two floors. More details are given in Section 4.1.

3.5 DIESEL GENERATOR ANNEX

The availability of on-site diesel power was reviewed on the basis of the assumption that the tornado could cause loss of outside power.

Siding, windows, doors and ventilation openings would blow outward thus relieving the pressure loading. Damage to the roof might result if the differential pressure is not relieved in time. Two redundant diesel generators are provided. No physical damage to the diesels is anticipated. Furthermore, the physical separation between them is such that one missile would not be able to impact against both diesel generators, as shown in Figure 14A-3. More details are given in Section 4.4. The conclusion has been drawn that emergency power supply is reasonably assured.

3.6 SCREENHOUSE

Siding, windows, doors and ventilation openings would blow outward, thus relieving the pressure loading. No structure collapse is expected. The critical equipment housed in the screenhouse is represented by:

a) four service water pumps; and
b) 480 V Switchgear-Buses 17 and 18.

The four service water pumps are redundant and sufficient physical separation exists between them to make extremely unlikely the failure of all four pumps from the same tornado effect, as shown in Figure 14A-4.

Service water pumps 1A and 1C are energized from Bus 18 and service water pumps 1B and 1D are energized from Bus 17. Cross-tie between the two buses is available.

The two buses are located in the screenhouse and are physically separated. Hence, there is reasonable assurance that at least one service water pump-bus combination will operate properly. More details are given in Section 4.4.

3.7 CONTROL ROOM

No gross failure of this structure is anticipated. The only wall directly exposed is the East wall. The siding of this wall would blow outward relieving the pressure differential and leaving the interior exposed to the weather. The same would be true for windows, doors and ventilation openings.

Local controls for the equipment required for maintaining the plant in a hot shutdown condition have been provided as a backup to the controls available in the control room. Therefore, there is reasonable assurance that controls for the critical components will be available.

3.8. SERVICE BUILDING

The status of this building is similar to that of the auxiliary building, i.e., the siding on superstructure above elevation 271' would blow outward, thus relieving the pressure and wind loads. The components which might be affected by tornado are the two condensate storage tanks. There is reasonable assurance that feedwater supply will be maintained because of the available redundancy and of the fact that 2/3 of the tank volume is below grade.

3.9 CABLE TUNNELS

The cable tunnels are located underground and are capable of withstanding tornado loads.

ATTACHMENT III 1/1
(FROM AUX BLDG. ADDITION DESIGN CRITERIA)

4.6 Tornado Loads

4.6.1 Tornado Design Criteria

The Pumphouse will contain safety class equipment (Seismic Class I) and will therefore be designed to withstand short term tornado loadings, including the impact of tornado-generated missiles. The following tornado design criteria shall be used:

a. Maximum rotational wind velocity of 290 mph, together with translational wind velocity of 70 mph giving total design velocity of 360 mph.

Radius of maximum rotational velocity is considered to be 150 ft. Pressures and suction forces due to the 360 mph wind and all other design parameters shall be determined in accordance with ANSI-A58.1 - 1972.

b. External pressure drop is considered to be 3 psig.

c. A missile equivalent to a utility pole 35 ft. long, 14 inches in diameter, weighing 50 pcf and traveling at 130 ft./sec. within a height of 17 ft. above ground.

d. A missile equivalent to a two ton automobile traveling at 150 ft./sec. and impacting within a height of 22 ft. above ground.

e. A 12 ft. long 4" x 12" wooden plank traveling at 260 ft./sec. and impacting end-on at any height.

f. A missile equivalent to a 3 inch diameter Schedule 40 pipe, 10 ft. long, traveling at 160 ft./sec. and impacting end-on within a height of 48 ft. above ground.

g. A missile equivalent to a 6 inch diameter Schedule 40 pipe, 15 ft. long, traveling at 150 ft./sec. and impacting end-on within a height of 30 ft. above ground.

h. A missile equivalent to a 12 inch diameter Schedule 40 pipe, 15 ft. long, traveling at 130 ft./sec. and impacting end-on within a height of 14 ft. above ground.

4.6.2 Tornado Load Combinations

Each of the above missile loading cases shall be investigated to determine which one causes the most severe loading of the Pumphouse, or of individual Pumphouse components. The most severe missile load shall be combined with the tornado wind load for the structural design of the Pumphouse.

The design, materials, fabrication, inspection, and proof testing of the containment vessel complies with the applicable parts of the following:

1. ASME Boiler and Pressure Vessel Code, Section III - Nuclear Vessels, Section VIII - Unfired Pressure Vessels, Section IX - Welding Qualifications.

2. Building Code Requirements for Reinforced Concrete (ACI 318-63).

3. American Institute of Steel Construction Specifications:

   a) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings," adopted April 17, 1963.

   b) "Code of Standard Practice for Steel Buildings and Bridges," revised February 20, 1963.

4. USAS N 6.2 - 1965, "Safety Standard for Design, Fabrication and Maintenance of Steel Containment Structures for Stationary Nuclear Power Reactors."

5. ACI 301-66, "Specifications for Structural Concrete for Buildings"

6. ASTM C 150-64, "Specifications for Portland Cement"

7. State of New York Department of Public Works Specification

8. ASTM C 260-63T, "Specifications for Air-Entrained Admixtures for Concrete"

9. ASTM A 15-64T, "Specifications for Billet-Steel Bars for Concrete Reinforcement"

10. ASTM A 305-56T, "Specificat ons for Minimum Requirements for Deformation of Deformed Bars for Concrete Reinforcement"

11. ASTM A408-64T, "Specifications for Special Large Size Deformed Billet-Steel Bars for Concrete Reinforcement"

12. ASTM C 94-65, "Recommended Practice for Winter Concreting"

13. ACI 306-66, "Recommended Practice for Winter Concreting"

14. ACI 605-59, "Recommended Practive for Hot Weather Concreting"

15. ASTM A 421-65, "Specifications for Uncoated Stress-Relieved Wire for Prestressed Concrete"

16. ASTM C29-60, "Method of Test for Unit Weight of Aggregate"

17. ASTM C 40-66, "Method of Test for Organic Impurities in Sands for Concrete"

18. ASTM C 127-59, "Method of Test for Specific Gravity and Absorption of Coarse Aggregate"

19. ASTM C 128-59, "Method of Test for Specific Gravity and Absorption of Fine Aggregate"

20. ASTM C 136-63, "Method of Test for Sieve or Screen Analysis of Fine and Coarse Aggregate"

21. ASTM C 39-64, "Method of Test for Compressive Strength of Molded Concrete Cylinders"

22. ASTM C 192-66, "Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory"

23. ASTM A 15-62T, "Specifications for Billet-Steel Bars for Concrete Reinforcement"

24. ASTM A408-64, "Specifications for Special Large Sized Deformed Billet-Steel Bars for Concrete Reinforcement"

25. ASTM A 432-64, "Specification for Deformed Billet-Steel Bars for Concrete Reinforcement with 60,000 psi Minimum Yield Strength"

26. ASTM C 31-65, "Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field"

27. ASTM C33-64, "Specifications for Concrete Aggregates"

28. ASTM C42-64, "Methods of Securing, Preparing, and Testing Specimens from Hardened Concrete for Compressive and Flexural Strengths"

29. ASTM C 131-64T, "Method of Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Machine"

30. ASTM C 138-63, "Method of Test for Weight per Cubic Foot, Yield, and Air Content (Gravimetric) of Concrete"

31. ASTM C 143-58, "Method of Test for Slump of Portland Cement Concrete"

32. ASTM C 150-65, "Specifications for Portland Cement"

33. ASTM C 172-54, "Method of Sampling Fresh Concrete"

34. ASTM C 231-62, "Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method"

35. ASTM C 260-65T, "Specifications for Air-Entrained Admixtures"

36. ASTM C 494-62T, "Specifications for Chemical Admixtures for Concrete"

37. ASTM C 173-58, "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method"

38. ACI 214-57, "Recommended Practice for Evaluation of Compression Test Results of Field Concrete"

39. ACI 315-65, "Manual of Standard Practice for Detailing Reinforced Concrete Structures"

40. ACI 347-63, "Recommended Practice for Concrete Formwork"

41. ASTM D 287-64, "Method of Test for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)"

42. ASTM D 97-66, "Method of Test for Pour Points"

43. ASTM D 92-66, "Method of Test for Flash Point by Cleveland Open Cup"

44. ASTM D 88-56, "Method of Test for Saybolt Viscosity"

45. ASTM D 937-58, "Method of Test for Cone Penetration of Petroleum"

46. ASTM D 512-62T, "Methods of Test for Chloride Ion in Industrial Water and Industrial Waste Water"

47. ASTM D 1255-65T, "Method of Test for Sulfides in Industrial Water and Industrial Waste Water"

48. ASTM D 992-52, "Method of Test for Nitrate Ion in Industrial Water"

49. ASTM A 442-60T, "Tentative Specifications for Carbon Steel Plates with Improved Transition Properties"

50. ASTM A 300-63T, "Specifications for Steel Plates for Pressure Vessels for Service at Low Temperature"

51. ASTM A 36-63T, "Specifications for Structural Steel"

52. SSPC-SP6-63, "Commercial Blast Cleaning"

53. SSPC-SP8-63, "Pickling"

54. SSPC-PA1-64, "Shop, Field and Maintenance Painting

55. ASTM A 322-64A, "Specification for Hot-Rolled Alloy Steel Bars"

56. ASTM A 29-64, "Specification for General Requirements for Hot-Rolled and Cold-Finished Carbon and Alloy Steel Bars"

57. ASTM D 624-54, "Methods of Test for Tear Resistance of Vulcanized Rubber"

58. ASTM D 676-59T, "Method of Test for Indentation of Rubber by Means of a Durometer"

59. ASTM B 412-66T, "Method of Tension Testing of Vulcanized Rubber"

60. ASTM D 573-53, "Method of Test for Accelerated Aging of Vulcanized Rubber by the Oven Method"

61. ASTM D 395-61, "Method of Test for Compression Set of Vulcanized Rubber"

62. ASTM D 746-64T, "Method of Test for Brittleness Temperature of Plastics and Elastomers by Impact"

63. ASTM D 1149-64, "Method of Test for Accelerated Ozone Cracking of Vulcanized Rubber"

64. ASTM D 471-66, "Method of Test for Change in Properties of Elastomeric Vulcanizates Resulting from Immersion in Liquids"

65. ASTM A 514-65, "Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding"

66. ASTM A 441-66T, "Specification for High-Strength Low Alloy Structural Manganese Vanadium Steel"

67. ASTM A 53-65, "Specification for Welded and Seamless Steel Pipe"

68. ASTM A 435-65, "Method and Specification for Ultrasonic Testing and Inspection of Steel Plates of Firebox and Higher Quality"

69. ASTM C 177-63, "Method of Test for Thermal Conductivity of Materials by Means of the Guarded Hot Plate"

70. ASTM C 165-54, "Method of Test for Compressive Strength of Preformed Block-Type Thermal Insulation"

71. ASTM C 355-64, "Methods of Test for Water Vapor Transmission of Thick Materials"

72. ASTM C 273-61, "Method of Shear Test in Flatwise Plane of Flat Sandwich Constructions or Sandwich Cores"

73. ASTM D 1622-63, "Method of Test of Apparent Density of Rigid Cellular Plastics"

The structural design also meets the requirements established by the "State Building Construction Code," State of New York, 1961.

ATTACHMENT V

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Rev. 1
9/9/66

TECHNICAL SPECIFICATION
FOR
FURNISHING, FABRICATING AND ERECTING
STRUCTURAL STEEL, GRATING, STAIR TREADS AND HANDRAIL
FOR THE
ROBERT EMMETT GINNA NUCLEAR POWER STATION - UNIT NO. 1
OF THE
ROCHESTER GAS AND ELECTRIC CORPORATION
ROCHESTER, NEW YORK

1.0 SCOPE OF WORK

1.1. GENERAL

The work to be performed under this Subcontract shall include the detailing furnishing, fabrication, delivery, unloading, storage where necessary, and erection of all structural steel, grating, stair treads and handrail required for the Robert Emmett Ginna Nuclear Power Station - Unit No. 1. The work shall include but not necessarily be limited to the following:

a. Preparation of shop details and erection drawings.

b. Structural steel for the structures including the Containment Vessel, Intermediate Building, Reactor Auxiliary Building, Turbine Room, Service Building and Facade. The structural steel consists of:

(1) Columns
(2) Base, cap and bearing plates
(3) Shims for setting all base and bearing plates
(4) Beams and girders
(5) Trusses
(6) Posts, hangers, ties and sag rods
(7) Struts and bracing
(8) Purlins and girts
(9) Stair stringers
(10) Trolley beams
(11) Ladders
(12) Tee plates
(13) Connections and connection bolts
(14) Rivets, welds and high strength bolts
(15) Crane Rails, clips and stops
(16) Checkered plate

c. Steel gratings, grating with attached plate, grating stair treads, and all related hardware.

d. Handrail for platforms, walk ways and stairs.

e. Shop paint.

1.2 WORK NOT INCLUDED

The following items of work associated with the plant structures are not included in this Subcontract but will be furnished and erected by others:

a. Anchor bolts

b. Grouting for column base plates

c. Field painting

d. Steel plate liners for Containment Vessel, Spent Fuel Pit, Decontamination Pit and Refueling Canal and liner penetration.

2.0 SITE DATA

2.1 LOCATION

The site for the Robert Emmett Ginna Nuclear Power Station Unit No. 1 is located on the south shore of Lake Ontario, near Smoky Point, in Wayne County, approximately 18 miles northeast of Rochester, New York.

2.2 TRANSPORTATION

The site will be graded and an access road provided to the work area. No rail facilities are available at the site. The nearest rail head is approximately four miles from the site.

2.3 ACCESS TO WORK AREA

The Contractor will be provided all required and reasonable access to the work area so as not to impede his operations.

2.4 SERVICES AND FACILITIES

The availability of services and facilities for this Subcontractor will be detailed by the Contractor, Bechtel Corporation. Generally services and facilities are as follows:

Available Services

1. Power will be available at existing locations at 480 V. in a capacity up to 60 amps. Power requirements in excess of this amount will require special consideration and a decision for each contract.
2. Water will be available at existing locations.
3. No compressed air will be available.
4. No telephone service will be available except at the coin phone in the Bechtel office.
5. Clean up will be the responsibility of the sub-contractor and if it is not properly accomplished the work will be performed and a back charge written to cover the cost.
6. The use of job site cranes will be offered when they are not in use on the base contract work. This service will be back charged with a percent added for overhead.

Work and Laydown Space

Adequate work and laydown space will be provided in areas not adjacent to the main buildings. Limited work and laydown space will be made available, depending on schedule and coordination of crafts, in the buildings, and surrounding areas.

Office and Change Areas

No office space or craft change facilities will be provided. Portable toilet facilities will be available.

Job Coordination

Bechtel will coordinate the site work and direct the subcontractor to promote harmony and provide the overall best work sequence. The Bechtel inspecting engineer may request and shall be permitted to witness all subcontract work to assure its continued quality. The subcontractor's obligation is to provide workmanship within the requirements of the specifications and to make designated tests to prove quality.

3.0 STRUCTURAL STEEL

3.1 SPECIFICATIONS AND CODES

All work under this Subcontract shall comply, except as hereinafter specified, with the following American Institute of Steel Construction Specifications:

1. "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", adopted April 17, 1963.

2. "Code of Standard Practice for Steel Buildings and Bridges", revised February 20, 1963.

3.2 MATERIALS

All structural steel used in the work and not otherwise designated shall conform to "Specification for Structural Steel (Tentative)", ASTM A 36-63T.

Rivet steel shall conform to "Specification for Structural Rivet Steel", ASTM A 141-58.

High strength bolts shall conform to "Specification for High Strength Bolts for Structural Steel Joints, Including Suitable Nuts and Plain Hardened Washers", ASTM A 325-65T.

Welding electrodes shall be suitable for the type of steel to be welded.

The Subcontractor shall furnish the ENGINEER and the Contractor three copies of all mill test reports and three copies of the reports of the steel fabricator's inspectors for the structural steel furnished by him under this Subcontract.

3.3 SHOP AND FIELD CONNECTIONS

Shop assembly connections may be either welded or riveted. Field connections shall be either welded or made with high strength bolts except for the following items which shall be either welded or bolted with structural grade bolts with hexagonal nuts:

1. All beams marked "Removable" on the Drawings
2. Stairways, landings, ladders, etc.
3. All girts and roof purlins

When high strength bolts are used in erection of steel for making permanent field connections the connection shall be in accordance with "Specifications for Assembly of Structural Joints Using High Strength Bolts" issued by the Research Council on Riveted and Bolted Joints of the Engineering Foundation and dated March 1962.

All welding shall comply with the requirements of the Specifications of the American Institute of Steel Construction and of the American Welding Society for the type of steel to be welded.

3.4 ERECTION

The Subcontractor shall erect all structural steel furnished by him and required for the plant building except steel which must be left out temporarily for erection purposes. This steel shall be stored by the Subcontractor as directed by the Contractor and

erected by Others. This steel will be designated on the Drawings as being erected by Others.

Other steel will be designated on the Drawings to be left out temporarily during the normal course of erection for erection purposes and to be later erected by the Subcontractor before he leaves the job site.

The Subcontractor shall coordinate his WORK with that of other contractors and afford other contractors reasonable opportunity for the introduction of their materials and the execution of their work. Legible and durable erection marks should be painted on all members.

3.5 TEMPORARY STEEL FOR ERECTION

The Subcontractor shall attach to his Proposal a drawing showing any temporary steel for erection which the Subcontractor proposes to furnish and erect. The drawing shall show the arrangement for the temporary steel for erection and the loading thereon. This drawing is subject to review by the ENGINEER, but such review does not relieve the Subcontractor of his responsibility to comply with the Specification and Drawings.

The Subcontractor shall, when his steel erection WORK is completed, remove any temporary steel, including equipment supporting steel, placed for erection purposes. Any holes in building steel, resulting from connection of erection steel thereto, shall be permanently plugged by the Subcontractor, subject to the approval of the Contractor.

4.0 GRATING AND STAIR TREADS

4.1 SPECIFICATIONS AND CODES

All steel grating and grating stair treads shall conform to the following Metal Grating Institute Specifications:

1. "Standard Specifications for Metal Grating and Metal Grating Treads", adopted October 8, 1957.
2. "Code of Standard Practice of the Metal Grating Institute"

All steel plate shall conform to the following American Institute of Steel Construction Specifications:

1. "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", adopted April 17, 1963.
2. "Code of Standard Practice for Steel Buildings and Bridges", revised February 20, 1963.

All welding shall comply with the requirements of the specifications of the American Institute of Steel Construction and of the American Welding Society for ASTM A 36-63T steel.

4.2 MATERIALS AND REQUIREMENTS

All materials for grating, plates, grating treads, clip fasteners, and tread bolts and nuts exclusive of hold down studs and nuts, shall comply with the requirements of "Specifications for Structural Steel", ASTM A 36-63T, except as otherwise noted on the Drawings.

Studs, to be used for fastening, shall be 1/4 inch diameter, type 304 stainless steel of proper length. Nuts to be used for fastening shall be silicon bronze nuts.

All grating and grating treads shall be of the welded type with depths as shown on the drawings. All grating and grating treads unless otherwise noted on the Drawings shall be fabricated from 3/16 inch thick bearing bars on 1-3/16 inch centers with spiral cross bars welded on 4 inch centers.

All checkered steel plate and plain plate, as called for on the drawings, shall be shop welded to and furnished with the grating panels.

All toe plate shown attached to the grating, shall be furnished by this Subcontractor and shall be installed in the fabrication shop except where the erection sequence necessitates field installation.

All grating treads shall have 1" x 3/16 inch bearing bars, checkered plate nosings, a width of 9-3/4 inches, and lengths as shown on the drawings. Treads shall be furnished with 3/8" x 1" cadmium plated machine bolts and nuts, four per tread, for fastening treads to stair stringers.

All cutouts required for pipes, columns, conduits, etc. shown on the drawings shall be provided for in the grating. The dimensions of openings shall be as shown on the Drawings. The cutouts and openings smaller than 6 inches shall be banded with bars of the same depth and thickness as the bearing bars. The cutouts and openings 6 inches and larger shall be banded with 1/4 inch toe plate projecting 6 inches above the finished floor.

The Subcontractor shall furnish adequate support angles under the grating at openings, where required.

4.3 FIELD CONNECTIONS TO SUPPORT STEEL

All plain grating panels shall be fastened to the supporting steel with two standard saddle clips at each end of the panel, and with two additional clips to the intermediate beam when the panel is continuous over two spans.

All grating with attached steel plate shall be fastened to the supporting steel with two welds at each end of the panel, and two additional welds to the intermediate beam when the panel is continuous over two spans.

4.4 GALVANIZING

All steel grating, attached plate, stair treads and saddle clips shall be hot dipped galvanized in accordance with "Specifications for Hot Galvanized Coatings on Products Fabricated From Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip", ASTM A 123-63. All fabrication, including cutouts and alterations, shall be completed before galvanizing.

5.0 HANDRAIL

5.1 MATERIAL

All handrail shall be made of 1-1/4" diameter, schedule 40 standard weight, black and galvanized steel pipe and fittings conforming to "Specification for Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses", ASTM A 120-63T. All handrail shall have one rail centerline 2'-0" above the finished floor level and a second rail center line 3'-6" above the finished floor except where noted otherwise on the Drawings. The posts shall be spaced not more than 8'-0" on centers. All handrail shall be in accordance with the typical handrail detail shown on the Drawings.

All joints shall be welded and ground to a smooth finish. Turns shall be made by the use of tube turns or pipe bends and all railing extending beyond the posts shall be terminated with drive-in plugs.

5.2 FIELD CONNECTIONS

All handrail posts shall be bolted to the structural steel supporting the floor grating, except where shown otherwise on the Drawings. All handrail posts set in concrete shall be set

in sleeves provided by others with the concrete slabs and shall be secured in place with molten lead or sulphur.

All bolts, nuts and clip angles required for fastening the handrail posts to the structural steel shall be furnished by this Subcontractor.

All handrail indicated on Drawings as removable, or fastened to removable steel framing, shall have joints at appropriate places and be bolted for easy removal of sections so indicated. All handrail running into bracing and columns will be field cut and welded to fit.

All welding shall comply with the requirements of the American Institute of Steel Construction and of the American Welding Society.

6.0 PAINTING

All structural steel and handrail to be furnished under this Subcontract, shall be cleaned of rust or mill scale in accordance with the Steel Structures Painting Council Surface Cleaning Specifications SSPC-SP 2-63 "Hand Cleaning" and/or SSPC-SP 3-63 "Power Tool Cleaning" as required.

Paint shall be omitted at all areas of field welding and on all steel surfaces which will be in contact with concrete. All contact surfaces of connections shall be painted, including those for trusses and plate girders.

All structural steel and handrail, to be furnished under this Subcontract, shall receive one shop coat of paint which shall be one of the following:

1. Socony-Valdura 13-Y-5 Zinc Chromate Primer
2. Glidden RGL 32802 Zinc Chromate Primer
3. Pennsbury Yellow Zinc Chromate Primer
4. Keeler & Long No. 4800 Exterior Orange Lead Primer

The shop paint shall be mixed and applied in accordance with the Steel Structures Painting Council's Paint Specification SSPC-PA 1-64 "Shop, Field and Maintenance Painting".

Shop paint shall have a dry film thickness of 2 mils.

Field paint will be by Others.

7.0 SHOP AND ERECTION DRAWINGS

The Sub-contractor shall submit to the Engineer, for his approval, one reproducible copy and one print of all shop and erection drawings, data sheets, etc. required for his WORK. Two copies of all drawings, etc. shall also be submitted concurrently to Westinghouse Atomic Power Division. This shall be done with such promptness as to cause no delay in either his WORK or that of any other contractor. These drawings shall be checked and certified, prior to submission, and shall contain all required information. The Subcontractor shall make any corrections required by the Engineer and file with the Engineer and the Westinghouse Atomic Power Division two copies each of the corrected drawings.

Approved drawings will be so stamped and dated and shall form a part of the Subcontract. One set of the approved drawings will be returned to the Subcontractor. Approval of such drawings shall not relieve the Subcontractor of the responsibility for deviation from the Contract Documents, nor from responsibilities for errors in shop or erection drawings.

8.0 RECORD DRAWINGS

Upon completion of his work the Subcontractor shall submit to the Engineer a complete set of all drawings for the work. These drawings shall correctly indicate the work "as built" and shall include all modifications of the work and additions thereto which have been incorporated. The drawings shall consist of approved drawings, legibly marked, and submitted one print and one reproducible each to the Engineer and the Westinghouse Atomic Power Division.

9.0 INSTALLATION AND INSPECTION PROCEDURES

The Subcontractor shall submit to the Engineer a written, detailed description of his inspection and/or installation procedures for comments and review. These procedures shall be submitted at least two weeks prior to actual start of WORK. Any comments by the Engineer shall in no way relieve the Contractor of his responsibility to execute his WORK to meet the intent of the Drawings and Specifications.

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LIST OF DRAWINGS

The following Gilbert Associates, Inc. drawings set forth the location and extent of the WORK to be done and are hereby expressly made a part of this Specification:

DRAWING NO.	TITLE
	Turbine Area-Steel Framing
D-502-011	Column Schedule & Base Plate Details
D-502-021	Mezzanine Floor Elev. 271'-0"
D-502-022	Operating Floor Elev. 289'-6"
D-502-023	Control Room - Plans & Elevations
D-502-031	Platforms, Landings & Stairs
D-502-051	Top Chord Roof Plan
D-502-052	Bottom Chord Roof Plan
D-502-061	Longitudinal Section
D-502-062	South Elevation
D-502-063	East Elevation
D-502-064	West Elevation
D-502-065	Cross Section
D-502-066	Cross Bracing Below Operating Floor
D-502-071	Girts - North Elevation
D-502-072	Girts - South Elevation
D-502-073	Girts - East Elevation
D-502-074	Girts - West Elevation
	Containment Vessel - Steel Framing
D-521-001	Column Schedule
D-521-002	Intermediate Floor Elev. 253'-3"

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DRAWING NO.	TITLE
D-521-003	Operating Floor Elevations 278'-4" & 274'-6"
D-521-005	Misc. Platforms Elev. 267'-3", Elev. 300'-4" & Stair Details
D-521-011	Crane Runway Elev. 331'-0"
	Forced Structure - Steel Framing
D-521-071	East Elevation - Columns, Girts & Bracing
D-521-072	West Elevation - Columns, Girts & Bracing
D-521-073	North Elevation - Columns, Girts & Bracing
D-521-074	South Elevation - Columns, Girts & Bracing
	Reactor Auxiliary Building - Steel Framing
D-522-001	Column Schedule & Bracing
D-522-031	Misc. Steel & Stair Details
D-522-041	Roof Steel & Crane Runway Elev. 306'-10"
D-522-051	Girt Elevations
	Intermediate Building - Steel Framing
D-523-011	Column Schedule
D-523-021	Platform Elevations 271'-0" & 278'-4"
D-523-022	Platform Elevations 293'-0" & 298'-4"
D-523-023	Platform Elevations 315'-4" & Roof 317'-6"
D-523-051	Roof Elev. 335'-4" & Stair Details
	Service Building - Steel Framing
D-531-001	Column Schedule & Base Plate Details
D-531-002	Mezzanine Floor Elev. 262'-2 1/2", Floor Elev. 271'-0" & Roof

ATTACHMENT V

TECHNICAL SPECIFICATIONS
For
STRUCTURAL CONCRETE
For The
BROOKWOOD PLANT UNIT NO. 1
Of The
ROCHESTER GAS AND ELECTRIC CORPORATION
Rochester, New York

1.0 SCOPE

These specifications cover all cast-in-place structural concrete for Brookwood Unit No. 1 of the Rochester Gas and Electric Company, the station site being located.

2.0 REFERENCE CODES

All concrete and concrete work shall be in accordance with the "Proposed Specifications for Structural Concrete for Buildings", ACI 301, copy of which is attached hereto, the latest edition of the State Building and Construction Code for the State of New York, and applicable standards of the Department of Public Works of the State of New York, all except as hereinafter revised or appended.

3.0 CONCRETE PROPORTIONS

3.1 DESIGN TYPE
All concrete structures except as noted hereinafter are designed on the basis of a working stress design. The shell of the containment vessel is designed on the basis of ultimate strength.

3.2 CONCRETE STRENGTH
Except as noted hereinafter all structural concrete shall have a minimum ultimate compressive strength of 3000 psi in 28 days. Concrete fill shall have a minimum ultimate compressive strength in 28 days of 3000 psi or 1500 psi as designated on the Drawings. The structural concrete for the containment vessel shell including the ring girder, cylindrical walls and dome shall have a minimum ultimate compressive strength of 5000 psi in 28 days. The detailed requirements for high strength concrete in the containment vessel will be designated on the Drawings.

3.3 CHECK The determination of the water-cement ratio to attain the required strength shall be in accordance with Method 2, Section 308 (b) of Proposed ACI 301. The testing laboratory shall submit to the Engineer for approval the proportions proposed for use and shall also furnish the required test data as evidence that the proportions selected will produce concrete of the specified quality.

4.0 CEMENT

All cement shall be portland cement conforming to "Specification for Portland Cement", ASTM C150-54, Type II, except as otherwise specified hereinafter or on the Drawings or as specifically approved in writing by the Engineer. The cement shall be confined to a single brand with an established reputation for being uniform in character and shall be accepted by the Engineer.

The Contractor shall store the cement in a dry place and in such a manner as to permit easy access for proper inspection and identification of each shipment. All cement stored at the building plant or construction site prior to its use shall be accurately and tested before use.

5.0 AGGREGATES

5.1 FINE AGGREGATE

Fine aggregate shall conform to Proposed ACI 301 and to the State of New York, Department of Public Works Specification latest edition. Only natural sand shall be used. Samples of the proposed aggregate shall be submitted to the Testing Laboratory for such tests as the Engineer may require. The aggregate shall not be used unless approved by the Engineer in writing, after the results of the tests have been ascertained. The source of the fine aggregate shall not be changed without the written approval of the Engineer.

5.2 COARSE AGGREGATE

Coarse aggregate shall conform to Proposed ACI 301 and to the State of New York Department of Public Works Specification latest edition. Samples of the proposed aggregate shall be submitted to the Testing Laboratory for such tests as the Engineer may require. The aggregate shall not be used unless approved by the Engineer in writing after the results of the test have been ascertained. The source of the coarse aggregate shall not be changed with out the written approval of the Engineer.

The maximum size of aggregate shall not be larger than 1/3 of the minimum dimension of the member nor larger than 3/4 of the clear distance between reinforcing bars. The maximum size of aggregate where concrete is used for fire proofing of structural steel shall not be larger than 1/5 the distance between form and steel member.

In addition to the above mentioned limitations the maximum size of coarse aggregate for the various portions of a structure shall not exceed the folloowing:

Portion of Structure	Maximum Size of Coarse Aggregate Based on Square Screen Openings
Reinforced foundation walls, footings, piers, plinths, plain footings, caissons and substructure walls	1 1/2 inches
Supporting slabs, beams and reinforced walls	3/4 inches
Fire proofing of structural steel	3/8 inch stone or pea gravel
Pavement and slabs on fill	2 inches

6.0 [illegible]

6.1 AIR ENTRAINING ADMIXTURES

All structural concrete shall be considered subject to potentially destructive exposure and shall contain entrained air in accordance with Table 5A (b) of Proposed ACI 301. [illegible] Admixtures shall be used conforming to Specifications for Air-Entraining Admixtures for Concrete, ASTM C260-53T.

6.2 WATER REDUCING DENSIFIER

A water reducing densifier shall be added to all structural concrete with a required ultimate compressive strength equal to or greater than 3000 psi at 28 days. The admixture shall be "Plastiment", a product of Sika Chemical Company. The quantity to be added, the controlling temperatures and the method of mixing shall conform to the manufacturer's recommendations for use of their product.

6.3 CALCIUM CHLORIDE

Admixtures containing calcium chloride shall not be used.

7.0 WATER-CEMENT RATIO

Maximum water-cement ratio for various strengths of concrete shall be as follows:

Compressive Strength (psi at 28 days)	Gallons of Water/ Sack of Cement
5000	5
3000	6

8.0 FORMWORK

8.1 GENERAL

All poured concrete shall be formed, including the sides of footing and other portions of structures below grade, except that rock cuts shall be used as forms for vertical surfaces as shown on the drawings and/or as directed by the Engineer. Earth cuts shall not be used as forms for vertical surfaces.

8.2 MATERIAL

Forms shall be wood or metal that are of sufficient strength and rigidity, and have a surface suitable for the required finish. If wood is used to form concrete that will be exposed to view, it shall be made with 3/4 in. thick Douglas fir B/B "Plyform" as graded by D.F.P.A. Concrete that will be concealed from view may also be formed with 3/4 in. thick "Plyform", as above, or else shall be formed with seasoned wood boards of not less than 1 in. stock thickness. Boards shall be free from excessive warpage or other defects that would prevent tight joints of affect the true lines and surfaces of the concrete.

Change for Steps.

All forms lumber shall be new, but it may be reused in various parts of this construction as long as it remains in good condition.

Lateral forms shall be straight and free from distortion that would be reflected in the poured concrete. The forms shall be accurately aligned and fitted so that joints will be straight and continuous and so that adjoining surfaces will be flush.

Forms shall be thoroughly cleaned after each use, and surfaces in contact with concrete shall be coated with form oil.

8.3 DESIGN AND ERECTION

The design and engineering of the formwork shall be the responsibility

of the Contractor. No shop or field drawings for form work need be submitted to the Engineer.

Centering for beams and girders shall be so designed that they can be stripped without disturbing the intermediate supporting posts or can be restored in an acceptible manner.

8.4 CAMBER

The Engineer shall be consulted regarding the cambering of beams and slabs to compensate for anticipated deflections in the formwork.

8.5 TOLERANCES

Except as noted hereinafter, formwork shall be constructed so as to ensure that the concrete surfaces will conform to the tolerances of Proposed ACI 301. The steel plate liner on the containment vessel when used as a concrete form shall be braced and shored to ensure that the deflection does not exceed 1/4 in. for an arc length of 10 ft.

8.6 FORM REMOVAL

The removal of formwork shall be in accordance with the requirements of Proposed ACI 301. The following table shows suggested minimum strengths required before the forms are removed. The minimum time limits are average values based on 3000 psi concrete, attaining strength under normal job conditions at a temperature of 70 degrees F. The time limits shall be increased for concrete having slower strength development due to lower temperatures or other conditions and may be reduced for concrete developing strength more rapidly, all subject to the approval of the Engineer.

Structural Classification	Min. Strength Required	Min. Period
Sides of footings, walls	500 psi	1 day
Sides of beams, girders, columns	1500 "	3 days
Forms under floor slabs	2000 "	7 days
Centering under beams, girders, flat slabs	2500 "	10 days

9.0 REINFORCEMENT

9.1 REINFORCING STEEL

Concrete reinforcing steel shall be deformed bars of intermediate grade billet-steel conforming to "Specifications for Billet-Steel Bars for Concrete Reinforcement", ASTM A 15-64T, with deformations conforming to "Specifications for Minimum Requirements for Deformations of Deformed Bars for Concrete Reinforcement", ASTM A 305-56T. Special large size concrete reinforcing bars shall be deformed bars of intermediate grade billet-steel conforming to "Specifications for Special Large Size Deformed Billet-Steel Bars for Concrete Reinforcement", ASTM A 408-64T. All reinforcing steel shall be from reputable sources.

The supplier of the reinforcing steel shall submit to the Engineer a certified mill test report for each heat of steel to be used in the work.

chemical composition and specification requirements on mechanical properties.

9.2 WELDED WIRE FABRIC
Welded wire fabric for concrete reinforcement shall conform to "Specifications for Welded Wire Fabric for Concrete Reinforcement", ASTM A 185-61T. All welded wire fabric is designated as load carrying reinforcement and shall be spliced in accordance with Section 505 (b) of Proposed ACI 301.

9.3 DETAILING CONCRETE REINFORCEMENT
The contractor shall submit placing drawings, reinforcing bar details, and bar lists which are used for the fabrication and placement of the reinforcement in the structure for the Engineers approval that the details are in general compliance with the engineering drawings.

The Contractor shall submit three prints of all bar lists and placing drawings for review by the Engineer. These drawings shall be checked and certified, prior to submission, and shall contain all required information. The Contractor shall make corrections required by the Engineer and file with the Engineer an unfolded reproducible of each drawing from which clean and legible prints can be made. Approved reproducibles will be so stamped and dated. One set of the approved drawings will be returned to the Contractor. Approval of such drawings shall not relieve the Contractor of the responsibility for errors in the bar lists or placing drawings.

9.4 REINFORCING STEEL SPLICES
No splices of reinforcement shall be made except as shown on the Drawings, or as specified herein, or as approved by the Engineer. Lapped splices in tension shall not be used for bar sizes larger than #11. Where the bar size exceeds #11, CAD-WELD splices shall be used to develop 125% of the minimum yield point stress of the bar. Testing of CAD-WELD splices will be based on a random sampling procedure utilizing a statistical evaluation. Minimum lap splice lengths shall be in accordance with ACI 315-65.

10.0 JOINTS AND EMBEDDED ITEMS

10.1 CONSTRUCTION JOINTS
Joints not shown on the Drawings shall be made and located in accordance with the requirements of Proposed ACI 301 and shall be approved in writing by the Engineer.

10.2 EXPANSION JOINTS
Premolded expansion joint filler shall conform to the applicable requirements for Preformed Expansion Joint Fillers for Concrete Paving and General Construction (Nonextruding and Resilient Bituminous Types)," ASTM D1751-59T. The location size and type of filler shall be as shown on the Drawings. The expansion joints shall be sealed with a material compatible with the preformed expansion joint filler.

10.3 WATER STOPS
Waterstops shall be polyvinylchloride waterstops of the dumbbell or

serrated type as manufactured by Servicised Products Corporation or A.W. Meadows, Inc. or approved equal. The location, size and detail of waterstops shall be as shown on the Drawings.

10.4 ANCHOR BOLTS AND PIPE SLEEVES
All anchor bolts and pipe sleeves shall be furnished and installed as shown on the Drawings. Steel for anchor bolts shall conform to "Specifications for Structural Steel", ASTM A36-63T. Except as otherwise noted on the Drawings, all pipe sleeves shall be ASA Schedule No. 40. The embedded materials shall be adequately secured in position before placing concrete. After concrete is placed all anchor bolts shall be coated with grease.

Check anchor bolts after pour - Line & Grade

11.0 MIXING CONCRETE

11.1 MEASURING MATERIALS
All solid ingredients shall be measured by weight. Liquid ingredients including water and admixtures, may be measured either by weight or volume. Devices for measuring quantities of materials shall be accurate to within 1% under operating conditions.

11.2 TRANSIT MIXING
Ready-mixed concrete shall be mixed and transported in accordance with "Specifications for Ready-Mixed Concrete", ASTM C94-65. The minimum amount of mixing in truck mixers loaded to maximum capacity shall be 70 revolutions of the drum or blades after all of the ingredients, including water, are in the mixer. The maximum number of revolutions at mixing speed shall be 100; any additional mixing shall be at agitating speed.

Revolution Counter Required.

11.3 DELIVERY
The concrete shall be delivered to the site and discharge shall be completed within 1 1/2 hours or before the drum has been revolved 300 revolutions, whichever comes first, after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates. In hot weather, the 1 1/2 hour time limit shall be reduced, as directed by the Testing Laboratory and/or Engineer.

11.4 REJECTED CONCRETE
The concrete will be rejected if there is any evidence of "setting up" in the mixer.

11.5 MIXING WATER
The proportion of water in each stored mix shall be adjusted at least every week as required by the content of surface moisture on the aggregates. Except for this adjustment, no changes in quantity of mixing water shall be made without the approval of the Engineer.

11.6 BATCH RECORD
Each batch of concrete shall be recorded on a Batch Ticket showing the date, mutual proportions of the mix, consecutive batch number, position in the work, and identification number of the mixer.

C94 - Time loaded and amount of concrete. Revolving revolution counter first 70 then of water.

shall be carefully placed to completely fill the voids below the base plates.

15.2 PREPARATION OF SURFACES
Where exposed concrete surfaces are to be covered with grout, the Contractor shall prepare the surface of the concrete so that a good bond between concrete and grout can be obtained. The surfaces shall be scarified, roughened and all laitance removed.

16.0 PRESTRESSED CONCRETE

16.1 TENDON MATERIAL
Tendons shall consist of wire conforming to "Specifications for Uncoated Stress - Relieved Wire for Prestressed Concrete", ASTM A421-65 and shall be the BBRV post-tensioning system as manufactured by Joseph T. Ryerson & Son, Inc. The steel tendons for prestressed concrete shall be fabricated with the following quality control procedures being observed:

a. Physical and chemical test reports shall be submitted to the Engineer for each reel of wire.

b. The tendon fabricator shall cut samples from each end of a reel, form buttonheads at the ends and test the specimens. These tests shall ensure that the wire ruptures before failure of the buttonhead and that the wire meets the physical requirements of ASTM A421.

High strength alloy steel bars shall conform to SPECIAL STRESSTEEL as manufactured by the Stressteel Corporation with a guaranteed minimum ultimate strength of 160,000 psi.

16.2 PROTECTION OF TENDONS
Rock anchors shall be grouted in two stages for their full length all is shown on the Drawings. The tendons in the cylindrical wall shall be of unbonded construction. The tendons used for unbonded construction shall be coated with grease and wrapped. The type of grease and wrapping shall be with specifications to be issued by the Engineer.

16.3 APPLICATION OF PRESTRESSING FORCE
The sequence for applying the prestressing force to all tendons shall be in accordance with a procedure to be detailed by the Engineer.

17.0 VAPOR BARRIER
The Contractor shall provide and install a vapor barrier under concrete slabs poured on grade as shown on the Drawings. The subgrade shall be level and well tamped before the vapor barrier. Where necessary, a layer of sand shall be applied to prevent any projections from ruptured the vapor barrier. Permanent Polythene or an equal approved by the Engineer (Visqueen) may be used. The vapor barrier shall be installed in accordance with the manufacturer's printed instructions to the exact [illegible] slabs [illegible] less than 6" laps.

mixer. The truck driver shall deliver this record to the Testing laboratory personnel at the location where the concrete is delivered.

12.0 PLACING CONCRETE

12.1 PREPARATION OF SUBGRADE

Where the foundations or concrete structures are shown on the drawings as being placed on ground, the subgrade supporting them shall be level and trimmed to the lines and dimensions shown and shall be free of debris and organic material. The subgrade shall be compacted by using a suitable compactor to a density of at least 95% of modified AASHO maximum density. Immediately prior to placing the concrete the subgrade shall be thoroughly wetted. Under no conditions shall concrete be placed on frozen subgrade material.

Immediately before any concrete is placed on or against rock, the rock shall be carefully cleaned of all dirt, gravel, boulders, scale, loose fragments and other objectionable substances by air and/or water jetting and brooming and shall then be thoroughly wetted.

Ample notification shall be given to the Engineer and/or Testing Laboratory prior to placing concrete on subgrade to permit them to inspect the subgrade. It is the intent of the Engineer to make a photographic record of the subgrade for selected areas of the containment vessel.

Camera

12.2 CONCRETING UNDER WATER

Under no circumstances shall concrete be deposited under water.

12.3 ADVERSE WEATHER CONDITIONS

Concrete shall be protected against adverse weather conditions in accordance with "Recommended Practice for Winter Concreting", new ACI 306-66, and "Recommended Practice for Hot Weather Concreting", ACI 605-59, except that accelerators such as calcium chloride and anti freeze compounds shall not be used.

13.0 FLOOR HARDENER

The finished concrete surface of all floors shall have a non-metallic hardening compound applied. The hardener shall be Harcol Standard Natural as manufactured by Connecborn Building Products, Inc. The preparation, placing, finishing and curing of the hardener shall be in accordance with the manufacturer's printed instructions.

14.0 CURING AND PROTECTION

Initial & final

Curing methods outlined in proposed ACI 301 shall be used except that membrane other than a curing compound shall be used for initial curing of concrete in the containment shell.

15.0 EXPANSION JOINTS, JOINTS

15.1 GENERAL

Grout for base plates shall be 1 part cement and 2 parts sand and

18.0 PERIMETER INSULATION

The perimeter insulation to be placed vertically against the foundation walls and horizontally under slabs on grade shall be Styrofoam SB expanded polystyrene insulation board as manufactured by the Dow Chemical Company. The insulation board shall be one inch thick and shall be installed in accordance with the manufacturer's printed instructions.

19.0 QUALITY CONTROL

19.1 PRELIMINARY TESTS

The Westinghouse Atomic Power Division will obtain the services of a Testing Laboratory which will, prior to the Contractor commencing concrete work, make preliminary determinations of controlled mixes, using the materials proposed and consistencies suitable for the work, in order to determine the mix proportions necessary to produce concrete conforming to the type and strength requirements called for herein or on the Drawings. Aggregates shall be tested in accordance with the latest editions of the following ASTM Specifications: C29, C40, C127, C128 and C136. Compression tests shall conform to ASTM Specifications C39-64 and C192-65. The Contractor shall submit to the Testing Laboratory a sufficient time before concrete work will commence all concrete ingredients required by the Testing Laboratory for these preliminary tests.

The proportions for the concrete mixes will be determined by Method 2 of Section ~~309~~ 308 of Proposed ACI 301 and as hereinbefore specified.

The Engineer shall have the right to make adjustments in concrete proportions if necessary to meet the requirements of these specifications.

In the event the Contractor furnished reliable test records of concrete made with materials from the same sources and of the same quality in connection with current work, then all or a part of the strength tests specified hereinbefore may be waived by the Engineer, subject however to any provisions to the contrary of building codes or ordinances of the governing authority.

19.2 FIELD TESTS

During concrete operations the Testing Laboratory will have an inspector at the batch plant who will certify the mixed proportions of each batch delivered to the site and sample and test periodically all concrete ingredients. Another inspector at the construction site will inspect reinforcing and form placements, take slump tests, make test cylinders, check air content and record weather conditions. Except as noted hereinafter, test cylinders will be molded, cured, capped and tested in accordance with Proposed ACI 301 except that one of the three cylinders will be cast and tested at 3 days and the remaining two at 28 days. For the containment shell a set of four cylinders will be made for each 50 cubic yards or fraction thereof placed in any one day.

One cylinder shall be tested at 3 days, another cylinder at 7 days

and the remaining two cylinders at 28 days. Slump tests will be made at random with a minimum of one test for each 10 cubic yards of concrete placed, also slump tests will be made on the concrete batch used for test cylinders.

In the event that concrete is poured during freezing weather or that a freeze is expected during the curing period, an additional cylinder will be made for each set and be cured under the same conditions as the part of the structure which it represents.

19.3 TEST EVALUATION

The evaluation of test results will be in accordance with Chapter 17 of proposed ACI 301. Sufficient tests will be conducted to provide an evaluation of concrete strength in accordance with this specification.

19.4 DEFICIENT CONCRETE

Whenever it appears that tests of the laboratory cured cylinders fail to meet the requirements set forth in this specification, the Engineer and for Testing Laboratory shall have the right, at the Contractor's expense to:

a. Order changes to the proportions of the mix to increase the strength.
b. Require additional tests of specimens cured entirely under field conditions.
c. Order changes to improve procedures for protecting and curing the concrete.
d. Require additional tests in accordance with "Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete", ASTM C42-64.

If the aforementioned tests fail to prove that the questionable concrete is of the specified quality, the Contractor shall replace the concrete work as directed, all at the Contractor's expense.

ADDENDUM NO. 1
TO
TECHNICAL SPECIFICATIONS
FOR
STRUCTURAL CONCRETE
FOR THE
BROOKWOOD PLANT UNIT NO. 1
OF THE
ROCHESTER GAS AND ELECTRIC CORPORATION
ROCHESTER, NEW YORK

4.0 CEMENT

Second line after the words "Type II" insert "for moderate heat of hydration".

8.0 FORMWORK

8.1 GENERAL

At the end of this section add the following:

"All exposed edges shall be chamfered. The size of the chamfer strip shall be 3/4 inches unless otherwise noted on the Drawings."

10.0 JOINTS AND EMBEDDED ITEMS

10.1 CONSTRUCTION ITEMS

At the end of this section add the following:

"Construction joint surfaces shall be prepared for the placement of concrete thereon by cleaning thoroughly with wire brushes, water under pressure, or other means to remove all coatings, stains, debris or other foreign material."

10.4 ANCHOR BOLTS AND PIPE SLEEVES

At the end of this section add the following:

"Embedded items shall be checked for line and grade after concrete is placed."

11.0 MIXING CONCRETE

11.2 TRANSIT MIXING

At the end of this section add the following:

"As required by ASTM C94-65 all trucks shall be equipped with a revolution counter."

11.6 BATCH RECORD

At the end of this section add the following:

"As required by ASTM C94-65 the batch ticket shall also include the time loaded, amount of concrete and reading of revolution counter at first addition of water."

14.0 CURING AND PROTECTION

Curing methods detailed in ACI 301-66 shall be used except that a method other than using a curing compound shall be used for initial and final curing of concrete in the containment shell.

19.0 QUALITY CONTROL

19.1 PRELIMINARY TESTS

In the second paragraph change "Section 309" to "Section 308".

19.2 FIELD TESTS

At the end of the third paragraph add the following:

"This cylinder shall be tested at 28 days."

Add the following additional section:

"20.0 WATER

The chloride content of mixing water shall not exceed 100 ppm and turbidity shall not exceed 2000 ppm."

DKC
10-17-66
Revised 4-3-67

ADDENDUM NO. 2
TO
TECHNICAL SPECIFICATIONS
FOR
STRUCTURAL CONCRETE
FOR THE
BROOKWOOD PLANT UNIT NO. 1
OF THE
ROCHESTER GAS AND ELECTRIC CORPORATION
ROCHESTER, NEW YORK

Add the following section:

"20.0 GROUNDING

20.1 CONCRETE REINFORCEMENT

All concrete reinforcement embedded in the side wall up to Elevation 252 feet shall be made electrically continuous by bonding all such items together by means of the CADWELD process. Arc welding concrete reinforcement for any purpose including the achievement of electrical continuity shall not be permitted unless noted otherwise on the Drawings. Standard CADWELD powder shall be used to weld copper to steel. The welding material shall consist of a copper thermit mixture employing tin metal in an amount to effectively constitute from 4.5 percent to 5.5 percent of the resulting weld metal. Prior to CADWELDING the surface of the reinforcement shall be cleaned free of rust and mill scale and filed with a coarse file or grinding wheel. Every precaution shall be taken to remove only the minimum metal required to obtain a smooth surface. The CADWELD process shall be performed in accordance with the manufacturer's printed instructions. The concrete reinforcement shall be made electrically continuous at a minimum of three locations per circumferential ring or vertical bar and shall be bonded to the containment liner at three locations approximately 120° apart. The bond connection to the reinforcement shall be staggered in the vertical and horizontal directions to provide a minimum distance between connections of five feet. The staggered pattern shall be repeated no more frequently than for every fifth bar. The CADWELD splice used for 14S and 18S bars will provide electrical continuity.

20.2 TENSION BARS

The tension bars shall be bonded together by the CADWELD process and a direct bond made to the containment liner at three locations approximately 120° apart. The connection to the tension bar shall be to the outboard face of the anchor plate

embedded in the side wall well away from the 1-3/8 inch diameter bar.

20.3 METAL CONDUIT

The metal conduit for the side wall tendons shall be made electrically continuous for their full height by tack welding at threaded couplings. The conduits shall be bonded together at approximately Elevation 235 feet and a direct bond made to the liner at three locations approximately 120° apart."

ADDENDUM NO. 3
TO
TECHNICAL SPECIFICATIONS
FOR
STRUCTURAL CONCRETE
FOR THE
BROOKWOOD PLANT UNIT NO. 1
OF THE
ROCHESTER GAS AND ELECTRIC CORPORATION
ROCHESTER, NEW YORK

10.0 JOINTS AND EMBEDDED ITEMS

10.1 CONSTRUCTION ITEMS

At the end of this section add the following:

"On construction joint surfaces in the Containment Vessel including all vertical joints in the cylindrical shell and all joints in the dome an epoxy-resin compound shall be used to bond the new concrete with the abutting pour. The epoxy-resin compound shall be one of the following:

a. Epoxtite Weld - Servicised Products Corp.
b. Colma Bonding Compound - Sika Chemical Corp.
c. Epotox Bonding Compound - Toch Brothers, Inc.

Concrete surface preparation and the mixing and application of the epoxy-resin shall be in accordance with the manufacturer's printed instructions. Epoxy-resin compounds other than those listed hereinbefore shall not be used unless approved by the Engineer."

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2-13-67

ADDENDUM NO. 4
TO THE
TECHNICAL SPECIFICATIONS
FOR
STRUCTURAL CONCRETE
FOR THE
ROBERT EMMETT GINNA NUCLEAR POWER PLANT
UNIT NO. 1
OF THE
ROCHESTER GAS AND ELECTRIC CORPORATION
ROCHESTER, NEW YORK

Add the following additional section:

"21.0 WATERPROOFING

21.1 General

The exterior walls of the Containment Vessel and Auxiliary Building from the edge of the base mat/ring girder to Elevation 253'-0" shall be waterproofed on the outside face. The waterproofing material shall be as manufactured by the Flintkote Company, New York, N. Y., or approved equal, applied in accordance with the manufacturer's printed instructions.

21.2 Specific Requirements

Concrete surfaces shall be dry before applying the waterproofing materials and shall be free of all fins, ties and similar projections. All holes, voids and honeycombed areas shall be filled, patched or repaired to produce a smooth surface.

The first application shall consist of a thin penetrating coat of Asphalt Primer applied at the rate of one gallon per 100 sq. ft. Prior to the application of membrane courses the angles at the intersection of

walls and base mat/ring girder and at corners of any offsets shall be reinforced with an additional application of MONOFORM compound and YELLOW JACKET glass fabric which shall be allowed to tack dry prior to the application of the first course. Two plies of membrane waterproofing shall be applied using YELLOW JACKET glass fabric embedded in GMR-100 compound. The quantities of components and the rate of application shall be in accordance with the manufacturer's printed instructions for a hydrostatic head of 20 feet. Where backfill is to be placed against the waterproofed surfaces, panels shall be furnished and installed to protect the membrane. These panels shall be 1/2" thick Flintkote asphalt coated insulation panels attached to the membrane with spots of asphalt plastic cement.

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10-11-67

ADDENDUM NO. 5
TO
TECHNICAL SPECIFICATIONS
FOR
STRUCTURAL CONCRETE
FOR THE
BROOKWOOD PLANT UNIT NO. 1
ROCHESTER GAS AND ELECTRIC CORPORATION
ROCHESTER, NEW YORK

Add the following section:

"22.0 PREPAKT CONCRETE

PREPAKT CONCRETE shall be used where specifically indicated on the Drawings. Minimum requirements for PREPAKT CONCRETE shall be in accordance with the "Guide Specifications for PREPAKT CONCRETE", as prepared by the Prepakt Concrete Company, Cleveland, Ohio, a copy of which is attached hereto as part of this specification."

ADDENDUM NO. 6
TO
TECHNICAL SPECIFICATIONS
FOR
STRUCTURAL CONCRETE
FOR THE
BROOKWOOD PLANT UNIT NO. 1
ROCHESTER GAS AND ELECTRIC CORPORATION
ROCHESTER, NEW YORK

Add the following sections:

"25.0 SPECIAL SURFACE PREPARATION

All concrete surface areas within the Auxiliary Building and Containment Vessel to be coated with Phenoline 305 which have not been poured shall receive a sack coating. Immediately after removal of the forms and within a maximum period of seven days after concrete placement, the surface to be coated shall be inspected and probed to locate and open any voids or honeycombed areas. Such voids and holes shall be filled immediately with a grout consisting of 1 part portland cement and 2½ parts sand utilizing the same materials as was used for the concrete. The grout shall be smoothed flush with the wall surface and kept damp by sprinkling with water 3 or 4 times a day.

Rough edges and protrusions shall be stoned flush with the surface immediately after removal of the forms.

The concrete shall cure at least 25 days at 50-90°F, including at least 20 days after removal of the forms prior to application of the Phenoline 305.

ADDENDUM NO. 7
TO
TECHNICAL SPECIFICATIONS
FOR
STRUCTURAL CONCRETE
FOR THE
BROOKWOOD PLANT UNIT NO. 1
ROCHESTER GAS AND ELECTRIC CORPORATION
ROCHESTER, NEW YORK

10.1 JOINTS AND EMBEDDED ITEMS

10.2 EXPANSION JOINTS

At the end of this subsection, insert the following:

"The sealant for all expansion joints within the Containment Vessel shall be Dow Corning 780 Building Sealant as manufactured by Dow Corning Corporation."

PRELIMINARY
ADDENDUM NO. 8
TO
TECHNICAL SPECIFICATIONS
FOR
STRUCTURAL CONCRETE
FOR THE
BROCKWOOD PLANT UNIT NO. 1
ROCHESTER GAS AND ELECTRIC CORPORATION
ROCHESTER, NEW YORK

At the end of Section 22.0 PREPAKT CONCRETE; add the following:

"There shall be no retempering of Prepakt Concrete."

Filon notebook on specifications
Structural Concrete

DKC
2-28-69

PRELIMINARY
ADDENDUM NO. 9
TO
TECHNICAL SPECIFICATIONS
FOR
STRUCTURAL CONCRETE
FOR THE
BROOKWOOD PLANT UNIT NO. 1
ROCHESTER GAS AND ELECTRIC CORPORATION
ROCHESTER, NEW YORK

Delete Section 21.0 WATERPROOFING in its entirety and insert the following:

"21.0 WATERPROOFING/DAMPPROOFING

21.1 General

The exterior wall of the Auxiliary Building from the edge of the base mat to Elevation 253'-0" and the exterior wall of the Containment Vessel from the edge of the ring girder to Elevation 235'-0" shall be waterproofed on the outside face. The waterproofing material shall be as manufactured by the Flintkote Company, New York, New York, or approved equal, applied in accordance with the manufacturers printed instructions. The exterior wall of the Containment Vessel from Elevation 235'-0" to Elevation 253'-0" shall be dampproofed using RIW Marine Mastic D&D as manufactured by Toch Bros. Inc., Paterson, New Jersey, or approved equal, applied in accordance with the manufacturer's printed instructions.

21.2 Waterproofing Requirements

Concrete surfaces shall be dry before applying the waterproofing materials and shall be free of all fins, ties and similar projections. All holes, voids and honeycombed areas shall be filled, patched or repaired to produce a smooth surface.

The first application shall consist of a thin penetrating coat of Asphalt Primer applied at the rate of one gallon per 100 sq. ft. Prior to the application of membrane courses the angles at the intersection of walls and base mat/ring girder and at corners of any offsets shall be reinforced with an additional application of MONOFORM compound and YELLOW JACKET glass fabric which shall be allowed to tack dry prior to the application of the first course. Two plies of membrane waterproofing shall be applied using YELLOW JACKET glass fabric embedded in GMR-100 compound. The quantities of components and the rate of application shall be in accordance with the manufacturer's printed instructions for a hydrostatic head of 20 feet.. Where backfill is to be placed against the waterproofed surfaces, panels shall be furnished and installed to protect the membrane. These panels shall be 1/2" thick Flintkote asphalt coated insulation panels attached to the membrane with spots of asphalt plastic cement.

21.3 Dampproofing Requirements

Concrete surfaces shall be dry before applying the dampproofing materials and shall be free of all fins, ties and similar projections. All holes, voids and honeycombed areas shall be filled, patched or repaired to produce a smooth surface. All surfaces shall be free of dirt, dust, ice etc. Apply two spray coats of RIW Marine Liquid D&D to a total thickness of 1/8 inch over the entire wall area.