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




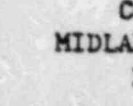
BECHTEL ASSOCIATES PROFESSIONAL CORPORATION
ANN ARBOR, MICHIGAN

EXHIBIT D

TECHNICAL SPECIFICATION
FOR
SUBCONTRACT FOR
UNDERPINNING, EXCAVATION, AND PLACING OF CONCRETE
FOR THE
CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 AND 2
MIDLAND, MICHIGAN

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FACING SHEET
UNDERPINNING, EXCAVATION, AND PLACING OF CONCRETE
 CONSUMERS POWER COMPANY
 MIDLAND POWER PLANT UNITS 1 AND 2
 MIDLAND, MICHIGAN

JOB No.	7220	REV.	
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TECHNICAL SPECIFICATION
FOR
UNDERPINNING, EXCAVATION, AND PLACING OF CONCRETE

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- A. QUALITY ASSURANCE REQUIREMENTS FOR Q-LISTED ITEMS AND WORK
- B. SPECIFICATION 7220 C-231 (Q) "FORMING, PLACING FINISHING AND CURING OF CONCRETE" PAGES 22, 23, 24, 25,

1.0 SCOPE

1.1 ITEMS INCLUDED

The following work to be performed in accordance with this subcontract is located at Midland Plant Units 1 and 2. This specification includes Q-listed work where specifically noted and is to be performed in accordance with Subcontractor's QA program:

- 1.1.1 Underpinning the auxiliary building penetration rooms with caissons in the area indicated in the drawings
- 1.1.2 Removal of all unsuitable material as determined by Contractor and replacement of all removed material with concrete from under the feedwater valve pits
- 1.1.3 In addition, the following items are included under the scope of this subcontract:
 - a. Submit all drawings, calculations, and detailed procedures for a proposed type and method of underpinning which is best suited for the intended purpose and, as a minimum, meets all of the applicable criteria specified herein.
 - b. Furnish all labor, material, tools, equipment, supervision, design, and procedures to perform all operations and incidentals necessary to complete the work to the satisfaction of Contractor.
 - c. Provide (design, furnish, and install) local dewatering to remove and control all water which could cause soil movement.
 - d. Provide (design, furnish, and install) permanent support under the auxiliary building penetration rooms capable of withstanding approximately 4,000 kips vertical load at locations shown in the drawings without exceeding a 1/2-inch settlement (movement) of

the structure at points indicated in the drawings.

- e. Provide (design, furnish, and install) permanent support under the turbine building along the K line to support the column and slab loads at columns 2.0, 2.5, and 3.0 for Unit 1 and 10.0, 10.5, and 11.0 for Unit 2, resulting from and including the temporary support of the valve pits as indicated in the drawings.
- f. Provide hydraulic jacking capacity sufficient to simultaneously lift approximately 4,000 kips of structural load utilizing the permanent support as a reaction point.
- g. Provide lateral support for the soil in the zone of influence resulting from excavation made during underpinning to prevent soil movement.
- h. Place and cure lean concrete backfill under the designated buildings including encasement of the permanent caissons.
- i. Provide positive contact between the underside of the building foundation and the lean concrete backfill by methods acceptable to Contractor.
- j. Install styrofoam or similar material as indicated on the drawings.
- k. Monitor the buildings for settlement.

1.2 ITEMS NOT INCLUDED BUT PERFORMED BY OTHERS

- 1.2.1 Area dewatering prior to underpinning and excavation

- 1.2.2 Temporary support (above the ground) of the feedwater valve pit for Units 1 and 2 as indicated in the drawings.
- 1.2.3 Disposing of the waste material from a stock pile to be located at the ground surface near Subcontractor's access shaft.
- 1.2.4 Furnishing and testing of lean concrete backfill
- 1.2.5 Furnishing and testing structural concrete
- 1.2.6 Furnishing reinforcing steel
- 1.2.7 Furnishing styrofoam
- 1.2.8 Soil testing
- 1.2.9 Monitoring the auxiliary building for cracks

2.0 ABBREVIATIONS

ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ASTM	American Society of Testing Materials
AWS	American Welding Society

3.0 CODES, STANDARDS, AND REFERENCES

ACI 318-77	Building Code Requirements for Reinforced Concrete
ACI 543-74	Recommendation for Design, Manufacture, and Installation of Concrete Piles
AISC	Manual of Steel Construction, 7th Edition
ASTM A 36-77a	Specification for Structural Steel
ASTM A 53-77a	Specification for Steel, Black and Hot-Dipped, Zinc-Coated, Welded, and Seamless Pipe
ASTM A 252-77a	Specification for Welded and Seamless Steel Pipe Piles

AWS D1.1-74 Structural Welding Code

Reference 1 Soft Ground Tunneling with Steel Supports,
Commercial Shearing Inc., Proctor and
White, Youngstown, Ohio, 1977 (used for
definition of state and behavioral
characteristics of soil)

4.0 DOCUMENTATION REQUIREMENTS

4.1 Engineering and quality verification documents shall be submitted to Contractor by the underpinning Subcontractor. Permission to proceed, based upon Contractor's review of the procedures, does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by Subcontractor and does not relieve Subcontractor from full compliance with contractual obligations. The submittal requirements are summarized in Form G-321-D attached. These requirements are augmented by detailed requirements in this specification.

4.2 As a minimum, Subcontractor shall submit the following procedures (in detail, including hold points and inspection points) to Contractor's satisfaction:

4.2.1 General Underpinning Procedure - This procedure shall include the overall concept of the work involved, including the interface of all the operations listed below.

4.2.2 Detection and Monitoring of Structural Movement Procedure

4.2.3 Local Dewatering Procedure

4.2.4 Support of Excavation, Bracing, and Lagging Procedure

4.2.5 Installation of Access Shafts Procedure

4.2.6 Permanent Support Procedure for
approximately 4,000-Kip Caisson
Capacity Installed Under Each
Electrical Penetration Room

- 4.2.7 Pile and/or Caisson Installation, Cleaning, Concreting, and Testing Procedure
- 4.2.8 Lifting Procedure for Raising Ends of the Electrical Penetration Rooms Utilizing Approximately 4,000 Kips of Hydraulic Jacking Force
- 4.2.9 Mass Excavation and Removal of the Material Under the Structures Procedure
- 4.2.10 Installation of Styrofoam Procedure
- 4.2.11 Mass Concreting Procedure
- 4.2.12 Dry Packing/Pressure Grouting Procedure
- 4.2.13 Soil Grouting Procedure (Chemical and Cement)
- 4.2.14 Pump Tremie Procedure
- 4.2.15 Final Cleanup Procedure
- 4.2.16 Welding Procedures and Qualifications

5.0 MATERIAL REQUIREMENTS

Materials shall conform to the above standard specifications, and Subcontractor shall submit to Contractor certified copies of mill test reports of all material used as specified by the applicable ASTM specifications.

- 5.1 ASTM A 36: For structural steel and bearing plates
- 5.2 ASTM A 53: Types E or S, Grade B for piles and caissons
- 5.3 ASTM A 252: Grade 2 seamless for piles and caissons

6.0 DESIGN PARAMETERS

6.1 PILE AND CAISSON DESIGN

Piles or caissons may be used to underpin the turbine building along the K line adjacent to the valve pit structure. Only caissons shall be used to underpin the auxiliary building penetration rooms.

- 6.1.1 Piles shall be located at a minimum center-to-center spacing of 3.0 feet for 80-ton piles and 3.5 feet for 100-ton piles. The pile center to the edge of concrete shall be 1'3" for 80-ton piles and 1'6" for 100-ton piles.
- 6.1.2 Combination bearing/soldier piles shall penetrate a minimum of 5 feet into the till or natural dense sand strata as determined by the soil removed from the interior of the pile and the jacking resistance.
- 6.1.3 Maximum calculated soldier pile lateral deflection shall be limited to 0.25 inch due to bending under the combined axial and lateral loading.
- 6.1.4 Maximum calculated lagging member deflection due to bending shall be limited to 0.25 inch.
- 6.1.5 The lateral pressure diagram for soil pressure shall be trapezoidal with break points at 0.2 of the full excavated depth.
- 6.1.6 Bending stress reduction of lateral loads due to arching shall not be allowed.
- 6.1.7 Pile and caisson locations shall be taken into account in the support of the mudmat to prevent separation from the foundation.
- 6.1.8 A full water head shall be considered for lateral support from el 627' to the bottom of mass excavation under the structures.
- 6.1.9 Caissons shall extend at least 4.0 feet into the till or natural dense sand strata as evidenced by inspection of in situ material. The design bearing capacity shall be 20 ksf times the diameter squared (ft^2) of the caisson. If the caisson is belled, the capacity shall be calculated at 17.7 ksf times the plan area of the bell. No increase in capacity is allowed for additional embedment of the caisson in the bearing

strata.. Caissons acting as combination soldier and bearing elements are governed by the stress and deflection criteria from Sections 6.1.3 through 6.1.7.

- 6.1.10 The access shaft from el 634' to el 607' need not conform to Sections 6.1.3 to 6.1.8 but must be in accordance with acceptable industry practice.
- 6.1.11 For bearing plate design, the allowable bearing stress for concrete shall be 750 psi. Bearing stress for steel shall be 27,000 psi.
- 6.1.12 The design stresses shall not be greater than the allowable stress presented in AISC, ACI, or as specified herein. In the event of conflict, notify Contractor, who will determine the governing criteria.

6.2 DESIGN LOADS

6.2.1 Structure Loads

The load of each auxiliary building penetration room is equal to 8,300 kips (vertical). The center of gravity of the load is shown in the drawing. The allowable eccentricity of the underpinning support system during construction with respect to the east-west centroidal axis of the penetration room load is 3 feet.

Foundation pressure as well as local column loads for structures in the vicinity are shown in the drawings.

6.2.2 Soil Conditions

Soil conditions and interpretation of soil properties encountered are discussed below. In general, the backfill consists of heterogeneous mix of very loose to dense sand and very soft to hard clay fill. Details of soil information and boring logs are given in the foundation engineering sections of the PSAR and FSAR and are available from Contractor. The interpreted engineering properties of

backfill presented below are based upon the laboratory and field investigations performed in the vicinity of the diesel generator building.

- a. Soft to stiff, silty, sandy clay fill (CL)

Total unit weight $\gamma_t = 110 - 130$ pcf

Dry unit weight $\gamma_d = 98 - 116$ pcf

Undrained shear strength = 150 - 3,000 psf

- b. Loose to dense, silty, fine to medium sand (sm-sp)

Total unit weight $\gamma_t = 110 - 130$ pcf

Dry unit weight $\gamma_d = 94 - 116$ pcf

Angle of internal friction 28 - 32 degrees

- c. In-Situ Fill

Total unit weight $\gamma_t = 130$ pcf

Average undrained shear strength
El 580-560' 6,000 psf

Below 560' 8,000 psf

- 6.2.3 The permanent support for each auxiliary building penetration room provided by underpinning shall have a vertical resistance capacity sufficient to produce a moment equal to or greater than 325,000 foot kips at column rows 5.3 and 7.8, respectively. This moment capacity is the major design criterion and shall be met by Subcontractor. The approximate value of 4,000 kips of installed capacity as referenced throughout this specification is an estimate of the actual caisson capacity. The exact capacity required is to be determined by Subcontractor. All pumps, jacks, gages, equipment, and other hardware shall be of sufficient capacity and number to install and

test, in accordance with this specification, the caissons that will produce a moment equal to or greater than 325,000 foot kips.

- 6.2.4 The permanent underpinning support for the turbine building shall be capable of safely resisting the column loads indicated in the drawings plus half the base slab pressure within the zone of influence. The zone of influence is defined by a slope of one horizontal to one vertical from the bottom of the excavation required for removal of the unsuitable material from under the valve pit structure. The permanent underpinning support for the turbine building shall take into account the 1,300 kips of force anticipated due to support of the valve pit structure.

7.0 PILE AND CAISSON LOAD TESTING

- 7.1 The vertical factor of safety established by in-place testing shall be not less than 1.5 for piles and caissons.

7.2 Test Method

- 7.2.1 The first caisson installed under each auxiliary building penetration room shall be load tested for 24 hours at 1.5 times the design load and 12 hours at 2.0 times the design load. The test load shall be applied in increments of 50%, 20%, 10%, 10%, and 10% of 1.5 times the design load at 1-hour intervals which are not included in the 24-hour period. At the completion of the 24-hour test at 1.5 times the design load, the load shall be increased to 2.0 times the design load in increments of 10% of the design load per hour. The load shall be maintained at 2.0 times the design load for 30 hours and then removed in decrements of 20% per hour to 80% of design load, then removed in decrements of 30%, and finally 50% at 1-hour intervals. This caisson selected for testing shall be representative of the majority of caissons to be installed.

*0150 check
load 30,000
to be
subjected when
you reach decrements
50% & 50%*

- 7.2.2 All remaining caissons shall be loaded to 1.0 times the design load prior to concreting. This loading shall be referred to as the Empty Shell Test (EST). A satisfactory EST is defined as causing a caisson movement of less than 0.10 inch in a 5-minute period under a load equal to 1.0 times the design load.
- 7.2.3 After the EST and concreting of the caisson, the caisson shall be subjected to a Full Test Load (FTL). A satisfactory FTL is defined as causing a caisson movement of less than 0.05 inch in a continuous 1-hour period under a load equal to 1.5 times the design load. Extensometers (AMES) dial gages shall be calibrated to 0.001 inch per revolution and used to measure the movement of the caisson relative to the structure.
- 7.2.4 After installation of a group of caissons which constitute 500 design tons of underpinning resistance and prior to the completion of the caissons of the next group, one caisson in the previous group shall be chosen by Contractor for retesting. The caisson shall be tested for a period of 5 minutes at 1.5 times the design load. A satisfactory test shall be one where less than 0.010 inch of settlement occurs from the start of the test to the end of the test. If the test is satisfactory, the work on the next group may continue. If the test is not satisfactory, the caisson being tested shall be unloaded and retested in accordance with the requirements of FLT (Section 7.2.3). Then one more caisson in the group shall be subjected to the 5-minute and 0.01-inch settlement test. If the second caisson retested is satisfactory, the work on the next group may continue. If it is not satisfactory, repeat the procedure on caissons selected by Contractor until a satisfactory 5-minute and 0.01-inch settlement test is achieved before proceeding with the work.

After completion of the FLT (Section 7.3.2) or 5-minute retest, the caissons shall be locked off (wedged tight) at 1.5 times the design load.

7.2.5 During the period of the test performed in Section 7.2.1, neither jacking against the structure nor any work which causes vibrations or may otherwise affect the test results shall be permitted.

7.3 The test method for the piles and/or caissons under the turbine building adjacent to the valve pit structure shall be in accordance with Section 7.2.

8.0 UNDERPINNING AND SUPPORT OF STRUCTURES

8.1 GENERAL

Subcontractor shall provide the necessary underpinning and permanent support for the auxiliary building penetration rooms for Units 1 and 2 in accordance with the requirement of this specification and as shown in the drawings.

In addition to the underpinning work shown in the subcontract drawings, Subcontractor shall take all other action necessary to maintain the integrity of these buildings. Subcontractor shall be responsible for supporting structures and taking all necessary precautions to prevent the settlement (movement) greater than specified in this specification or cracking of the buildings, including slabs on grade, supported slabs, appendages, interior partitions, and other columns and walls.

8.2 RESPONSIBILITY

Subcontractor shall conform to the following.

8.2.1 Assume full responsibility for all underpinning and related operations. Take necessary precautions for protection of persons, and preclude damage to property, including structures which are underpinned or affected by underpinning work.

8.2.2 All underpinning operations shall conform to applicable codes and also meet requirements of other authorities having jurisdiction over the work involved.

8.2.3 The maximum settlement (movement) of the auxiliary building penetration rooms and the turbine building along the K line for Units 1 and 2 shall not exceed 1/2 inch.

8.3 TEMPORARY SUPPORT

Prior to underpinning for Unit 1 and 2 operations, the feedwater valve pits will be temporarily supported by Contractor as shown in the drawings. The feedwater valve pits shall not be subjected to any additional vertical loads or external forces by Subcontractor during the underpinning operation.

8.4 FILE AND CAISSON INSTALLATION

8.4.1 General

The piling or caisson shall consist of a concrete-filled steel pipe. The steel pipe shall be installed by jacking against the existing structure. The pipe shall be precut to a convenient length for jacking. The pipe segments shall be joined together by full penetration welds around the circumference as the pipes are advanced into the subsurface.

The pipe shall be installed open-ended to the depths specified. The pipe shall then be subjected to the EST (Section 7.2.2), cleaned, inspected, concreted, subjected to the FLT (Section 7.2.3), and wedged tight to the structure under a load equal to 1.5 times the design load.

8.4.2 Materials

Steel pipe shall conform to ASTM A 252, Grade 2 seamless or ASTM A 53, Types E or S, Grade B. It shall have a minimum wall thickness sufficient to sustain the design load of the pile or caisson calculated at $f_a = 18,000$ psi. All cutting of the pipe shall be done in such a manner that the cut edge shall be perpendicular to the longitudinal axis of the pipe. Flame cutting is permitted. Beveling of edges for welding shall be done in such a manner to ensure a true cut. Internal or external pipe couplings, whether mechanical or welded, are not permitted. The pipe tip shall be reinforced by a steel shoe or by increasing the wall thickness of the lowermost section of pipe. The reinforcement shall be sufficiently strong to sustain a static point load equal to the maximum jacking force without permanent deformation of the lowermost pipe section. The shoe diameter or outside diameter of the lowermost pipe section shall not exceed the diameter of the remaining pipe section by more than 1/4 inch. Steel friction breakers may be installed on the outside of the pipe by welding. Friction breakers will not extend more than 1/8 inch beyond the outside of the pipe.

8.4.3 Pile Installation

- a. The plan location shall be established at the bottom of the concrete slab at el 607'+. The tolerance for the plan location shall be +5 inches, but the algebraic aggregate of the deviations shall not exceed +5 inches.
- b. The allowable top-to-bottom plumbness of the pile shall be not more than 2% out over the entire length. If the plumbness is more than 2% over the entire length, Subcontractor shall reduce the

design load on the pile accordingly.

- c. The maximum deviation for pile straightness shall be 1/2 inch in 10 feet and 1/2 inch in 20 feet.
- d. If any criteria specified in Items a, b, or c of Section 8.4.3 are not satisfied, Subcontractor shall calculate the allowable reduced design capacity of the pile in accordance with generally acceptable methods. Calculations shall be submitted to Contractor for review. Subcontractor shall not be permitted to increase the load on other piles to compensate for the reduction caused by failure to achieve the requirements stated in Items a, b, or c of Section 8.4.3. All additional piles which shall be installed to compensate the loss of capacity shall be at the expense of Subcontractor.
- e. The maximum jacking force shall be 1.50 times the design pile load or 0.85 fy prior to the reduction for L/r ratio or 0.70 fy as indicated in the certified material test report prior to reduction for L/r ratio. A commercial grade bentonite slurry may be injected between the pipe and the soil to minimize side wall friction.
- f. Maintain a minimum of a 1-foot (vertical measurements) soil plug in the pile at all times unless an obstruction is encountered. If an obstruction is encountered, then maintain a liquid level inside the pile to within 5 feet of the bottom of the jacking pit, and limit the removal of material beyond the existing tip of the pile to less than 1 foot except by specific written instructions by Contractor.

- g. No water jetting, slurry jetting, or air jetting for loosening or removal of material inside or in advance of the pile is permitted except by written permission from Contractor.
- h. No airlifting or venturi principle lifting of the material in the pile or in advance of the pile is permitted within 5 feet of the pile tip except after final seating of the pile in the till. If air or venturi lifting is employed, Subcontractor shall maintain a liquid level in the pile at the bottom of the jacking pit during the entire operation. Contractor shall be notified in advance and in writing each time Subcontractor employs this procedure.
- i. No impact or vibratory forces may be used for advancing the pile.
- j. Inspection of piles prior to concreting shall be accomplished by visual inspection and measurements inside the pile. Subcontractor shall make a final cleaning of the pile and remove all water and deleterious matter from inside the pile. The pile will then be inspected by Contractor, who will give written permission to Subcontractor to place concrete in the pile. The maximum length of earth plug at the pile tip prior to concreting is 1'-6" of compact material.
- k. The concrete for the pile shall be placed in such a manner that the concrete drops vertically from the top of the pile. Subcontractor shall take necessary measures to prevent segregation and voids in the concrete during placing.

1. Contractor reserves the right to direct Subcontractor to use the pumped tremie method for concreting the piles without employing the grout plug.

8.4.4 Caisson Installation

- a. The plan location shall be established at the bottom of the concrete slab at elevation 607'+. The allowable deviation from the plan location shall be +5 inches, but the algebraic aggregate of the deviation shall not exceed +5 inches.
- b. The allowable top-to-bottom plumbness of the caisson shall be not more than 2% out over the entire length. If the plumbness is more than 2% over the entire length, Subcontractor shall reduce the design load on the caisson accordingly.
- c. The maximum deviation for caisson straightness shall be 1 inch in 10 feet and 1 inch in 20 feet.
- d. If any criteria specified in Items a, b, or c of Section 8.4.4 are not satisfied, Subcontractor shall calculate the reduced allowable design capacity of the caisson in accordance with generally acceptable methods. Calculations will be submitted to Contractor. Subcontractor shall not be permitted to increase the load on other caissons to compensate for the reduction caused by failure to achieve the requirements stated in Items a, b, and c of Section 8.4.4. All additional caissons shall be at the expense of Subcontractor.
- e. The maximum jacking force shall be 0.85 f_y prior to the reduction for the L/r ratio or 0.70 f_y as indicated in the certified material test report for the steel shell (prior to reduction for L/r

ration) or 800 kips, whichever is less. A commercial grade bentonite slurry may be injected between the pipe and the soil to minimize side wall friction.

- f. No water jetting, slurry jetting, or air jetting for loosening or removal of material inside or in advance of the caisson is permitted except by written permission from Contractor.
- g. No airlifting or venturi principle lifting of the material in the caisson or in advance of the caisson is permitted within 5 feet of the caisson tip except after final seating of the caisson in the till. If air or venturi lifting is employed, Subcontractor shall obtain written permission from Contractor, and then maintain a liquid level in the caisson at the bottom of the jacking pit during the entire operation.
- h. Caisson linings shall be of adequate thickness to ensure safe working conditions within the caissons.
- i. The straight-shafted portion of the metal-lined caissons shall be limited in plan area to 16 square feet.
- j. Metal-lined caissons with belled or wedge-shaped bottoms shall not have the top bell started until the shaft has penetrated only into the clay till a minimum of 2 feet.
- k. The bell angle shall be a minimum of 60 degrees from the horizontal. The bell shall be lined for depths in excess of 4 feet below the straight shaft. The annulus (void) between the straight shaft liner and the ground shall be grouted and cured for 24 hours prior to starting excavation of the bell.

1. If squeezing ground (as defined in Soft Ground Tunneling with Steel Supports by Proctor and White) is encountered, Subcontractor shall proceed in such a manner that no ground is lost. Methods acceptable for this operation are as follows:
 1. Jacking the lining past the squeezing zone without removal of material
 2. Drilling under bentonite slurry and jacking (Drilling cannot proceed in excess of 1 foot beyond end of lining.)
- m. If running ground (as defined in Soft Ground Tunneling with Steel Supports by Proctor and White) is encountered, the following methods for advancing are acceptable.
 1. Jacking the lining past the running zone without removal of material
 2. Drilling under bentonite slurry and jacking (Drilling cannot proceed in excess of 1 foot beyond end of lining.)
 3. Grouting
- n. If flowing ground (as defined in Soft Ground Tunneling with Steel Supports by Proctor and White) is encountered, stop excavation, fill caisson with water or slurry, give written notice of the condition to Contractor, and await written direction from Contractor prior to proceeding.
- o. Concreting shall not be performed until Contractor has inspected the bottom and bell of the caisson and made measurements for plumbness, straightness, and location.

- p. The concrete for the caisson shall be placed in such a manner that the concrete drops vertically from the top of the caisson. Subcontractor shall take necessary measures to prevent segregation and voids in the concrete during placing.
- q. Contractor reserves the right to direct Subcontractor to use the pumped tremie method for concreting.

8.5 JACKING AND TESTING EQUIPMENT

- 8.5.1 The jacking and testing apparatus is to be actuated by hydraulic pressure generated by electrically or mechanically driven pumps. All high-pressure hydraulic apparatus shall be kept in a state of good maintenance.
- 8.5.2 All jacking and testing apparatus shall be equipped with two hydraulic pressure gages. The pressure gages for the production jacking equipment shall have a minimum face diameter of 2 inches. Testing equipment for the 24-hour load test (Section 7.2.1) shall have gages with a minimum 6-inch diameter face calibrated so that 270 degrees of dial movement covers the operating range of the equipment. Test equipment for the FLT (Section 7.2.3) shall have 4-inch diameter gage faces and be calibrated so the 270 degrees of dial movement cover the operating range of the equipment.
- 8.5.3 Subcontractor shall have the following hydraulic pressure gages at the job: three 8-inch face, three 6-inch face, and three 4-inch face gages calibrated with the specific rams intended to be used with each set of gages. The calibration shall be performed and certified by an independent laboratory which specializes in that type of work no earlier than 1 month prior to load testing. The calibration certificates shall be submitted to Contractor.

- 8.5.4 The gages and rams referred to in Section 8.5.3 shall hereafter be referred to as the master set. The master set shall not be used in the field operations except for the 24-hour load test. The master set shall be kept in a place suitable to Contractor and shall be used for calibrating all gages used in the field.
- 8.5.5 Subcontractor shall furnish a test manifold and test stand which will enable Subcontractor to field-calibrate four field gages simultaneously in the same hydraulic circuit as the respective three master gages and ram. Subcontractor shall notify Contractor in writing when field calibrating of gages will be done. Contractor will have a representative present during field calibration. The field gages shall be calibrated against a master set having a larger gage face. The results of the field calibration shall be forwarded to Contractor following the calibration.
- 8.5.6 Each field and master gage shall be assigned a unique identification number, and that number shall be engraved on the gage cover and also be painted on the gage back. In addition, a suitable calibration curve or tabulation for the particular gage shall be affixed to the back of the gage by means of a clear, sticky, celluloid cover. If gage face overlays are used, this is equally satisfactory.
- 8.5.7 Recalibration of the master sets is required at a minimum of every 3 months. This should be scheduled so there is at least one set of 6-inch or larger master gages on the project at all times. In addition, the master gages shall be recalibrated any time that one master gage varies by more than 5% of its calibrated rating as established by the other two master gages in the same master set. Field gages shall be recalibrated monthly or at any time when one gage is broken or damaged or when one gage varies by more

than 10% from its calibrated rating as established by its companion gage.

3.5.9 The field testing apparatus shall contain a snubber valve in the hydraulic circuit. The snubber valve shall be located on the high-pressure side between the tandem gages and the pump, and immediately behind the gages. For the FLT (Section 7.2.3), the snubber valves shall be closed when the ram attains the test load and shall stay closed until either the movement of the pile exceeds 0.05 inch, or when the FLT (Section 7.2.3) with less than 0.05 inch has occurred. Movement (not gage pressure) is the testing criterion for the FLT (Section 7.2.3). However, if the gage pressure drops by more than 10% during the FLT (Section 7.2.3), the test shall be restarted. For the 24-hour load test, the gage pressure required shall be maintained throughout the test period.

8.5.9 During the underpinning operation, Subcontractor shall have available at the site all rams, gages, pumps, hose, and fittings required to simultaneously lift the auxiliary building penetration area at the location of the permanent support. The total lifting capacity required is approximately 4,000 kips, which is to be distributed equally as specified in Section 6.2.3.

8.6 DETECTION OF MOVEMENT

8.6.1 General

Subcontractor shall submit and implement to the satisfaction of Contractor a procedure to monitor each structure which might be affected by the underpinning operations.

8.6.2 Horizontal movement detection points shall be located at or near the top and at the ground level of the structures. Vertical movement detection points shall be located near the ground level of the structures.

8.6.3 Measurements shall be to the nearest 1/16 inch based upon survey observation.

8.6.4 Measurements shall be made daily during the underpinning operation, and Contractor shall be informed in writing if any movement is detected in excess of 1/16 inch of the previous reading or accumulated value of 1/8 inch.

9.0 WELDING

9.1 All welding shall be performed in accordance with AWS D1.1. Contractor shall approve all welding procedures.

9.2 All welders shall be qualified to the applicable welding procedures in accordance with AWS D1.1.

10.0 EXCAVATION

10.1 GENERAL

Subcontractor shall submit prior to excavation a detailed procedure describing the method of excavation. This procedure shall be to the satisfaction of Contractor and shall indicate coordination of the installation of lagging and bracing. The procedure shall also indicate the maximum amount of excavation below any previously installed lagging or structure. As a minimum, the excavation procedure shall include the following.

10.1.1 The location and dimension of each jacking pit

10.1.2 A flow diagram showing the excavation of all pits and the sequence of installation, testing, and locking off vertical support elements (caisson or jacked pile).

10.1.3 A table relating the information provided in Item 10.1.2 showing the following data with respect to each vertical support element:

- a. Pile or caisson number
- b. Pit number
- c. Sequence number
- d. Vertical capacity installed (kips)
- e. Area undermined times 5.5 kips/ft
(Note: The area undermined includes the disturbed but not excavated soil (influence zone) determined by a 1 horizontal to 3 vertical slope subtended from the bottom of the excavation prior to the installation of the lagging. Thus, a pit which is opened up to a depth of 6 feet prior to the installation of the lagging would have an influence zone which extended 2 feet beyond the edge of the excavation. If this same pit was subsequently (after installation of lagging) excavated to a greater depth, and lagging was installed as frequently as required by this specification, the influence zone would remain at 2 feet.)
- f. Net overload (Item e) minus (Item d) (kips)
- g. Percent net overload (Item f) times (100) divided by 8,300 kips

10.1.4 Sequence Control and Limits

In general, the objective is to install approximately 4,000 kips of underpinning resistance as close to the extreme end of the wings as possible. Subcontractor's plan shall be governed accordingly.

- a. Piles which are adjacent to one another may be worked simultaneously provided the area of undermine is within allowable limits

- b. Caissons which are adjacent to one another cannot be worked simultaneously. Where there are adjacent caissons, one must be excavated, concreted, tested, and stressed before work on any adjacent caisson can start. However, the first 7 feet below el 607' may be excavated in advance (if the space is required) for access to a nonadjacent caisson or pit.
- 10.2 Once an excavation is started, it must be worked continuously and without cessation until the lagging is in place and the lateral ground support restored.
- 10.3 Explosives shall not be used to dislocate and/or remove hardened material during excavation. Conventional tools, such as rock splitters and demolition tools, are acceptable.
- 10.4 Subcontractor shall submit the following procedure that is satisfactory to Contractor. This procedure shall describe in detail the measures, including hold points and inspection points, taken by Subcontractor to ensure slope stability and to prevent any movement of foundation material outside the excavation area.
- 10.5 Prior to excavation of material from under or within 7 feet from the foundations of the auxiliary or turbine buildings, the sand material shall be grouted. The pregrouted zone shall extend vertically from the underside of the existing foundation or mudmat to a depth of approximately 1 foot below the access excavation, or approximately 7 feet beyond the farthest lateral extent of the excavation.
- 10.6 The initial excavation below the bottom of the slab at el 607'+ shall not exceed 7 feet in depth. In addition, in no case shall the jacking pit exceed 7 feet in depth.
- 10.7 The percent net overload as established by Section 10.1.3 shall not exceed 10% during installation of approximately 4,000 kips of permanent support capacity under each electrical penetration room.

- 10.8 Subcontractor shall advance the mass excavation under the valve pit structures to the depth determined by Contractor. The bottom surface shall then be prepared for concreting as follows.
- 10.8.1 The surface shall be flat but sloped to a minimum of 1/4 inch per foot draining toward a sump located in one corner.
- 10.8.2 Subcontractor shall dispose of all water in the sump to the satisfaction of Contractor.
- 10.9 LAGGING INSTALLATION
- 10.9.1 All lagging material that will remain in the ground shall be metal or concrete. Any wooden lagging used for jacking pit lining or any other purpose must be removed. If removal of the lagging exposes earth, which will not be excavated, then the unremoved soil shall be grouted prior to removal of the lagging. The object of the grouting is to ensure intimate contact between the soil and the structure, and where granular soil is involved, to ensure the material in the zone of influence is self-supporting.
- 10.9.2 The initial excavation, where the earth is not supported, shall not exceed a depth of 4 feet if it is within 6 feet of the K line. Otherwise, a maximum depth of 7 feet shall be used.
- 10.9.3 After initial excavation, the lagging shall be installed and back packed or grouted. The lagging along the K line located below el 600.0' shall be grouted.
- 10.9.4 The excavation shall not proceed to a depth greater than 3 feet below the previously grouted lagging.
- 10.9.5 The procedure for installation of the lagging below el 600' along the K line shall indicate the maximum vertical distance between unpacked lagging and the bottom of the excavation. This distance shall not exceed 16 inches.

10.9.6 If squeezing ground (as defined in Soft Ground Tunneling with Steel Supports by Proctor and White) is encountered below el. 600', Subcontractor shall employ a Chicago lagging system (near vertical-driven lagging) for advancing. The advance shall be limited to a maximum of one-half the length of the lag. After advancing one-half a lag, the lower breasting member shall be installed and the lagging wedged.

10.9.7 If running ground (as defined in Soft Ground Tunneling with Steel Supports by Proctor and White) is encountered below el. 600', the zone shall be grouted in advance of excavation. Spiling is not a satisfactory procedure for running ground.

10.9.8 If flowing ground (as defined in Soft Ground Tunneling with Steel Supports by Proctor and White) is encountered, Subcontractor shall immediately close the opening from which ground is flowing, dewater the area to the extent that the ground behavior is changed to a running condition, and then proceed in accordance with Section 10.9.7.

11.0 CONCRETING

11.1 GENERAL

Subcontractor shall submit to the satisfaction of Contractor a detailed procedure, including hold points and inspection points, describing the placing of concrete under the structure. As a minimum, the placing and consolidating of the concrete shall be in accordance with Articles 11.0 and 12.0 of Specification 7220-C-231, unless otherwise specified herein.

11.2 Pile, pit and caisson procedures are specified elsewhere.

11.3 Mass concrete shall first be placed in the corner opposite the sump such that any water shall be driven to the sump as the concrete is placed.

- 11.4 The first lift shall not exceed 2 feet in thickness; all subsequent lifts shall not exceed 5 feet in thickness.
- 11.5 Successive lifts shall be dowled into the preceding lift by using #8 bars on 18 -inch centers on a grit pattern. Dowels shall be located such that a minimum of 24 inches shall be embedded in both lifts.

Reinforcing steel will be furnished by Contractor.

- 11.6 The surface of the concrete lifts shall be horizontal within +3 inches for the entire area.
- 11.7 The top lift shall be placed to within 6 inches of the bottom of the existing slab. The remaining void between the lean concrete backfill and the foundation slab shall be either dry pack grouted or pressure grouted using a nonshrink grout. Subcontractor, shall submit a procedure to the satisfaction of Contractor, including hold points and witness points, describing in detail the method of dry pack grouting or pressure grouting.
- 11.8 Each lift of concrete shall be water cured for a minimum of 48 hours in accordance with ACI 318-1977 before continuing the placement.
- 11.9 Contractor will perform slump, percent air content, temperature, unit weight, and compressive strength cylinders on the lean concrete placed, and perform a compressive strength test on the grout used.
- Subcontractor shall assist contractor when performing all grout and concrete testing.
- 11.10 Preceding the placing of concrete, Subcontractor shall install 2-inch styrofoam along the containment structure and 3-inch styrofoam between the containment and auxiliary buildings. Subcontractor shall submit a procedure for installing the styrofoam to the satisfaction of Contractor.

12.0 CLEANING AND RESTORATION

Subcontractor shall restore the work area to the same condition that existed prior to the start of operation and to the satisfaction of Contractor.

Subcontractor shall also submit a procedure on final cleaning.

13.0 QUALITY ASSURANCE REQUIREMENTS

13.1 GENERAL

The following operations are to be controlled in accordance with Subcontractor's approved QA program (Subcontractor's QA program shall be in accordance with Specification 7220-G-23, Appendix A, Attachment 2):

13.1.1 The design, materials, installation, testing, concreting, grouting, and all other incidentals for the permanent underpinning (caissons) of the auxiliary building penetration rooms

13.1.2 The excavation, mass concreting, and grouting under the valve pit structures

13.1.3 As a minimum, the following sections of this specification are under the scope of Subcontractor's QA program: 5.0, 6.1.4, 6.1.5, 6.1.6, 6.1.7, 6.1.8, 6.1.9, 6.1.11, 6.1.12, 6.2.1, 6.2.2, 6.2.3, 7.1, 7.2, 8.1, 8.2, 8.4.1, 8.4.2, 8.4.4, 8.5, 8.6, 9.0, 10.1, 10.4, 10.5, 10.6, 10.7, 10.9, and 11.0. These sections are applicable only with the work defined in Sections 13.1.1 and 13.1.2.

13.2 Because of the nature of the work, an independent overlay inspection will be performed by Contractor in accordance with this specification and Subcontractor's procedures.

14.0 MEASUREMENT OF PAYMENT

The measure of payment for this subcontract shall be in accordance with the pricing structure of the contract.

APPENDIX A

QUALITY ASSURANCE REQUIREMENTS FOR Q-LISTED ITEMS AND WORK

- 1.0 Subcontractor shall establish and maintain an effective quality assurance program which will meet the applicable requirements of Specification G-23 to ensure that all materials and workmanship furnished hereunder for Class I structures conform to the specifications.
- 2.0 Contractor shall have free access to all work and shall have the authority to stop work or reject shipment if the specification requirements, including those for documentation, have not been fulfilled.
- 3.0 Subcontractor shall furnish documentation in accordance with the specifications as summarized and directed by Form G-321-D. To complete Form G-321-D, Subcontractor shall check in column 8 which documents are being transmitted, and shall sign line 21. Subcontractor shall fill in lines 13 through 20 as applicable. Entries such as N/A or NA (not applicable) and "see attached sheets" are permissible. Form G321-D completed is then used for a cover sheet as directed on the back of the form.

Attachments:

1. Form G-321-D, Engineering and Quality Verification Document Requirements, Rev. 0
2. Specification 7220 G 23, General Requirements for Supplier Quality Assurance Programs, Rev. 7
3. Data Sheet 1, Quality Assurance Program Elements, Rev. 0

READ INSTRUCTIONS ON BACK BEFORE FILLING IN FORM

These requirements for Engineering and Quality Verification Documents are to be fulfilled in accordance with the schedule set forth below. Supplier's failure to comply with these requirements may result in order cancellation or withholding of payment until compliance is established.

1. Document Category Number	2. Specification Paragraph Reference	3. Kind of Copies	ENGINEERING DOCUMENTS				QUALITY VERIFICATION DOCUMENTS					12. Remarks	
			4. Quantity Required		5. Prior Approval Required		6. Quantity Required for Release	7. Distribution Code	8. Supplier Conform Check	9. Inspection Release	10. Engineering Review		11. Field QCE Check In
			Initial	Final	Yes	No							
		Reproducible											
		Microfilm											
4.1E	4.2	Reproducible	1	1									For each procedure listed in par. 4.2
		Microfilm			X								
17.1	5.0	Reproducible		N/A		1	C						
		Microfilm											
8.0E	6.0	Reproducible	1	1									
		Microfilm			X								
1.1E	6.0	Reproducible	1	1									
		Microfilm			X								
25.0V	8.6.4	Reproducible		N/A		1	C						
		Microfilm											
12.0E	9.1, 9.2	Reproducible	1	1									
		Microfilm			X								
6.0E	13.0	Reproducible	1	1		1	C						A controlled copy to be sent to O.C. and Engineering
		Microfilm			X								
		Reproducible											
		Microfilm											
		Reproducible											
		Microfilm											

13. Supplier's Order No.	14. Supplier's Part No.	15. Supplier's Part Name	16. Quantity
17. Buyer's Req. Item No.	18. Buyer's Line/Equip. Tag or Code No.	19. Buyer's Part Name	20. Traceability


21. Supplier's Conformance Statement: We certify that the listed work and required documents meet the requirements of the procuring documents. Supplier: _____ Signature _____ Title _____ Date _____

22. Inspection Release Statement: Work was retained based on satisfactory completion of inspection and review of documentation. Authorized Deviations: YES, Noted under 12, Remarks NONE. Technical Inspector: _____ Signature _____ Date _____

23. Engineering Review Statement: The Quality Verification Documents submitted to Engineering with this form have been reviewed for conformance to the specified requirements and are acceptable. Engineer: _____ Signature _____ Date _____

24. QCE Check-in Statement: This form and the Quality Verification Documents referenced herein have been received and their relationship to the hardware items verified. CONTROL NO. _____ FILE NO. _____ QCE: _____ Signature _____ Date _____

After QCE Check-in Distribute to: Procurement Manager, Field Office Manager, Material Supervisor

 6-321-D AA REV 2 5/74	MIDLAND PLANTS - UNITS 1 & 2 CONSUMERS POWER COMPANY	JOB NO. 7220
		P.O./SPEC. NUMBER C-950
ENGINEERING AND QUALITY VERIFICATION DOCUMENT REQUIREMENTS		REV. 0
		SHEET 1 OF 0

INSTRUCTIONS FOR PREPARING G-321-D

- A. **PURPOSE** This is a multi-purpose form to be used by Buyer/Contractor to specifically identify documents required of the supplier to satisfy specification requirements, and it to be used by the supplier as a cover sheet for Quality Verification Documents when submitting them to the Buyer/Contractor.
- B. **GENERAL INFORMATION:** Engineering (E) and Quality Verification (V) Documents are identified by Category number and title in section H, below.
- C. **USE:** A copy of the front of this form shall be completed by the supplier and provided to the Buyer's/Contractor's Inspector along with the applicable Quality Verification Documents for his review prior to release of the unit(s).
- D. **DISTRIBUTION:** All Engineering (E) Documents are to be sent to the Project Engineer at the address shown below (Code a).

When inspection release is completed, the Verification (V) Documents are to be distributed to the respective addresses shown below in accordance with the distribution code specified in Column 7. A copy of the completed Form G-321-D must accompany each "package" of Verification Documents to its destination. Also, a copy of completed Form G-321-D is to be included with the hardware shipment and a copy sent separately to the Project Field Quality Control Engineer at the jobsite.

Code a.
Bechtel Associates Professional Corp.
P. O. Box 1000
Ann Arbor, Michigan 48106
Attn: Project Engineer, Job 7220

Code b. With hardware shipment
Bechtel Power Corp.
3500 E. Miller Road
Midland, Michigan 48640

Code c.
Bechtel Power Corp.
P. O. Box 2167
Midland, Michigan 48640
Attn: Quality Control Engineer

E. **DEFINITIONS OF TERMS:** (See also Document Category Definitions G-321-SUP A)

- Supplier - This is a generic term and is synonymous with the terms seller, vendor, contractor, sub-contractor, sub-supplier, etc.
- Reproducible - can be legibly duplicated by either microreproduction or electrostatic dry process.
- Microfilm - 35mm microfilm conforming to the requirements of the procurement documents. When not specified, supplier shall submit his standard for approval.
- Prior Approval Required - Bechtel approval required prior to use of documents in the design, fabrication, installation, or other work process.
- Initial - the first submittal of a document in accordance with the schedule mutually agreed to by the Buyer and the supplier.
- Final - the submittal that reflects the resolution of review comments, or the complete submittal required. Both are to be accepted prior to rendering final payment. Drawings submitted as final must be full size reproducible made from original document. Adjacent to the title block, each drawing must be certified and show Buyer's job title, job number, purchase order number, line, equipment tag or code number, and the manufacturer's serial number(s).
- Certified - the dated Signature and Title of an authorized and responsible employee of the supplier.
- N/A - Not applicable - can be used for individual entries, columns and lines by Project engineering, and for individual entries by the supplier.

F. **BECHTEL ENTRY INSTRUCTIONS**

- | Entry No. | Information Required |
|-----------|---|
| 1 | Enter Document Category Number |
| 2 | Enter Specification paragraph reference. |
| 3 | Make no entry. Relates to kind of copies required. |
| 4 | Enter the number of each kind of copy for "initial" or "final" submittals of Engineering Documents. |
| 5 | Enter approval requirement by: X under "Yes" or "No" column. |
| 6 | Enter the number of each kind of copy of Quality Verification Documents required for release of the item or installation. |
| 7 | Enter Quality Verification Document distribution code letter in accordance with paragraph D above. |
| 8 | Make no entry. For supplier use only. |
| 9 | Bechtel Inspector to complete upon release. Sign on line 22. |
| 10 | Enter Bechtel Engineering review confirmation. Sign on line 23. |
| 11 | Bechtel OCE to complete check-in. Sign on line 24. |
| 12 | Enter remarks as appropriate. |

G. **SUPPLIER ENTRY INSTRUCTIONS**

- | Entry No. | Information R |
|------------|--|
| 8 | Enter number of pages of each type of Quality Verification Documents being submitted for the unit(s) being released. Sign Statement of Conformance on line 21. |
| 12 | Enter remarks as appropriate. When a deviation has occurred, reference the deviation(s) and Buyer/Contractor's authorization in this column, and include the authorization document(s) in the Verification Document Package. |
| 13, 14, 15 | Enter information as required. |
| 16 | Enter the numbers of units covered by the Quality Verification Documents being submitted. For each requisition item no. being released provide a separate copy of this completed form and the supporting Quality Verification Documents. |
| 17, 18, 19 | Enter information as required. |
| 20 | Enter identification number(s) traceable to the unit(s) being released, e.g. serial no., heat no. of major component, cable reel no. or other unique designator. |

H. **DOCUMENT CATEGORY NUMBERS:** Engineering (E) and Quality Verification (V) Document Requirements as entered in Column 1, and defined in G-321-SUP A Document Category Definitions. For details, see specification paragraph(s) referenced in Column 2.

- | | | |
|--|---|---|
| 1.0 DRAWINGS (E) | 16.2 Typical Material Used | 28.9 RT - RADIOGRAPHIC EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V) |
| 1.1 Outline Dimensions, Services and Foundation/Mounting Details | 11.0 MATERIAL DESCRIPTION (E) | 21.0 MT - MAGNETIC PARTICLE EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V) |
| 1.2 Assembly Drawings | 12.0 WELDING PROCEDURES AND QUALIFICATIONS (E), AND VERIFICATION REPORTS (V) | 22.0 PT - LIQUID PENETRANT EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V) |
| 1.3 Shop Detail Drawings | 13.0 WELD ROD CONTROL PROCEDURES (E), AND VERIFICATION REPORTS (V) | 23.0 EDDY CURRENT EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V) |
| 1.4 Wiring Diagrams | 14.0 REPAIR PROCEDURES (E), AND MAJOR REPAIR VERIFICATION REPORTS (V) | 24.0 PRESSURE TEST - HYDRO, AIR LEAK, BUBBLE OR VACUUM TEST PROCEDURE (E), AND VERIFICATION REPORTS (V) |
| 1.5 Control Logic Diagrams | 15.0 CLEANING AND COATING PROCEDURES (E), AND VERIFICATION REPORTS (V) | 25.0 INSPECTION PROCEDURE (E), AND VERIFICATION REPORTS (V) |
| 1.6 P & IDs | 16.0 HEAT TREATMENT PROCEDURES (E), AND VERIFICATION REPORTS (V) | 26.0 PERFORMANCE TEST PROCEDURES (E), AND VERIFICATION REPORTS (V) |
| 2.0 PARTS LIST AND COST (E) | 17.0 CERTIFIED MATERIAL PROPERTY REPORTS (V) | 26.1 Mechanical Tests |
| 3.0 COMPLETED BECHTEL DATA SHEETS (E) | 17.1 MTR (Certified Material Test Report) | 26.2 Electrical Tests |
| 4.0 INSTRUCTIONS (E) | 17.2 Impact Test Data | 27.0 PROTOTYPE TEST REPORT (E & V) |
| 4.1 Erection/Installation | 17.3 Ferrite Data | 28.0 Personnel Qualification (E) procedure |
| 4.2 Operating | 17.4 Material Certificate of Compliance | 29.0 Supplier shipping preparation procedure (E) |
| 4.3 Maintenance | 17.5 Electrical Property Reports | |
| 4.4 Site Storage and Handling | 18.0 CODE COMPLIANCE (V) | |
| 5.0 SCHEDULES: ENGINEERING AND FABRICATION/ERECTION (E) | 19.0 UT - ULTRASONIC EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V) | |
| 6.0 QUALITY ASSURANCE MANUAL/PROCEDURES (E) | | |
| 7.0 SEISMIC DATA REPORT (E) | | |
| 8.0 ANALYSIS AND DESIGN REPORT (E) | | |
| 9.0 ACOUSTIC DATA REPORT (E) | | |
| 10.0 SAMPLES (E) | | |
| 10.1 Typical Quality Verification Documents | | |

DOCUMENT CATEGORY DEFINITIONS

(E) - Engineering Documents. This term comprises procedures, drawings, specifications, QA plans, prototype qualification test procedures, reports and other similar documents that require Bechtel permission to proceed prior to fabrication, or prior to use of the document in the design, fabrication, installation, or other work process unless otherwise indicated. The term is also applied to price lists, and instructional documents for handling, storage, maintenance, etc., that are of informational interest only to project engineering.

(V) - Quality Verification Documents. This term comprises material test reports, heat treatment charts, welding records, NDE results, performance test reports, etc., which demonstrate or certify conformance to the technical or inspection requirements of the procurement documents.

1.0 DRAWINGS (E)

- 1.1 Outline Dimensions, Services and Foundation/Mounting Details - Drawings providing external envelope, including lugs, center line(s), location and size for electrical cable, conduit, fluid, and other service connections, isometrics, and details related to foundations and mountings.
- 1.2 Assembly Drawings - Detailed drawings indicating sufficient information to facilitate assembly of the component parts of an equipment item.
- 1.3 Shop Detail Drawings - Drawings which provide sufficient detail to facilitate the fabrication or manufacture of the equipment item. This includes but is not limited to, spool drawings, heat exchanger internal details, internal piping and wiring, cross-section details and architectural details.
- 1.4 Wiring Diagrams - Drawings which show the schematic wiring and connection information for electrical items.
- 1.5 Control Logic Diagrams - Drawings which show the paths which input signals must follow to accomplish the required responses.
- 1.6 P&IDs - Piping and Instrumentation Diagrams which show piping system details and the basic control elements.

2.0 PARTS LIST AND COST (E) - Exploded view with identified parts and recommended spare parts for one year's operation with unit cost.

3.0 COMPLETED BECHTEL DATA SHEETS (E) - Information provided by a supplier on data sheets furnished by Bechtel which states serial numbers, operating ranges, etc., of equipment that the supplier intends to deliver to satisfy the specification requirements.

4.0 INSTRUCTIONS (E)

- 4.1 Erection/Installation - Detailed written procedures, instructions, and drawings required to erect or install material or equipment.
- 4.2 Operating - Detailed written instructions describing how an item or system should be operated.
- 4.3 Maintenance - Detailed written instructions required to disassemble, reassemble and maintain items or systems in an operating condition.
- 4.4 Site Storage and Handling - Detailed written instructions which define the requirements and time period, for lubrication, rotation, heating, lifting or other handling requirements to prevent damage or deterioration during storage and handling at jobsite. This includes return shipping instructions.

5.0 SCHEDULES ENGINEERING AND FABRICATION/ERECTION (E) - Bar charts, critical path methods, etc., which chronologically detail the sequence of activities.

6.0 QUALITY ASSURANCE MANUAL/PROCEDURES (E) - The document(s) which describe(s) the planned and systematic measures that are used to assure that structures, systems, and components will meet the requirements of the procurement documents.

7.0 SEISMIC DATA REPORT (E) - The analytical or test data which provides physical response information on an item, material, component or system in relation to the conditions imposed by the stated seismic criteria.

8.0 ANALYSIS AND DESIGN REPORT (E) - The analytical data, (stress, electrical loading, fluid dynamics, etc.), which assures that an item satisfies specified requirements.

9.0 ACOUSTIC DATA REPORT (E) - The noise, sound and other vibration data required by specification which is in the audible range and above the seismic frequency.

10.0 SAMPLES (E)

10.1 A representative data package which will be submitted for the items purchased as required in the specification.

10.2 A representative example of the material to be used.

11.0 MATERIAL DESCRIPTION (E) - The technical data describing a material which a supplier proposes to use for a specific order. This usually applies to architectural items, e.g., metal siding, decking, doors, paints, coatings.

12.0 WELDING PROCEDURES AND QUALIFICATIONS (E), AND VERIFICATION REPORTS (V) - The welding procedures, specification and supporting qualification records required for welding, hard facing, overlay, brazing and soldering. A verification report of welds performed including the identification of the qualified welder(s), and the procedure(s) used, and certification that the welder(s) were qualified.

- 13.0 MATERIAL CONTROL PROCEDURES (E) - The procedures for controlling issuance, handling, storage, and traceability of material such as weld rod
- 14.0 REPAIR PROCEDURES (E), AND MAJOR REPAIR VERIFICATION REPORTS (V) - The procedures for controlling material removal and replacement by welding, brazing, etc., subsequent thermal treatments and final acceptance inspection. Verification reports may include weld repair locations (maps), material test reports for filler metal, pre-and post-weld heat treatment records, NDE records, etc. The resolution of whether a repair is major or not is a Bechtel responsibility
- 15.0 CLEANING AND COATING PROCEDURES (E), AND VERIFICATION REPORTS (V) - The procedures for removal of dirt, grease or other surface contamination and includes application of protective coatings. Verification reports include certification of visual examination for surface preparation, surface profile, materials, etc., humidity data, temperature data and coating thickness data as required by the procurement documents.
- 16.0 HEAT TREATMENT PROCEDURES (E), AND VERIFICATION REPORTS (V) - The procedures for controlling temperature, time at temperature as a function of thickness, furnace atmosphere, cooling rate and method, etc. Verification reports normally include furnace charts or similar records which identify and certify the item(s) treated, the procedure used, furnace atmosphere, time at temperature, cooling rate, etc. Verification data may be in either narrative or tabular form.
- 17.0 CERTIFIED MATERIAL PROPERTY REPORTS (V)
 - 17.1 MTR (Certified Material Test Reports) - These reports include all chemical, physical, mechanical and electrical property test data required by the material specification and applicable codes. This is applicable to cement, concrete, rebar, cable jacket materials, rebar, rebar splices, etc. The certified MTR shall include a statement of conformance that the material meets the specification requirements.
 - 17.2 Impact Test Data - Results of all Charpy or drop weight tests including specimen configuration, test temperature and fracture data.
 - 17.3 Ferrite Data - Report of the ferrite percentage for stainless steel materials used, including castings & welding filler metals as deposited.
 - 17.4 Material Certificate of Compliance - Verification document which certifies conformance to the requirements of the applicable material specification.
 - 17.5 Electrical Property Reports - Report of electrical characteristics, e.g., dielectric, impedance, resistance, flame test, corona, etc.
- 18.0 CODE COMPLIANCE (V) - Verifying documents (such as data Forms U-1, N-2, State, etc.), which are prepared by the manufacturer or installer and certified by the Authorized Code Inspector.
- 19.0 UT - ULTRASONIC EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V) - Method of detection and examination results of presence and certain characteristics of discontinuities and inclusions in materials by the use of high frequency acoustic energy.
- 20.0 RT - RADIOGRAPHIC EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V) - Method of detection and examination results of presence and certain characteristics of discontinuities and inclusions in materials by x-ray or gamma-ray exposure of photographic film.
- 21.0 MT - MAGNETIC PARTICLE EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V) - Method of detection and examination results of surface (or near surface) discontinuities in magnetic materials by distortion of an applied magnetic field.
- 22.0 PT - LIQUID PENETRANT EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V) - Method of detection and examination of surface discontinuities in materials by application of a penetrating liquid in conjunction with suitable development techniques.
- 23.0 EDDY CURRENT EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V) - Method for detection and examination results of discontinuities in material by distortion of an applied electromagnetic field.
- 24.0 PRESSURE TEST - HYDRO, AIR, LEAK, BUBBLE OR VACUUM TEST PROCEDURE (E), AND VERIFICATION REPORTS (V) - Method for evaluating the structural and mechanical adequacy or integrity by application of differential pressures, and report of the test results.
- 25.0 INSPECTION PROCEDURE (E), AND VERIFICATION REPORTS (V) - Organized process followed for the purpose of determining that specified requirements (dimensions, properties, performance results, etc.) are met. Documented findings resulting from an inspection are included in the verification report.
- 26.0 PERFORMANCE TEST PROCEDURES (E), AND VERIFICATION REPORTS (V) - Tests performed to demonstrate that functional design and operational parameters are met by each item produced and the report of the test results. Test results performed as verification of compliance to qualification requirements shall be submitted as engineering documents.
 - 26.1 Mechanical Test, e.g., pump curves, valve stroking, load, temperature rise, calibration, environmental, etc.
 - 26.2 Electrical Tests, e.g., load, impulse, overload, continuity, voltage, temperature rise, calibration, saturation, loss, etc.
- 27.0 PROTOTYPE/QUALIFICATION TEST PROCEDURES AND TEST REPORTS (E) - Report of a test which is performed on a standard or typical example of equipment, material or item, and is not required for each item produced in order to substantiate the acceptability of equal items. This normally includes tests which may, or could be expected to, result in damage to the item(s) tested.
- 28.0 PERSONNEL QUALIFICATION PROCEDURES (E) - Procedures for qualifying welders, inspectors and other special process personnel.
- 29.0 SUPPLIER SHIPPING PREPARATION PROCEDURE (E) - The procedure used by a supplier to prepare finished materials or equipment for shipment from his facility to the jobsite.
- 30.0 (OPEN)
- 31.0 (OPEN)
- 32.0 (OPEN)
- 33.0 (OPEN)
- 34.0 (OPEN)


Specification 7220 C-95(Q)
 Appendix A
 Attachment 1
 Page 4 of 4

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Bechtel Associates Professional Corporation
Ann Arbor, Michigan

Appendix A
Attachment 2
Specification 7220 C-95

GENERAL REQUIREMENTS
FOR
SUPPLIER QUALITY ASSURANCE PROGRAMS
FOR THE
MIDLAND PLANT
UNITS 1 AND 2
FOR
CONSUMERS POWER COMPANY

No.	DATE	ANSI Ref.	REVISIONS	BY	CHK'D	APP'D
1	5-1-73		Added Paragraph 1.4, corrected Rev. No. on Exhibit A Corrected Sheet ii-Rev. 6-Block-Added clarification in Paragraph 2.2, Exhibit B-revised	R.Z.C.	CD	[Signature]
2	4/23/77		Revised as noted to clarify and incorporate QA Reg. Guide Requirements Deleted APP. III	LAM		[Signature]
3	4-15-77		Revised to Ref. Data Sheet 1 and Add Appendix III	WBS		[Signature]
4	7-15-74		Revised to delete "0" des. and add Appendix II	QAM		[Signature]
5	4-15-77		Revised To Use Mandatory Form Per EDP 6-10 & to Clarify	[Signature]		[Signature]
ORIGIN			JOB No 7220		SPEC DES GUIDE No. REV	
 <p style="text-align: center;">GENERAL REQUIREMENTS FOR SUPPLIERS QUALITY ASSURANCE PROGRAMS</p>			7220-C-23		7	

SHEET	REV.	SHEET	REV.	SHEET	REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	REV.
1	7												
2	7												
3	7												
4	7												
5	7												
6	7												
7	7												
8	7												
ADD I	6												
ADD II													
1	6												
2	6												
EXH A	7												
EXH B													
1	7												
2	7												

6	6/21/77	Revised to clarify & incorp. Reg. Guides Deleted APP. III	LAM	P.R.C.									
5	2-7-74	Rev. to Ref. Data Sht and add Appendix III											
4	1-18-74	Rev. to delete Q des add App. II											
3	2-29-74	Rev. to Change Form											
2	3-11-74	Rev. Per CPCo Comments											
1	1/18/74	Rev. Per CPCo comm											
0	10/3/73	Initial Issue				7	5/1/74	Correct EXH A Rev. App III-D-1		Rev. 6 P2.A CD			
NO.	DATE	REVISIONS	BY	CHK'D	APP'D	NO	DATE	REVISIONS	BY	CHK'D	APP'D		

FACING SHEET

GENERAL REQUIREMENTS FOR SUPPLIERS QUALITY ASSURANCE PROGRAMS

JOB No 7220
Specification
7220-G-23




REV.
7






3-310-1C
3-11-58

GENERAL REQUIREMENTS
FOR
SUPPLIER QUALITY ASSURANCE PROGRAMS
FOR THE
MIDLAND PLANT
UNITS 1 & 2
FOR
CONSUMERS POWER COMPANY



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APPENDIX II	SDDR INSTRUCTION		
EXHIBIT A	SAMPLE DATA SHEET 1		
EXHIBIT B	SDDR FORM		

1.0 SCOPE

- 1.1 This specification provides the quality assurance requirements for the equipment, material, or services as specified in the purchase order, specifications, or material requisitions.
- 1.2 This specification does not delete or revise (but is in addition to) those requirements defined by the procurement documents. If a supplier believes that an inconsistency exists between this specification and the procurement documents and referenced codes and standards, he shall immediately notify Bechtel for resolution. 
- 1.3 Definitions used herein are derived from ANSI N45.2.10-1973. If the supplier needs clarification, requests departure, or feels an inconsistency exists between this specification and the procurement documents, he shall immediately notify Bechtel for resolution. 
- 1.4 For all activities within the scope of the ASME B&PV Code, the supplier shall maintain a quality program that is in compliance with current Code requirements. All revisions necessary to meet these requirements shall be submitted to the buyer within seven days after the supplier receives written acceptance by the authorized inspection agency. Evidence of Code acceptance shall accompany the submittal. 

2.0 GENERAL PROGRAM REQUIREMENTS

- 2.1 The term supplier, as used herein, includes seller, vendor, contractor, and subcontractor.
- 2.2 The project quality assurance program is governed by NRC Regulation 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants." To satisfy this requirement, the supplier shall establish and implement a quality assurance program that conforms to the applicable provisions of ANSI N45.2-1971, "Quality Assurance Program Requirements for Nuclear Power Plants" as delineated on Data Sheet 1 (Exhibit A) and to the other codes and standards as cited in the contract documents. For commodities within the scope of the ASME 




B&PV Code, the Code shall govern; for those items not within the scope of the Code, ANSI N45.2-1971 QA program requirements shall be applicable. These quality assurance requirements shall apply to all aspects of the work necessary for carrying out this contract, including design, procurement, fabrication, inspection, installation, and testing. (Data Sheet 1 is attached to this specification for reference only. This completed form is attached to the material requisition package.)

2.3 In the event a supplier does have a quality assurance program in accordance with Paragraph 2.2 and if the supplier's function is limited to placing the order with the actual manufacturer, the supplier shall be responsible for providing a controlled copy of the manufacturer's quality assurance program documents to Bechtel within 30 days after the award. The manufacturer's and supplier's quality assurance program documents must meet the requirements as outlined in this specification that pertain to the activities he performs. In no case will the supplier start activities without prior approval of the portions of the program applicable to the respective operation.



2.4 When audits are required the supplier shall implement a system of internal and external audits consistent with the requirements of ANSI N45.2.12, Draft 4, Rev. 1, dated November 1, 1974, "Requirements for Auditing of Quality Assurance Programs for Nuclear Power Plants."

2.5 When it becomes necessary for the supplier to procure materials, components, or services from a subsupplier(s), it is the suppliers responsibility to establish and implement a procurement control process consistent with the requirements and guidelines of ANSI N45.2.13, Draft 3 Rev. 3 dated June 1975, "Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants."

2.6 Definitions utilized in the Supplier's Quality Assurance Program shall be consistent with ANSI N45.2.10-1973.

3.3 In order to comply with Subsection 50.55(e) of 10 CFR 50 Appendix B, the supplier, in less than 12 hours after detection, shall report to Bechtel Project Engineering each deficiency found in design, manufacturing, and/or construction, which, were it to have remained uncorrected, could have affected adversely the safety of operations of the nuclear power plant at any time throughout the expected lifetime of the plant, and which represents:



- a. A significant breakdown in any portion of the quality assurance program conducted in accordance with the requirements of ANSI N45.2
- b. A significant deficiency in final design as approved and released for manufacturing and/or construction such that the design does not conform to the criteria and bases stated in the specifications
- c. A significant deficiency in manufacturing, and/or construction of/or significant damage to a structure, system, or component which will require extensive evaluation, extensive redesign, or extensive repair to meet the criteria and bases stated in this specification or to otherwise establish the adequacy of the structure, system, or component to perform its intended safety functions
- d. A significant deviation from performance specifications which will require extensive evaluation, extensive redesign, or extensive repair to establish the adequacy of a structure, system, or component to meet the criteria and bases stated in the specifications or to otherwise establish the adequacy of the structure, system, or component to perform its intended safety function.
- e. Notification of reportable deficiencies as delineated above shall be by telephone or TWX, followed up by a completed SDDR form per instructions in Appendix II.



3.4 Any departure from the requirements of the procuring documents or Bechtel approved supplier technical documents which the supplier intends to incorporate in the completed item or service provided must be documented on a Supplier Deviation Disposition Request (SDDR). Deviation requests shall be submitted to the Bechtel project engineer with a copy to the Bechtel supplier quality representative if one is assigned within five working days after detection. Specific instructions are contained in Appendix II. The signature of the suppliers authorized representative in block number 17 of the SDDR form, signifies compliance with Paragraph 3.3. In addition, the supplier shall also maintain a status list of all nonconformances.

3.4.1 Definitions

- a) Rework is defined as the process by which a nonconforming item is made to conform to a prior specified requirement by completion, remachining, reassembling, or other corrective means. Items classified as rework do not require submittal of the SDDR.
- b) See sheet 2 of SDDR for definition of repair.

3.5 Engineering and quality verification documents shall be submitted to Bechtel in accordance with the provisions of Form G-321-D. While in the supplier's facilities these and other records required by applicable codes and standards which are necessary to verify activities affecting quality, shall be maintained in facilities to protect contents from possible destruction by causes such as fire, flooding, tornadoes, insects, rodents, and from possible deterioration by a combination of extreme variations in temperature and humidity conditions. Storage systems shall provide for the accurate retrieval of information without undue delay. (Compliance to ANSI N45.2.9-1974, "Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants" fulfills these requirements.) Quality assurance records are those records which

furnish documentary evidence of the quality of items and of activities affecting quality. Records become quality assurance records upon issuance for use.

3.5.1 Records shall not be stored loosely. They shall be firmly attached in binders or placed in folders or envelopes for storage on shelving in containers. Steel file cabinets are preferred.

3.5.2 An audit system shall be established to assure that the quality assurance records' storage system is effective. The following shall be performed as a minimum:

- a. Periodic surveys to assure that records logged in are available and have been placed in their proper location within the files and to assure that the control system is adequate
- b. Periodic audits to assure that the facilities are in good condition and that the temperature/humidity controls and protective devices are functioning properly
- c. Periodic audits of the records to assure that the documents are not deteriorating due to improper storage practices or rough handling
- d. The frequency of surveys and audits delineated above shall be determined by the supplier and addressed in the quality assurance program documents



3.6 All quality related records, procedures, and qualifications shall be available for examination by Bechtel or Bechtel's authorized agents.

3.7 The applicable quality assurance records shall be considered valid only if stamped, initialed, signed, or otherwise authenticated and dated by authorized personnel. These may be either the original or a high quality reproducible copy.



3.8 No quality related record shall be destroyed or otherwise disposed of without written permission of Bechtel (or their designee).

3.9 QUALIFICATIONS OF INSPECTION, EXAMINATION, AND TESTING PERSONNEL

3.9.1 The supplier's quality assurance program shall provide measures to assure that personnel performing safety-related inspections, examinations, and tests are qualified to perform these activities. Such measures include procedures for qualifications of personnel describing the minimum experience, training, and proficiency testing required for qualification. The measures shall also include requirements for records documenting qualifications for each of the suppliers' inspection, examination, and testing personnel. (Compliance to ANSI N45.2.6, "Qualifications of Inspection, Examination, and Testing Personnel for the Construction Phase of Nuclear Power Plants" fulfills these requirements.)



3.9.2 Nondestructive examination performed according to the quality requirements of Section III of the ASME Boiler and Pressure Vessel Code shall be performed by supplier personnel certified to SNT-TC-1A

3.9.3 Personnel qualification procedures will be reviewed by Bechtel prior to initiation of inspections, examinations, or tests.

4.0 QUALITY SURVEILLANCE

4.1 All designing, procuring, manufacturing, processing, assembling, testing, examination, and inspection operations performed by the supplier and his lower-tier suppliers are subject to surveillance by Bechtel or Bechtel's authorized agents. This surveillance shall in no way relieve the supplier of any contractual responsibilities.



NOTE: The term surveillance, here, may include inspection, survey, and/or audit.

- 4.2 The Bechtel supplier quality representative shall be given free access to the supplier's and his subsupplier's facilities to perform the necessary surveillance and report on the work in all phases of design, manufacturing, and testing.
- 4.3 The supplier shall give the Bechtel supplier quality representative at least five working days prior notice of all tests, and other check points in the manufacturing program specifically requested by the representative, after a joint review of supplier's work plan(s) and this specification.
- 4.4 If the requirements of this specification have not been fulfilled, the Bechtel supplier quality representative has the authority to refuse release for shipment.

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△ 2 △

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APPENDIX I

PROPOSAL

(This sheet applies to the bid stage)

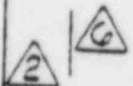
With his proposal, each bidder shall submit a summary description of the quality assurance program to be implemented in the performance of the work, or an uncontrolled copy of his quality assurance manual or procedure. This shall include information on the organization of the bidder, including the authority and responsibility of personnel performing QA/QC functions. It shall also explain administrative policies and procedures to be used in carrying out the program.

The bidder shall provide an adequate statement of justification if his quality assurance program does not need to contain all of the elements or portions thereof called for in Data Sheet 1 (Exhibit A). Any modifications agreed to by Bechtel will be identified in the procurement documents.

Bechtel will evaluate the description of the quality assurance program to determine its acceptability. An acceptable quality assurance program is a mandatory requirement for placing an order.

If a bidder is currently performing to or has completed a Bechtel order which invokes the requirements of this specification, he may, in lieu of submitting a copy of his manual, submit a letter listing the date of Bechtel acceptance, the controlled manual to be used and the revision that is currently in effect or was in effect, and a statement that it will apply for this proposed effort.

Bechtel reserves the right to survey/audit the bidder/supplier to determine the adequacy of his quality program as he proposed or is executing.



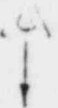
APPENDIX II

SDDR INSTRUCTIONS

DEVIATION - any departure from the requirements of the procuring documents, which the supplier intends to incorporate in the completed item or service provided.

- 1.0 The supplier shall be required to submit deviation requests to the Bechtel project engineer with a copy to the Bechtel supplier quality representative within five working days after detection. When this time limit cannot be met, notification by telephone, TWX, etc is acceptable; at that time, a revised submittal date shall be established. Any deviation is considered unacceptable until approval from Bechtel in writing is obtained.
- 2.0 SDDRs must be supported by technically valid information that is sufficient for project engineering evaluation. When necessary, the supplier shall attach supporting technical documents (of reproducible quality) to the SDDR. One copy of each attachment must also be supplied to the Bechtel (supplier quality representative), if assigned.
- 3.0 Detailed instructions for completion of the SDDR are shown on the attached form and instruction sheet, Exhibit B. It is required that all portions of the SDDR applicable to the supplier be completed prior to submittal to Bechtel including Block No. 10. If the entries are not completed, the SDDR will be returned to the supplier for inclusion of the pertinent information.
- 4.0 A copy of the SDDR, with the applicable attachment(s), is returned to the supplier after completion of Bechtel engineering actions.
- 5.0 For approved SDDRs, suppliers may be required by project engineering to change their engineering documents to reflect the "as-built" condition without extra cost to the Buyer.

A copy of the completed SDDR (including attachments) shall be included by the supplier in the QC data package for the item(s) to which it applies. The SDDR is considered complete when all entries are made including the appropriate verification signatures by the supplier and Bechtel supplier quality representative. If no representative is assigned for the order,



arrangements will be made by Bechtel engineering for verification of implementation.

- 6.0 A copy of the SDDR form shall be maintained as a QA record by the supplier after all entries have been completed.

(PART OF SHEET 1)
THE FOLLOWING ASSETS EX-1571 QUALITY ASSURANCE
PROGRAM ELEMENTS APPLY TO THIS SPECIFICATION.

EXHIBIT A TO
7220-G-23
Rev. 7



TO BE COMPLETED
BY DESITEL

TO BE COMPLETED BY THE SUPPLIER

SUPPLIER DOCUMENT AND
PARAGRAPH REFERENCES

APPLICABLE

- QUALITY ASSURANCE PROGRAM
- ORGANIZATION
- DESIGN CONTROL
- PROCUREMENT DOCUMENT CONTROL
- INSTRUCTIONS, PROCEDURES, AND DRAWINGS
- DOCUMENT CONTROL
- CONTROL OF PURCHASED MATL., EQUIP., & SERVICES
- IDENT. & CONTROL OF MATLS., PARTS, COMPONENTS
- CONTROL OF SPECIAL PROCESSES
- INSPECTION
- TEST CONTROL
- CONTROL OF MEASURING AND TEST EQUIPMENT
- HANDLING, STORAGE AND SHIPPING
- INSPECTION, TEST AND OPERATING STATUS
- NONCONFORMING ITEMS
- CORRECTIVE ACTION
- QUALITY ASSURANCE RECORDS
- AUDITS
- OTHERS

SAMPLE

NO.	DATE	REVISIONS			
			BY	CHECKED	APPROVED

220-G-23		JOB NO.	
		DOCUMENT NO.	REV.

Supplier Deviation Disposition Request

Rev. 7

Page 1 of 2

FOR SUPPLIER USE

Supplier SDDR No. _____ Date Submitted _____

NOTE: The reverse side of this form contains the instructions for its preparation and use. Items marked with an asterisk (*) are for Bechtel entries only.

FOR BECHTEL USE

* Bechtel SDDR No. _____ * Date Received _____

Supplier shall complete all blocks 1 through 13 with black ink or typewriter. Use N/A for Not Applicable.

1. Supplier Name: _____

Address _____

City & State _____

Zip _____

2. Supplier's Order No. _____

3. Supplier's Part No. _____

4. Supplier's Part Name _____

5. Date Deviation Determined _____

6. Previous SDDR No. & Date _____

7. Bechtel P. O. No. _____

8. Bechtel Part No. _____

9. Bechtel Part Name _____

10. Bechtel Inspector Notified _____

11. Bechtel Eng. Notified _____

12. Qty or Serial No. _____

13. Deviation Description (Attach extra sheets, photographs, sketches, etc. as necessary)

14. Supplier's Disposition Classification:

Use As Is

Repair

Modify Bechtel Requirement

15. Proposed Disposition and Technical Justification (Attach extra sheets, sketches, etc. as necessary)

16. Associated Supplier Document Change(s): _____

17. Cost Effects: _____

18. Supplier's Authorized Representative

Signature: _____

Name: _____

Title: _____

Date: _____

* 19. Bechtel Engr. Action:

Proposed Disposition

Proposed Disposition

Engr. Follow-up:

Dwg Change

Other

Accepted

Rejected

Spec/Req. Change

Other Suppliers Affected

* 20. Bechtel Disposition Statement Including Justification (Attach extra sheets, sketches, etc. as necessary)

* 21. Bechtel Acceptance

GS _____

PE _____

POE _____

Date _____

Verification Signatures

Date _____

22. Supplier _____

* 23. Bechtel Supplier Quality Representative _____

INSTRUCTIONS FOR COMPLETING SDDR FORM

(Use Black Ink or Typewriter)

7270-G-23
Rev. 7
Page 2 of 2

This form is used by a supplier to:

- a) Notify Bechtel of deviations from approved technical requirements and document the supplier's proposed disposition, and with their technical justification.
- b) Record Bechtel's disposition of the SDDR.

A deviation is any departure from the technical requirements of the procuring documents which the supplier proposes to incorporate in the completed item or service provided. Deviation disposition can be classified as Repair, Use-As-Is, or Modify Requirement.

Repair is defined as the process of restoring a nonconforming characteristic to a condition such that the capability of an item to function reliably and safely is unimpaired, even though that item still may not conform to the original requirement. Repair includes alterations to the properties of the material through heat-treatment, welding, metal deposition, chemical processing, etc. This form is not to be used for cases where Bechtel has previously provided authorization to proceed using an accepted repair procedure covering a specific type of repair; however, records must be maintained for each specific repair.

Bechtel's engineering action and disposition statement does not relieve the Supplier from responsibility for the accuracy, adequacy, or suitability of the item or service being provided as defined in the procuring documents, nor does it constitute waiver of the right to renegotiate the terms of the procuring documents.

NOTE: Items marked by an asterisk (*) are for Bechtel use only.

- | Block No. | Entry Information |
|-----------|---|
| 1. | Supplier's name and address. List lower-tier Supplier's name and location (City and State) if applicable. |
| 2. | Enter the Supplier's order number if one has been assigned. |
| 3. | Enter Supplier's Part No. as applicable from the drawing, catalog, internal specification, etc. If the Deviation Request applies to all parts and additional space is needed, a list of parts to which the request applies may be attached. |
| 4. | Enter Supplier's Part Name. |
| 5. | Enter the date and the method (Spec. review, NDE, dielectric test, etc.) used to disclose the deviation. |
| 6. | List any previous SDDR's and their dates that have been submitted for deviations requested on this Purchase Order. |
| 7. | Enter the Bechtel Purchase Order Number. |
| 8. | Enter the Bechtel Requisition Item, part, tag or code number as it appears in the requisition. If additional space is needed, a separate sheet may be attached. |
| 9. | Enter the Bechtel P- Name if one has been assigned. |
| 10. | Enter the date and the method (TWX, letter, etc.) used to notify the Bechtel Supplier Quality Representative. |
| 11. | Enter the date and the method (TWX, letter, etc.) used to notify Bechtel Engineering. |
| 12. | As applicable, enter quantities or serial numbers of the items to which the deviation applies. If not serialized, record lot, batch, heat or other applicable identifying information. |
| 13. | Describe the deviating characteristics and define the extent of the out-of-specification condition for each identified piece affected. Identify the location of the deviating characteristic by print coordinates or specific location, as applicable. Attach extra sheets, photographs, sketches, etc., as necessary. |
| 14. | Identify disposition classification. |
| 15. | Describe the proposed disposition and provide technical justification for Bechtel's evaluation. If the deviation is correctable by repair, submit a detailed repair procedure or reference the procedure previously accepted (Level 1) by Bechtel for use in similar situations. Provide Bechtel control number, supplier control number and procedure title. |
| 16. | Identify the nature of changes that may result on associated supplier documents (drawings, specs., procedures, installation instructions, etc.). |
| 17. | Enter the cost impact of the subject deviation. |
| 18. | Enter the name (typed or printed), signature and title of the supplier representative authorizing the disposition request and date signed. |
| *19. | Enter an X in the applicable boxes. |
| *20. | Provide appropriate justification for the Bechtel action(s) indicated in Block 19. When changes to drawings, specifications, requisitions, or other Bechtel documents are involved, each document should be identified and the associated change briefly described. If other suppliers are affected, indicate who they are and the document that initiated resolution of that involvement. "Other" follow-up action (e.g., the need for additional Bechtel calculations, additional drawings or sketches, inspection by a Project Engineering representative, etc.) should also be identified here. |
| *21. | GS - Signature of the responsible Discipline Group Supervisor accepting the Engineering action and the date signed.
PE - Signature of the Bechtel Project Engineer and the date signed. |
| 22. | Signature of the supplier's inspector or other representative authorized to verify that the accepted disposition was correctly accomplished. |
| *23. | Signature of the Bechtel Supplier Quality Representative or other representative verifying that the accepted disposition was correctly accomplished. |

NOTE: A copy of the completed SDDR form shall be included by the supplier in the QC data package for each item to which it applies.

QUALITY ASSURANCE PROGRAM ELEMENTS
(DATA SHEET 1)

THE FOLLOWING ANSI N45.2-1971 QUALITY ASSURANCE PROGRAM ELEMENTS APPLY TO THIS SPECIFICATION.


TO BE COMPLETED
BY BECHTEL

TO BE COMPLETED BY THE SUPPLIER
SUPPLIER DOCUMENT AND
PARAGRAPH REFERENCES

APPLICABLE

- | | | |
|-------------------------------------|--|-------|
| <input checked="" type="checkbox"/> | QUALITY ASSURANCE PROGRAM | _____ |
| <input checked="" type="checkbox"/> | ORGANIZATION | _____ |
| <input checked="" type="checkbox"/> | DESIGN CONTROL | _____ |
| <input checked="" type="checkbox"/> | PROCUREMENT DOCUMENT CONTROL | _____ |
| <input checked="" type="checkbox"/> | INSTRUCTIONS, PROCEDURES AND DRAWINGS | _____ |
| <input checked="" type="checkbox"/> | DOCUMENT CONTROL | _____ |
| <input checked="" type="checkbox"/> | CONTROL OF PURCHASED MATL, EQUIP, & SERVICES | _____ |
| <input checked="" type="checkbox"/> | IDENT. & CONTROL OF MATLS, PARTS, COMPONENTS | _____ |
| <input type="checkbox"/> | CONTROL OF SPECIAL PROCESSES | _____ |
| <input checked="" type="checkbox"/> | INSPECTION | _____ |
| <input checked="" type="checkbox"/> | TEST CONTROL | _____ |
| <input checked="" type="checkbox"/> | CONTROL OF MEASURING AND TEST EQUIPMENT | _____ |
| <input type="checkbox"/> | HANDLING, STORAGE AND SHIPPING | _____ |
| <input type="checkbox"/> | INSPECTION, TEST AND OPERATING STATUS | _____ |
| <input checked="" type="checkbox"/> | NONCONFORMING ITEMS | _____ |
| <input checked="" type="checkbox"/> | CORRECTIVE ACTION | _____ |
| <input checked="" type="checkbox"/> | QUALITY ASSURANCE RECORDS | _____ |
| <input checked="" type="checkbox"/> | AUDITS | _____ |
| <input checked="" type="checkbox"/> | OTHERS | _____ |

ANSI N45.2.1; N45.2.2; N45.2.10; N45.2.11;
N45.2.12; N45.2.13; (As defined in the procurement documents)

0	12/1/79	ISSUED FOR BIDS			
NO	DATE	REVISIONS	BY	CHECKED	APPROVED
BAPC		CONSUMERS POWER COMPANY MIDLAND POWER PLANT UNITS 1&2 MIDLAND, MICHIGAN	JOB NO 7220	DOCUMENT NO C-95(Q)	REV 0

APPENDIX B
to
Specification 7220 C-95(Q)

THE STATE OF
CALIFORNIA
COUNTY OF
SANTA CLARA
CITY OF
SANTA CLARA
I, the undersigned,
County Clerk of the County of Santa Clara,
do hereby certify that the foregoing is a true and correct copy
of the original as the same appears in the files of the County Clerk
of the County of Santa Clara.

11.0 CONVEYING AND PLACING

Conveying and depositing of concrete shall be in accordance with ACI 301, ACI 318, ACI Committee 304 Report "Placing Concrete by Pumping Methods", ACI 614, ASTM C-94 and as follows: An adequate communication system will be provided. No aluminum pipe or other conveying equipment containing aluminum, that will be in contact with the fresh concrete, shall be used for conveying concrete to point of placement. Steel pipe shall be used for concrete pumps or pneumatic placers. A piping arrangement utilizing a "Y" will be permitted provided a valve is installed at the branch point which will direct the flow into only one branch at any one time. The equipment shall be cleaned at the end of each operation.

11.1 Clean-up Preparation

Before depositing concrete, all placing equipment shall be cleaned. Debris, mud, snow, standing puddles of water, and ice shall be removed from spaces to receive concrete, and the reinforcement and other metal to be embedded shall be thoroughly cleaned of all coatings which might impair the bond. All compacted soil, rock or concrete surfaces to receive concrete shall be thoroughly saturated before placement.

11.2 Deposition

Critical structural concrete as designated on the drawings, shall be deposited in accordance with an approved schedule showing the number, size and sequence of concrete placements. Slabs shall be placed in a checkerboard pattern unless otherwise approved. A concrete placement check-out card shall be completed prior to concrete deposition. See Section 11.9 for procedures for large placements.



11.3 Time Between Adjacent Placements

Unless shown on the drawings or directed by Project Engineering, a minimum of 3 days shall elapse between the placing of concrete of adjacent horizontal sections of mass pours greater than 2- 1/2 feet in the least dimension.

11.4 Adequate provisions shall be made to protect the concrete from rain or snow during placement, and the exposed surfaces of fresh concrete after placement.

11.5 Segregation

Concrete shall not be dropped through dense reinforcing steel which might cause segregation of the coarse aggregate. In such cases spouts, flexible drop chutes, or other suitable means shall be used. In any event, concrete shall not be dropped free through a height of more than 6 feet, except as otherwise approved by Engineering.

On the bottom of formed beams and slabs, where the congestion of steel near the forms makes placing difficult, a layer of mortar, not to exceed one inch in depth shall be first deposited. The mortar shall have, as a minimum, the same cement-sand ratio as used in the concrete. Mortars of higher cement-sand ratios approved by Project Engineering may be used.

11.6 Placing Limitations

Concrete shall be deposited in horizontal layers of not greater depth than 24 inches so that satisfactory consolidation can be achieved with vibrators. Concrete shall not be allowed or caused to flow a distance within the mass of more than 5 feet from point of deposition.

11.7 Substitution of Mixes

With the exception of the containment exterior, non-pozzolan mixes may be substituted for mixes containing pozzolans, provided the concrete is 3 feet or less in the least dimension.

11.8 Additional Water

Concrete for Class X structures shall be rejected when the established water/cement ratio is exceeded. Water shall not be added to the concrete after it has been discharged from the batch plant.

11.9 Requirements for Planning Procedures for Large Placements (single item exceeding 600 cubic yards).

The proposed procedure shall be submitted to the Project Engineer at least two weeks in advance of the placement, and shall contain consideration of the following items:



- 11.9.1 The anticipated size and duration of the placement including both the maximum and average placing rates.
- 11.9.2 The proposed staffing over the anticipated duration of the placement, including curing, including a breakdown of the number of supervisory personnel, vibrator operators, finishers and laborers planned per shift.
- 11.9.3 The proposed conveyance system (i.e. the number of transit-mix trucks, the conveyor system, pumpcrete system and/or crane and bucket assemblies, chutes, and tremies) planned to accomplish the pour at the anticipated placing rate.
- 11.9.4 The planned sequence of the pour to achieve a monolithic slab and to insure against cold joints and the planned movements of the conveyance system (s) to accomplish this.
- 11.9.5 The checklist for approval of the pour including embedments.
- 11.9.6 The weather protection facilities proposed to prevent damage in the event of the inclement weather and in the case of planned cold weather placements the enclosure to accomplish the heating requirements for the necessary 7 days. Include the specifics on the heaters.
- 11.9.7 The procedures to follow in the case of emergencies (i.e. batch plant breakdown with a resultant requirement for an unplanned construction joint).

12.0 CONSOLIDATION OF CONCRETE

Methods for consolidating concrete shall conform with the recommended practices of ACI 309. Concrete shall be consolidated, thoroughly worked around the reinforcement and embedded fixtures, and into corners of the forms by mechanical vibrating equipment. The vibrating equipment shall be of the internal type and shall at all times be adequate in number of units and power of each unit to properly consolidate all concrete. The frequency vibration shall be not less than 7000 cycles per minute. The duration of vibration shall be limited to the necessary time to produce satisfactory consolidation without causing objectionable segregation. In consolidating each layer of concrete, the vibrator shall be operated in a near vertical position, and the vibrating head shall be allowed to penetrate under the action of its own weight and revibrate the concrete in the upper portion of the underlying layer. Surface vibrators shall not be used unless specifically approved by Project Engineering.



Form vibrators may be used in areas of extreme congestion as approved by the Field Engineer. The form vibration shall conform with the recommended practice of ACI-309. Vibrators shall not be used to move or spread concrete. Sufficient spare vibrators shall be kept available for immediate use at the point of desposition. (Recommend one spare vibrator for each three in use.) Provisions shall be made for auxiliary power to provide continuity of vibration in case of power failure from the principal source. Experienced and competent operators shall be provided for each vibrator being used, and shall have received instructions in proper vibration procedures.

FORM OF PROPOSAL
SUBCONTRACT FOR
UNDERPINNING, EXCAVATION, AND PLACING OF CONCRETE
FOR
CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 AND 2

Name of Bidder _____

The following summary of pricing and other information is offered to Bechtel Associates Professional Corporation in response to the bid request covering the material requisition identified above. By execution of this form of proposal, the bidder agrees to furnish all items described in the bid request in compliance with the material requisition and general conditions without deviation or exception (except as may be specifically noted below) in accordance with the following.

1.0 MEASUREMENT OF PAYMENT

The payment for the work performed as described below shall be on a lump sum basis. A separate lump sum price shall be submitted for each of the items listed below.

1.1 MOBILIZATION

Mobilization includes payment as compensation for the work and expense of importing labor, equipment, materials, supplies, supervision, and setting up onsite utilities.

1.2 AUXILIARY BUILDING

This includes payment as compensation for the work and expense of designing, furnishing, installing, and testing of the underpinning for the auxiliary building penetration rooms for Units 1 and 2. Work includes, but is not limited to, caissons from the underside of the existing foundation or mudmat to el 575', excavation of the material which is required to install the caissons, placing concrete backfill in the area of excavation, and dry packing.

1.3 TURBINE BUILDING

This includes payment as compensation for the work and expense of designing, furnishing, installing, and testing of the underpinning for the turbine building for Units 1 and 2. Work includes, but is not limited to, caissons and/or piles for support of the turbine building and the temporary load from the valve pit structure from the underside of the existing concrete foundation or mudmat to el 575', excavation of the material which is required to install the caissons, placing concrete backfill in the area of excavation and dry packing.

1.4 VALVE PIT STRUCTURE

This includes payment as compensation for the work and expense of excavation of all material underlying the entire plan area of the valve pit structure for Units 1 and 2. It extends from the elevation of the underside of the existing concrete foundation or the mudmat to el 580', support of the excavation from the elevation of the underside of the existing concrete foundation or mudmat to the top of the ccess shaft foundation, or el 580', whichever occurs first, foundation preparation, concrete backfill, and dry packing.

1.5 ACCESS SHAFTS FOR UNITS 1 AND 2

Included is payment as compensation for the work and expense of designing, furnishing, and installing shafts to provide access to the work itemized in Sections 1.2, 1.3, and 1.4 above. This work includes, but is not limited to, support of excavation and backfill of the two access shafts from the ground surface to 7 feet below the elevation of the underside of the existing concrete foundation or mudmat of the isolation valve pit. If Subcontractor elects to salvage the support of excavation material, such savings shall be included herein.

1.6 MONITORING

Included is payment as compensation for the work and expense of monitoring the buildings for movement.

1.7 DEMOBILIZATION AND CLEANUP

Included is payment as compensation for the work and expense of demobilization, cleanup, and any such work and expense necessary for the complete performance of the work but not included in any other of the payments listed herein.

2.0 ADJUSTMENTS

The payment for the lump sum price work shall be adjusted for added and deleted work according to the following schedule of unit prices.

2.1 Additional or deleted piles and caissons as ordered by Contractor shall include, but not be limited to, designing, furnishing, installing, testing of piles and/or caissons from the elevation of the underside of the existing concrete foundation or mudmat to el 575', bearing plates, stub columns, excavation, support of excavation, and support of excavation and concrete backfill of the necessary work space.

<u>Description (type)</u>	<u>Design Capacity (kips)</u>	<u>Price per Each Unit (\$)</u>
Caisson	_____	_____
Pile	_____	_____

2.2 The length of the caisson and/or pile deducted above or added below el 575' is as follows:

<u>Description (type)</u>	<u>Design Capacity (kips)</u>	<u>Price per Each Unit (\$)</u>
Caisson	_____	_____
Pile	_____	_____

2.3 Mass excavation, deducted above or added below el 580' (price per cubic yard in the bank measure)

2.4 Mass concrete, deducted above or added below el 580' (price per cubic yard)

- 2.5 Support of mass excavation, deducted above or added below el 580' (price per square foot of exposed area)

3.0 ITEMS NOT INCLUDED IN LUMP SUM

Payment for the work listed below is specifically excluded from the lump sum items or the lump sum unit price adjustment items.

- 3.1 Installation of styrofoam (price per contact square foot of area covered)
- 3.2 Placing and inspecting Q-listed dry packing (price per square foot)
- 3.3 Placing of reinforcing steel (price per pound)
- 3.4 Placing pumped tremie concrete (price per cubic yard)
- 3.5 SOIL STABILIZATION - Grouting (excluding grouting indicated in Section 4.2 above), as in the following:
- 3.5.1 Cement grouting (price per 94-pound sack of cement)
- 3.5.2 Chemical grouting (price per gallon)
- 3.6 OBSTRUCTIONS
- 3.6.1 Jacked Piling - Crew cost per hour, including all special equipment for removing obstruction - An obstruction for jacked piling is defined as follows.
- a. The pile fails to advance while subjected to the maximum jacking force when there is no plug at the tip (provided there is adequate lubrication between the pipe and the ground as evidenced by the jacking force just prior to encountering the obstruction). The material removed from within or in advance of the pipe contains rocks or concrete fragments greater than 2 inches in any flat plane dimension.

- b. Wood or steel is considered an obstruction by definition. (Material cost per linear foot of pile is to be added to the above crew cost for lengths of pile installed while passing or removing an obstruction. The price per linear foot is to be deducted from Section 13.2 for lengths of pile installed while passing or removing an obstruction.)

3.6.2 Caissons - Crew cost per hour, including all special equipment for removing obstruction - An obstruction for caissons is defined as follows.

- a. The caisson fails to advance while subjected to the maximum jacking force when there is no plug at the tip (provided there is adequate lubrication between the pipe and ground as evidenced by the jacking force just prior to encountering the obstruction). The material removed from within or in advance of the pipe contains rock or concrete fragments greater than 2 inches in any flat plane dimension.
- b. Wood or steel is considered an obstruction by definition. (Material cost per linear foot of caisson is to be added to the above crew cost for lengths of pile installed while passing or removing an obstruction. The price per linear foot is to be deducted from Section 13.2 for lengths of pile installed while passing or removing an obstruction).

3.6.3 Mass Excavation - The demolition of obstructions to a size suitable for efficient handling will be paid on a cost plus basis. All other costs for removal of obstructions shall be paid in the unit price for mass excavation.

- 3.7 Furnishing approximately 4,000-kip jacking system
- 3.8 Installing and removing approximately 4,000-kip jacking system
- 3.9 Operating approximately 4,000-kip jacking system
- 3.10 Additional load test at 1.5 times the design load for 5 minutes (reference Section 6.3.2.d) (price per each)
- 3.11 Additional load test at 1.5 times the design load (price per hour)

4.0 OTHER

Payment for the work listed below which is specifically excluded from the lump sum price items or the lump sum unit adjustment items or added unit items shall be paid on a cost plus basis. Cost shall be based on direct jobsite union labor plus labor burden, 5% of direct jobsite union labor for small (nonpowered) tools and consumables, and the invoice cost of materials, supplies, and equipment not owned by Subcontractor. Subcontractor-owned equipment shall be based on current blue book rates. An allowance of 25% of all direct costs shall cover all markup (job overhead, profit, general expense and administration fees, interest, home office expense, executive and management payroll, and travel).

- 4.1 Design, furnish, install, operate, maintain, and remove a dewatering system to remove local pockets of trapped water.

Note: The cost of other lump sum or unit price operations such as caisson installation, mass excavation, support of excavation, and concreting are not included in the cost of the dewatering system, even though their efficiency and productivity may be affected by the presence of water or the dewatering system. Subcontractor shall include whatever cost allowances deemed necessary for such inefficiencies or lack of productivity caused by water or the dewatering in the lump sum price, wherein the affected operation is compensated for, and that the prorated portion of the lump sum payment is accepted as the total compensation for that work.

Form of Proposal 7220-C-95(Q), Rev 0

Company

Signature of Bidder

Title

Bidder's Reference Number

Date of Bid

EXHIBIT "E"

LIST OF DRAWINGS

EXHIBIT "E"
LIST OF DRAWINGS

<u>Drawing No.</u>	<u>Title</u>	<u>Rev.</u>
C-2010	Auxiliary Building Unit 1 Plant Area Dewatering	d
C-2011	Aux. Building Unit 2 Plant Area Dewatering	0
REFERENCE DRAWINGS		
Yard Drawings		
CIVIL		
C-5	Detail Plan Area B	6
C-51	Circulating Water System - Plan & Sections	11
C-52	Circulating Water System - Misc. Details	8
MECHANICAL		
M-166	Yard Piping Plan - Area B	3
ELECTRICAL		
E-530-Sh.#1	Duct Bank Sections	12
E-530-Sh.#2	Duct Bank Sections	3
E-531-Sh.#1	Duct Bank Layout - Plant Area	18
Turbine Building - Unit 1 & 2		
CIVIL		
C-501	Concrete Foundation Mat at El 614'-0"	11
C-504	Foundation Mat Reinforcing Plan	5
C-506	Foundation Mat Sections & Details - Sh.#1	8
C-508	Foundation Mat Sections & Details - Sh.#3	7
C-701	Concrete Foundation Mat at El 614'-0"	14
C-704	Foundation Mat Reinforcing Plan	6
C-710	Concrete Sections & Details - Sh. #2	5
MECHANICAL		
M-14	Equipment Location at El 614'-0"	7
M-17	Equipment Location at El 614'-0"	11
M-89	Piping Drawing - Area 5	1
M-97	Piping Drawing - Area 6	1
M-105	Piping Drawing - Area 7	5
M-113	Piping Drawing - Area 8	3
ELECTRICAL		
E-543	Embedded Conduit & Grounding @ El 614'-0"	9
E-547	Embedded Conduit & Grounding @ El 614'-0"	14