

Specification 3159 C-21  
Job No. 3159

SPECIFICATIONS  
for  
DESIGNING, FURNISHING AND ERECTING  
A REINFORCED CONCRETE CHIMNEY

for  
BECHTEL CORPORATION  
CONTRACTOR

for the  
BIG ROCK POINT PLANT

of the  
CONSUMERS POWER COMPANY

near  
CHARLEVOIX, MICHIGAN

Prepared by  
BECHTEL CORPORATION  
San Francisco, California

Date: March 17, 1961  
By: C. W. Halber m.g. fawcett  
Approved: Bill P...

SPECIFIC CONDITIONS

1.0 GENERAL

The work hereunder is subject to the Instructions to Bidders and General Terms and Conditions preceding these Specific Conditions, and the Subcontractor shall consider them in detail for instructions pertaining to his work and shall be responsible for and governed by all requirements thereunder.

2.0 LOCATION OF WORK

The chimney is to be constructed at the Big Rock Point Plant for the Consumers Power Company, located on the east shore of Lake Michigan approximately four miles northeast of Charlevoix, Michigan.

3.0 ACCESS

The site is served by a permanent access road from U.S. Highway No. 31 and by a spur track connecting to the Chesapeake and Ohio Railroad.

4.0 SURVEY WORK

The Contractor will locate reference points as required to enable the Subcontractor to construct the chimney accurately in the location and to the elevations shown on the drawings. Subcontractor shall be responsible for the protection of such reference points from damage caused by his operations, and for the accuracy of any secondary points he may derive therefrom.

5.0 WORK INCLUDED

Except as hereinafter specifically excluded, the Subcontractor shall furnish all labor, materials, equipment, tools, consumable supplies and transportation required or implied to complete in a workmanlike manner and to the satisfaction of the Contractor, the design and construction of an unpainted reinforced concrete chimney in the position shown on the drawings and as specified herein. The work shall specifically include the following:

5.1 Complete design of chimney and foundation.

5.2 Construction of one reinforced concrete chimney 240 feet 0 inches high, above Elevation 592'-6" including embedded and secured metal work, safety ladder, platform, seats and dowels for internal construction.

- 5.3 Accessories for stack as follows:
- a. Lightning protection system.
  - b. Ladder with safety rail and platform.
  - c. Port and sleeve for probe.
  - d. Aircraft obstruction lighting system.

6.0 WORK NOT INCLUDED

- 6.1 Construction of foundations.
- 6.2 Interior floors, ducts, doors, piping, monorail equipment, interior ladders and handrail.

7.0 CONSTRUCTION FACILITIES AND UTILITIES

7.1 Electric Service

Electric service is available at the site at existing locations in limited capacity. Arrangements may be made with the Field Superintendent for electric service to the extent of existing voltages and capacities, at no charge to the Subcontractor for current used, but Subcontractor shall provide his own cables for service from nearest source.

7.2 Water

Drinking water is available at existing outlets and pressures at the jobsite. All cost involved in bringing water from existing outlets to the Subcontractor's work shall be at the Subcontractor's expense as part of the contract price of the job.

7.3 Sanitary Facilities

Sanitary facilities are available within the Contractor's work area for the Subcontractor's personnel without charge on condition that full cooperation in maintaining these facilities respectable and sanitary is assumed.

7.4 Storage Space

The Contractor will provide and designate ground area for material storage, but the Subcontractor shall provide his own office, tool room covered storage or other facilities

required by him. The Subcontractor shall be solely responsible for the storage and protection of materials, tools, equipment and supplies stored by him at the jobsite.

#### 7.5 Concrete Supply and Testing

Limited concrete testing facilities and a concrete batch plant have been set up at the jobsite by other Subcontractors. Arrangements for the purchase of materials or use of their facilities may be made by contacting the Contractor's office at the site. Inquiries should be directed to W. C. McKinley c/o Bechtel Corporation, P.O. Box 367, Charlevoix, Michigan.

### 8.0 DRAWINGS AND CALCULATIONS

- 8.1 Drawings as listed in the requisition are included herewith to show plant plot plan, location of stack and location of Subcontractor's equipment and storage area. Also shown are dimensional requirements for the chimney, location of pipe penetrations into the foundation, ladder platform, probe port, as well as dowels and seats required for interior work by others.
- 8.2 The Subcontractor shall submit for approval, complete design calculations, including deflection and overturning moment from wind load, and complete shop and field drawings for all work to be performed under these specifications. No work shall be performed until design and details have been approved by the Contractor. Approval of these drawings by the Contractor shall apply only to general arrangement and shall not relieve the Subcontractor of entire responsibility for correctness of design, dimensions, and details, or of responsibility for safety of the chimney.

### 9.0 DETAILED REQUIREMENTS

#### 9.1 Design Criteria

- 9.1.1 Except as provided herein, all design and construction shall conform to the Specification for the Design and Construction of Reinforced Concrete Chimneys, American Concrete Institute Standard 505-54, and shall comply with all pertinent Federal, State, County, and Municipal laws and ordinances, and the regulations of the respective agencies thereof having jurisdiction.
- 9.1.2 Chimney concrete will be designed for a minimum 28 day strength of 3500 pounds per square inch.

9.1.3 The Subcontractor shall design the chimney shell to withstand without cracking or undue stress, a maximum gas temperature of 80°F with a minimum external temperature of -20°F. Under normal operating conditions, the volume of gas will be 30,000 cfm.

9.1.4 The basic wind velocity as determined from the U. S. Weather Bureau Map "Isotachs of Extreme Mile at 30 Feet Above Ground - 50-Year Mean Recurrence Interval" shall be 80 miles per hour. Along the height of the chimney, the velocities shall be increased as specified in Paragraphs 5 and 6, Page 1708-12, Journal, Structural Division A.S.C.E. July 1958. The velocities thus obtained shall be multiplied by a gust factor of 1.15. The drag coefficient shall be assumed as 0.80.

$$F = (C_D) (q)$$

In which  $F$  = pressure psf.  
 $C_D$  = drag factor = 0.80

9.1.5 Seismic forces acting on the chimney shall be analyzed as recommended in "Earthquake Design Criteria for Stack-Like Structures" Paper 10, Journal, Structural Division, ASCE, July 1958. For seismic design purposes the chimney shall be located in Zone 1 as defined by the Uniform Building Code.

## 9.2 Foundation

9.2.1 The foundation will be built by the Contractor in accordance with design and drawings furnished by the Subcontractor. Concrete with  $f'_c$  equal to 2500 psi will be used in the construction of the foundation. The foundation will be located on undisturbed soil located approximately 12 ft. below the bottom of the chimney. The design dead load bearing pressure is 4.0 kips per square foot. Due consideration shall be given in the design to various piping penetrating the foundation.

9.2.2 Subcontractor shall be free to furnish an inspection engineer to assure himself that the construction of the foundation is carried out in accordance with his design requirements.

### 9.3 Concrete Shell

- 9.3.1 The shell shall be designed to resist stresses due to dead load, effect of wind, effect of seismic load and effect of temperature, both vertically and circumferentially, all as set forth in the A.C.I. Standard 505-54, and as modified herein.
- 9.3.2 Both the inside and outside face of the shell shall be finished smooth without ridges or discontinuities. The degree of interior smoothness shall be comparable to that normally required for visible exterior surfaces.
- 9.3.3 The shell shall be 240 feet, 0 inches high, 16 feet, 0 inches inside diameter, at Elev. 595'-6", circular in cross-section, parabolic tapered and concentric with the vertical centerline. The top of the shell shall be 3 feet 9 inches inside diameter. If required, the Subcontractor may obtain this inside diameter by constructing a concrete nozzle poured monolithic with the shell. The inside shape of such a nozzle shall consist of a one foot vertical top section above a transition section with a maximum slope of one horizontal to four vertical. Vertical and horizontal reinforcement in top 20 feet of shell shall not be less than that required at the section 20 feet below the top of the chimney.

### 10.0 MISCELLANEOUS METAL

#### 10.1 Ladder

- 10.1.1 The chimney shall be provided with a galvanized steel ladder, in 15 feet sections extending from the bottom to the port probe platform at Elevation 669'-9" and fabricated and constructed as follows:

The ladder shall be made of 2-1/2 inch by 3/8 inch side pieces spaced 15 inches apart, with not less than 3/4 inch diameter rungs spaced 12 inches center-to-center. Side pieces of adjoining sections shall be bolted together. The ladder shall be attached with substantial straps spaced 7 feet 6 inches on centers, bolted to chimney with 3/4 inch diameter bronze bolts in bronze inserts. The two lower pairs of inserts shall be adequately connected to the grounding system and the top pair of inserts shall be connected to the circumferential cable or the down conductors. A distance of at least 9 inches from face of chimney to ladder side pieces shall be maintained. Ladder shall have straight sides and its construction shall conform to all state and local laws and regulations governing such installation.

10.1.2 Ladder and connections shall be designed to support a concentrated load of 350 lbs.

10.1.3 Ladder shall be equipped with a tower ladder safety device complete with one special safety belt and attachments, all as manufactured by Safety Tower Ladder Company, 1024 Burbank Boulevard, Burbank, California, or similar device approved by Contractor.

## 10.2 Platform

A platform of galvanized steel and grating shall be provided as shown on the drawings complete with safety railing and chain. The platform shall conform to all state and local laws and regulations governing such installations. The platform shall be bolted to the chimney with 3/4" diameter bronze bolts in bronze inserts.

## 10.3 Port for Probe

A port and sleeve of galvanized steel shall be embedded in the chimney shell 80 feet above the base as shown on the drawings.

## 11.0 LIGHTNING PROTECTION

11.1 A complete lightning protection system shall be provided and installed in accordance with the Code for Protection Against Lightning, Handbook No. 46, of the U. S. Department of Commerce.

11.2 Two (2) down conductors, each 250 MCM stranded copper cable, shall be provided. Down conductors shall be connected to the circumferential cable at the top of the chimney and will be connected by the Contractor to the station grounding system near the base of the chimney. Not less than 30 ft. surplus for each down cable shall be allowed for making connection with the ground system. Down conductors shall be carried down on opposite sides of the chimney, embedded in concrete of the chimney shell and the foundation, and shall pass outside of the foundation below finished grade line.

## 12.0 TEMPORARY WARNING LIGHTS

The regulations of the Civil Aeronautics Administration require that, where new construction presents a hazard to air navigation before the permanent marking and lighting can be completed, at least two warning lights shall be installed at the top of the structure. Subcontractor shall be responsible for conformance with CAA requirements in this respect until the permanent lighting is complete and operable.

13.0 TIME

The Subcontractor shall submit complete design calculations and drawings for the chimney and foundation three weeks after his receipt of the award of Subcontract. It is estimated that the Contractor will complete the foundation by July 15, 1961, at which date the Subcontractor may commence the erection of the chimney. Arrival of Subcontractor's material, equipment and set-up of operation may precede this date. Completion date for the chimney including air navigation lighting shall be as shown on the requisition unless an alternate date is mutually agreed upon by the Contractor and Subcontractor.

14.0 INSPECTION

Contractor expressly reserves the right of continuous inspection of all construction methods, processes, workmanship and materials. Subcontractor shall do everything reasonably necessary to facilitate such inspections with due regard to the safety of inspecting personnel.

15.0 CLEANING UP

The Subcontractor shall currently remove all rubbish and debris as it accumulates and upon completion and acceptance remove all supplies, tools and equipment furnished by him and leave the premises in a neat and orderly condition.

16.0 GUARANTEE

The Subcontractor shall guarantee the chimney against all defects of design, material and workmanship. He shall repair or replace, at his own expense, any part of his work that may develop any such defects within a period of one year after the work has been accepted.

17.0 ADDITIVE ITEM

Aircraft Obstruction Lighting and Ladder Above Probe Platform

17.1 Obstruction lighting conforming to CAA requirements shall be provided and installed according to the National Electric Code. The lighting shall be so installed as to be weather-tight and accessible for maintenance from the ladder. Ladder construction shall be governed by Para. 10.1



- 17.2 Power to operate lighting will be furnished at 120 V single phase. A separate circuit shall be provided for the flashing code beacons. Subcontractor shall make connections to this supply at a cabinet furnished by the Subcontractor and mounted in the room at the base of the chimney at Elevation 592'-6" and housing all electrical control equipment. A light sensitive control shall be provided to energize and de-energize the circuits, with a separate control switch for manual operation.
- 17.3 A two circuit periodic flasher shall be provided to operate the code beacons. Conduit connecting the lights with the control cabinet shall be hot dipped galvanized 1-1/2" I.P.S. maximum. The conduit may be embedded on the concrete shell or fastened to the exterior face.
- 17.4 Contractor may elect to provide floodlighting in lieu of fixed obstruction lighting. Decision as to form of lighting will be made at time of award of subcontract. If floodlighting is provided, it will be energized by the time of completion of Subcontractor's work.

Note: This Form of Proposal is to be copied by the Bidder on his own letterhead.

PROPOSAL

\_\_\_\_\_  
\_\_\_\_\_, 19\_\_\_\_  
Requisition No. 3159-C-21

Manager of Purchases  
Bechtel Corporation  
62 First Street  
San Francisco 11, California

Dear Sir:

Having carefully examined the drawings and specification for the Reinforced Concrete Chimney for the Big Rock Point Plant of the Consumers Power Company, the undersigned agree(s) to execute the design and to furnish all material, equipment, and labor necessary to complete the work indicated and described in, and in accordance with, the drawings and specification exclusive of the Additive Item, for the sum of: \_\_\_\_\_ (\$ \_\_\_\_\_)

Additive Item:

Installation of Air Navigation Lighting and installation of a Safety Ladder from the Probe Port Platform to the top of the chimney for the sum of: \_\_\_\_\_ (\$ \_\_\_\_\_)

The undersigned agree(s) to execute a contract, for the above described work, for the above stated compensation and if required, to furnish a performance and payment bond, in the sum of one hundred per cent of the contract. If a bond be required, the charge will be the amount of the premium, substantiated by a copy of the Surety Company's invoice.

The undersigned agree(s) to complete the work within \_\_\_\_\_ calendar days after approval of design drawings.

Signature \_\_\_\_\_

Address \_\_\_\_\_

Names of Individual  
Members of Firm:

\_\_\_\_\_

Corporation is organized under the laws of the State of \_\_\_\_\_.

ADDENDUM NO. 1 Rev. 0  
TO  
SPECIFICATION NO. 3159 - C-21, Rev. 0  
FOR  
REINFORCED CONCRETE CHIMNEY  
FOR  
CONSUMERS POWER COMPANY, BIG ROCK POINT PLANT  
CHARLEVOIX, MICHIGAN

Purpose

The purpose of this addendum is to add two platforms for servicing the obstruction lighting, to obtain an alternative quotation based on concrete and concrete testing being supplied by the Contractor, to locate the top of the foundation at Elev. 595'-6" all around and to establish the height of the chimney at 240'-0" above Elev. 595'-6".

Paragraph 5.2 shall read:

"Construction of one reinforced concrete chimney 240 feet 0 inches high above elevation 595'-6" including embedded and secured metal work, safety ladder, platforms, seats and dowels for internal construction."

Paragraph 5.3b shall read:

"Ladder with safety rail and platforms."

Paragraph 17.0 shall read:

"Aircraft obstruction lighting, ladder and platforms above probe platforms."

Add the following:

- 17.5 "Two platforms 2'-6" wide and 240° horizontal arc shall be provided and installed for servicing the obstruction lighting. One platform shall be located near the top, the other platform shall be located near the mid-height of the chimney. Platforms shall be galvanized and shall consist of angle

iron brackets spaced approximately 4'-0" on centers, and segmental angle iron stringers which shall be oriented to also serve as kickplates. Continuous pipe handrails and midrails shall also be provided. Other details of construction shall conform to those shown for the probe port platform and as covered by paragraph 10.2."

Paragraph 7.5 Add the following:

"If the Bidder elects to obtain concrete and concrete testing from the Contractor, he shall state in the proposal the estimated quantity of concrete required for the chimney."

Date: March 28, 1961  
By: M. J. K...  
Approved: W. H. F...

The following documents are in effect:

Specification 3159-C-23, Rev. C  
Addendum No. 1, Rev. 0  
Drawings C-315, Rev. 0, C-316, Rev. 0