

HISTORY OF CONSTRUCTION REPORT NEARMAN CREEK BOTTOM ASH SURFACE IMPOUNDMENT

Kansas City, Kansas

B&V PROJECT NO. 190719

B&V FILE NO. 41.0403

PREPARED FOR



Kansas City Board of Public Utilities

17 OCTOBER 2016



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1.0 Executive Summary

This report presents the compilation of the history of construction for the Kansas City Board of Public Utilities (BPU) Nearman Creek Power Station Bottom Ash Surface Impoundment in Kansas City, Kansas in compliance with 40 CFR § 257.73(c)(1). This report includes;

- name and address of operator -§ 257.73(c)(1)(i)),
- location of the CCR Unit -(§ 257.73(c)(1)(ii),
- purpose of the CCR Unit (§ 257.73(c)(1)(iii),
- name and size of watershed CCR unit lies within - (§ 257.73(c)(1)(iv),
- description of foundation and abutment material (§ 257.73(c)(1)(v)& (vi),
- method and dates of construction (§ 257.73(c)(1)(vi),
- impoundment drawings. Operating level, and CCR contents (§ 257.73(c)(1)(vii),
- description of existing instrumentation (§ 257.73(c)(1)(viii),
- discussion of area-capacity curves ((§ 257.73(c)(1)(ix),
- description of spillway (not applicable) (§ 257.73(c)(1)(x), and
- construction specifications and provisions (§ 257.73(c)(1)(xi).

1.1 LIMITATIONS

This report was prepared solely for the benefit of the Kansas City Board of Public Utilities (BPU) by Black & Veatch Corporation (Black & Veatch) based on information provided by others. Neither BPU nor Black & Veatch has made an analysis, verified data, or rendered an independent judgment of the validity of the information provided by others.

2.0 Impoundment Information

2.1 LOCATION AND GENERAL DESCRIPTION

The BPU Nearman Creek Power Station Bottom Ash Surface Impoundment is located in Kansas City, Kansas, within Wyandotte County, in northeastern Kansas. The location of the impoundment is shown on Figure 2-1. The impoundment is operated by BPU. The address of BPU is 540 Minnesota Avenue, Kansas City, KS 66101-2930.

The impoundment is a surface impoundment that consists of a bottom ash settling pond and a clear water pond that are separated by an internal dike. The two ponds are hydraulically connected by a 24-inch diameter reinforced concrete pipe.

The impoundment's identification number is "KDHE Permit Number 0413".

2.2 IMPOUNDMENT PURPOSE

The impoundment operates as a closed loop system that is designed to accumulate and store bottom ash that is sluiced from the existing Unit 1 coal-fired boiler, then recirculate clean water from the clear water pond back to the plant operations. The clear water is recycled by way of a pump located in an adjoining pump house.

2.3 WATERSHED INFORMATION

The impoundment is located within the Independence-Sugar watershed (HUC8 10240011). According to the U.S. Environmental Protection Agency, this watershed has an area of approximately 652,786 acres.

2.4 FOUNDATION AND ABUTMENT MATERIALS

According to the Lutz, Daily & Brain (LD&B) original bid package (Appendix A) as well as subsequent geotechnical investigations, the impoundment is constructed of embankment fill with the interior slopes and base of the ponds designed with a minimum 3 foot thick layer of impervious material and the interior dike between the two ponds was also entirely constructed of impervious fill. The bid package indicated that the area for the impoundment was prepared by stripping all topsoil to a depth of 12 inches prior to placing embankment and impervious fill. Based on the bid package information and subsequent geotechnical information, the foundation material upon which the embankment was constructed consists of a thin layer of silty sand followed by sand.

The original bid package specifications provided significant details on the material to be used as the impervious material within the impoundment. These details include compaction, material gradation, and material plasticity requirements. Consistent with the drawings, the bid specification provided little specifics on the embankment material or its construction requirements. Review of soil borings completed after construction indicated that the embankment material consisted of compacted lean clay with trace amount of fine sand. The exterior portions of the berms contained 6 inches of topsoil to support vegetation, aggregate road surfacing, or rip rap.

Black & Veatch developed the physical and engineering properties of the foundation and embankment materials based on the original bid specifications along with initial and subsequent geotechnical investigations. Table 1 lists the description and properties of the embankment and foundation soils.

| TABLE 1 PHYSICAL AND ENGINEERING PROPERTIES OF THE FOUNDATION AND EMBANKMENT MATERIALS | | | | |
|---|---|------------------------|---------------------------------|-----------------------|
| LAYER | EMBANKMENT FILL | IMPERVIOUS MATERIAL | NATIVE SILTY SAND | NATIVE SAND |
| Material | Low plasticity CLAY with trace Sand | Low plasticity CLAY | Sandy SILT/ SILT/ Silty SAND | Poorly Graded SAND |
| Moist Unit Weight (pcf) | 125 | 125 | 125 | 120 |
| Total Stress (Undrained) Parameters | | | | |
| Cohesion (c) (psf) | Varies 1000 to 3000 depending on elevation | | 500 | 0 |
| Angle of Internal Friction (ϕ) (degrees) | 0 | | 0 | 35.5 |
| Effective Stress(Drained) Parameters | | | | |
| Cohesion (c') (psf) | 160 | | 0 | 0 |
| Angle of Internal Friction (ϕ') (degrees) | 36 | | 30 | 35.5 |
| Abbreviations: | | | | |
| pcf – pounds per cubic foot | | | | |
| psf – pounds per square foot | | | | |

2.5 IMPOUNDMENT CONSTRUCTION

The impoundment was constructed of embankment and impervious fill material. The exterior of the impoundment was covered with 12 inches of topsoil and vegetation except for the north and northeast portion which was covered with 18 inches of rip rap underlain by 6 inches of aggregate base. Construction was completed 30 May, 1980, and was permitted by Kansas Department of Health & Environment on February 11, 1982. No construction records were provided by the Client as part of this review.

In 2008, in response to erosion issues that were requiring additional maintenance of the impoundment, BPU made repairs to the impoundment that included recompacting soil that had eroded along the outside slopes and placing 8 inch rip-rap along the interior slopes of the impoundment.

2.6 IMPOUNDMENT DRAWINGS

The impoundment was designed by LD&B of Shawnee Mission, Kansas. Plan view and cross-sections are provided in Appendix A.

Since the impoundment operated as part of a closed system, the normal operating pool elevation of approximately 758.8 feet is controlled by the rate of withdrawal from the clear water pond. According to the Inflow Design Flood Control System Plan, the maximum pool surface elevation following peak discharge from the inflow design flood is 760.1 feet. Both elevations are based on the National Geodetic Vertical Datum of 1929 (NGVD 29).

According to previous investigations, the western portion of the bottom ash pond contains Coal Combustion Residuals (CCR) up to and above the normal operating pool level. BPU routinely removes CCR from this area for beneficial reuse.

2.7 IMPOUNDMENT INSTRUMENTATION

The instrumentation on the impoundment consists of a water level marker located on the northeast edge of the bottom ash pond. The marker is fitted with two colored sections with the following elevations; top of red section is elevation 760.59, top of green section is 759.55, and bottom of green section is 758.49 feet. All elevations are based on the National Geodetic Vertical Datum of 1929 (NGVD 29).

2.8 AREA-CAPACITY CURVES

Area-capacity curves have not been developed for the impoundment. Hydrologic and Hydraulic capacity of the impoundment is presented in the Inflow Design Flood Control System Plan prepared by Burns & McDonnell Engineering Company Inc.

2.9 IMPOUNDMENT SPILLWAY

The impoundment operates as part of a closed loop system and does not have a spillway.

2.10 CONSTRUCTION SPECIFICATIONS AND PROVISIONS

The construction specifications are included in Appendix A.

Provisions for surveillance are provided in the Operations Plan prepared by Blackstone Environmental. The impoundment is inspected on a weekly, monthly, and annual basis by BPU personnel.

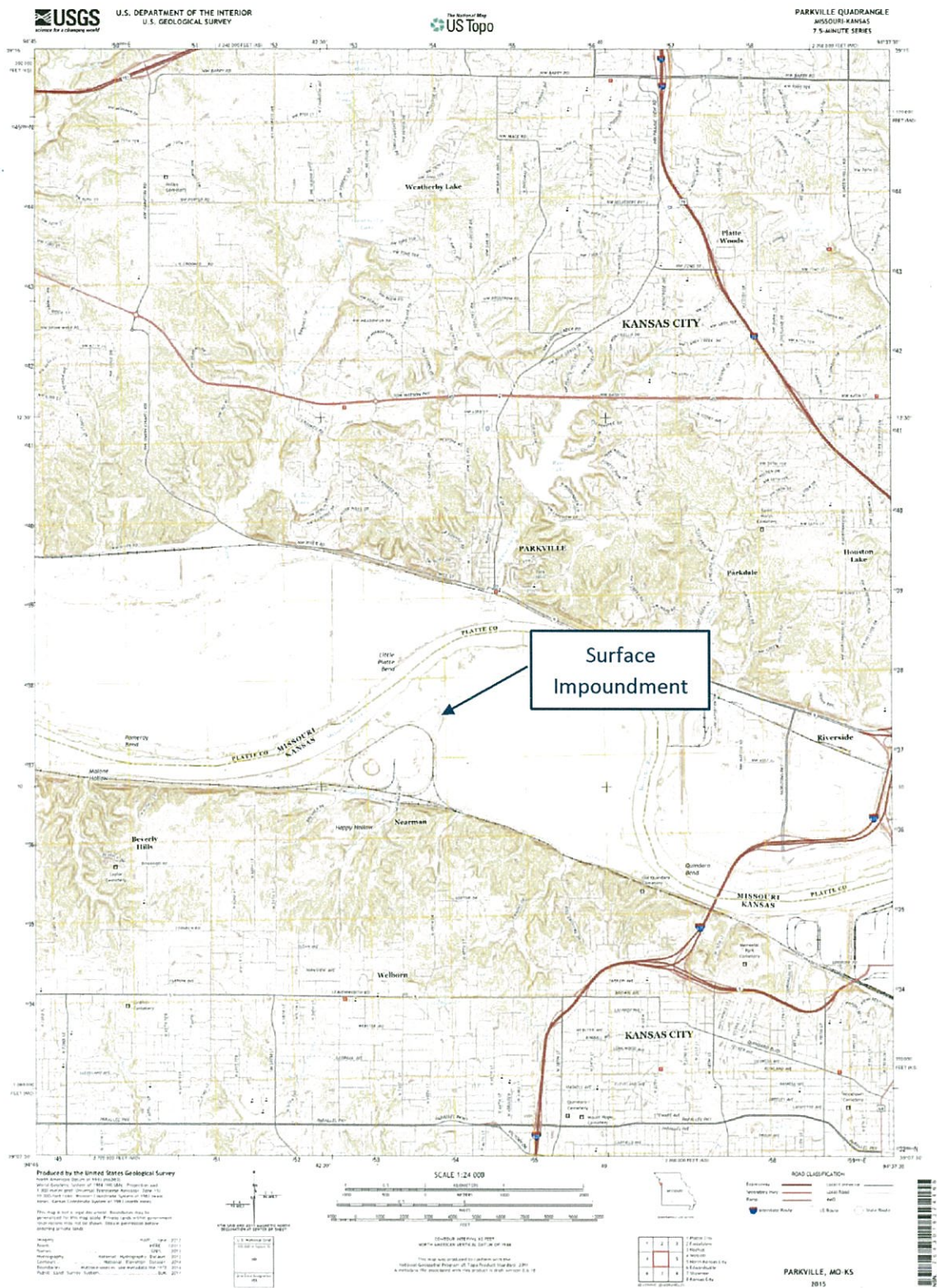


Figure 2-1 U.S. Geological Survey Topographic Quadrangle Map Showing Impoundment Location

**Appendix A LD&B Specifications and Drawings
(64 pages)**

DETAILED SPECIFICATIONS
FOR
POWER PLANT ASH PONDS
SPECIAL CONDITIONS

GENERAL: The Board of Public Utilities of Kansas City, Kansas is strengthening its electrical utility system by constructing a new municipal steam electric generating station called the Nearman Creek Power Station.

A levee structure has been constructed on the site to protect the plant site against flood damage from the Missouri River.

A railroad spur track extending from the mainline of the Missouri Pacific Railroad serves the plant site.

This Power Plant Ash Ponds Contract is one of many contracts that will be a part of the Utility System improvement program. Additional construction and equipment contracts associated with utility system improvements at the Nearman Creek Power Station have been either awarded, are in the process of being bid or will be released for bids in the near future.

LOCATION: The work herein specified will be constructed at the Nearman Creek Power Station site located in the City of Kansas City, Kansas south of the Missouri River near river mile 379, north of the Missouri Pacific Railroad near railroad mile post 293 and just north of the point where Nearman Drive terminates at Dickinson Road. The plant site area is at an approximate elevation of 750 ft above sea level.

INTENT OF SPECIFICATIONS: It is the intent of these specifications to describe in detail the complete construction of the Power Plant Ash Ponds for the Nearman Creek Power Station for the Board of Public Utilities of Kansas City, Kansas. Materials and workmanship which are obviously necessary to complete the project in accordance with the type of construction shown on the accompanying plans but not specifically mentioned in these specifications, shall be furnished complete.

The lump sum price named in these Specifications shall include the furnishing of all labor, material, equipment, transportation costs, equipment rental, storage, etc., necessary to construct the project as herein specified and as shown on the accompanying drawings.

TENTATIVE SCHEDULE OF CONSTRUCTION: The following is a tentative schedule of construction for delivery of equipment and of construction by contractors tabulated to the best knowledge of the Engineer at the present time and is listed only to give this Contractor some indication of when the associated parts of the project will be delivered or completed. Deviations by other contractors from this schedule shall not be reason for additional compensation to the Contractor.

During the duration of this construction Contract a close overlapping of work under this Contract and that of other construction contracts will prevail. It is required that excellent cooperation between all contractors associated with this utility system improvement program be exercised to expedite and produce a first-class job in every respect.

Some previously awarded major contracts and contracts to be awarded that will be doing work on the project site during the duration of this Contract are as follows:

- a. Power Plant Coal Handling System, Contract 70A, awarded to Mid-West Conveyor Company. Contract 70A will be erecting steel and setting equipment on foundations constructed by Miscellaneous Foundations Contract 85.
- b. Power Plant Building Superstructure and Office Building, Contract 81, V. S. DiCarlo General Contractors - Contract is in the construction stage at the job site.
- c. Steam Generating Unit, Contract 61, Riley Stoker Corporation - Contract is in the construction stage at job site.
- d. Electrostatic Precipitator, Contract 82, Belco Pollution Control Corporation - Contract is in the construction stage at job site.
- e. Power Plant Miscellaneous Foundations, Contract 85, Sharp Brothers Contracting Company - Contract is in the construction stage at the job site.
- f. Power Plant Power Piping, Contract 86A, Natkin and Company - Contract is in the construction stage at the job site.
- g. Power Plant Mechanical and Electrical Yard Construction, Contract 86B, Sanders Company - Contract is in the construction stage at the job site.
- h. Power Plant Wiring and Lighting, Contract 88, Sachs Electric - Commonwealth Electric - Contract is in the construction stage at the job site.
- i. Power Plant Service Well, Contract 72C, Layne Western Company, Inc. - Contract will be in the construction stage at the job site.
- j. Wastewater Treatment Plant and Piping, Contract 77D - Contract will be awarded and in the construction stage at the job site.
- k. Power Plant Intake, Outfall and Sealing Weir, Contract 77A - Contract is in the construction stage at the job site.
- l. The power plant substation which is being built by the Board of Public Utilities is in the construction stage at the job site.

- m. Roadway Subgrade and Paving, Drainage and Railroad Track Materials and Installation, Contract 76B - Contract is in the construction stage at the job site.

SCOPE OF CONTRACT: This Contract shall include furnishing all materials, transportation costs, storage, equipment, labor and tools necessary to complete the work as described in these specifications and shown on the accompanying plans.

SEQUENCE OF CONSTRUCTION: On award of the Contract, the successful Contractor will be given a "Notice to Proceed."

The following description, while not intended to cover all finite details, outlines the major items of work to be accomplished under this Contract:

1. Clear and grub the area within the limits of the ash ponds and the oil confinement berm.
2. Strip the top 12" of topsoil from areas to receive embankment fill and clay blanket and stockpile for utilization as the top surface on the ungraveled areas of embankment and area fills.
3. Construct embankment, roadway subgrades and drainage structures.
4. Construct crushed rock surfacing and place topsoil on embankments and fills.
5. Mulch, fertilize and seed designated embankment slopes.
6. Place riprap and bedding on designated areas.
7. Construct chain link fence and gates. **
8. Final clean-up of area.

In addition to the above mentioned items, this Contract shall include minor items not specifically mentioned herein but shown on the accompanying drawings or obviously necessary to provide a complete job.

TIME OF COMPLETION: The time of completion is of the essence for this Contract No. 75A. The earliest completion time for this Contract is imperative based upon Contracts already awarded and their associated delivery of equipment and materials as well as subsequent equipment contracts scheduled for bidding after the award of this Contract No. 75A.

The date of completion of the oil confinement berm and fuel oil haul road shall be no later than November 16, 1979. *

The date of completion of the remainder of this Power Plant Ash Ponds Contract 75A shall be no later than December 31, 1979. *

DRAWINGS: The drawings accompanying these specifications show in detail the extent of the work to be performed and are made an integral part hereof. The drawings are as follows:

| <u>Sheet No.</u> | <u>Drawing No.</u> | <u>Title</u> |
|------------------|--------------------|---|
| 1 of 12 | 72-2P-PP-2 | Site Location Plan |
| 2 of 12 | 72-2P-AP-1 | Ash Pond Dike Alignment |
| 3 of 12 | 72-2P-AP-2 | Ash Pond Grading Plan |
| 4 of 12 | 72-2P-AP-3 | Ash Pond Dike Profiles and Grading Details |
| 5 of 12 | 72-2P-AP-4 | Discharge Structures Details |
| 6 of 12 | 72-2P-AP-5 | Ash Pond Dike Cross Sections Sta 1+00 to Sta 7+00 |
| 7 of 12 | 72-2P-AP-6 | Ash Pond Dike Cross Sections Sta 8+00 to Sta 14+00 |
| 8 of 12 | 72-2P-AP-7 | Ash Pond Dike Cross Sections Sta 15+00 to Sta 21+00 |
| 9 of 12 | 72-2P-AP-8 | Ash Pond Dike Cross Sections Sta 22+00 to End and Interior Dike Cross Sections Sta 1+00 to Sta 3+00 |
| 10 of 12 | 72-2P-AP-9 | Ash Pond Interior Dike Cross Sections Sta 4+00 to Sta 10+00 |
| 11 of 12 | 72-2P-AP-10 | Ash Pond Interior Dike Cross Sections, Grading Sections and Road Profile |
| 12 of 12 | 72-2P-AP-11 | Oil Confinement Berm and Fuel Oil Haul Road |

The accompanying drawings indicate the size, location and general arrangement of the proposed construction. Dimensions lacking, but required shall not be scaled, but shall be referred to the Engineer in writing for the correct interpretation. Any inconsistencies or discrepancies which require correction or consideration shall also be referred to the Engineer in writing.

EXISTING FACILITIES: Overhead communication and signal lines exist on the site and on the Missouri Pacific Railroad right-of-way. These communication and signal lines are in service and this service must not be interrupted. This Contractor shall use extreme care in working around these lines. In the event that one of these lines should be damaged this Contractor shall immediately notify

Mr. K. D. Hestes, General Manager
Missouri Pacific Railroad Company
Phone 816-483-0525

Cost of repair to these communication and signal lines required as a result of damage by this Contractor will be borne by this Contractor.

There is an existing 26" diameter Cities Service natural gas line which is north and roughly parallel to the Missouri Pacific Railroad right-of-way. The location of this gas line is shown on the accompanying plans. It is imperative that this gas line stay in service and not be damaged by work associated with this Contract. This Contractor will be moving materials and equipment over this pipe line.

CONTROLLED ACCESS: Existing road crossings of the Missouri Pacific tracks and over the existing 26" diameter Cities Service gasline have been established and constructed by others. This Contractor is prohibited from crossing the Missouri Pacific tracks or the Cities Service gasline with vehicles or equipment of any kind or character except at the existing crossings.

RESPONSIBILITY TO RAILROAD: Whenever the term "Railroad" is used herein it shall mean the Missouri Pacific Railroad Company, 210 North 13th Street, St. Louis, Missouri 63103, represented by Mr. E. T. Franzen, Chief Engineer-Design and Construction, or his duly authorized agent, who will be acting for the Missouri Pacific Railroad Company.

If the Contractor or his subcontractors while crossing railroad property shall function thereon contrary to the specifications, or if such Contractor while crossing railroad property in a manner deemed hazardous by the railroad to its property and facilities or the safe and expeditious movement of its traffic, the railroad shall have the right to restrict crossing railroad property until the acts or omissions of such Contractor have been fully rectified to the satisfaction of the railroad.

If the railroad exercises their right to restrict crossing of railroad property for reasons that the Contractor is not complying with specified conditions, then the Contractor will not be permitted an extension of construction time. If the railroad requests restrictions for reasons that were not stated in the specifications or by separate letter, the Owner will consider a time extension.

Before commencing work involving crossing of railroad property, the Contractor shall be required to give written notice to Missouri Pacific Railroad, at least ten days in advance of the date on which the Contractor expects to begin work involving crossing of railroad property.

All correspondence to the Missouri Pacific Railroad shall be sent to:

Mr. K. D. Hestes, General Manager
Missouri Pacific Railroad Company
6400 Martin Avenue
Kansas City, Missouri 64120

and a copy shall be sent to:

1. Mr. Ralph E. Tearney, Jr.
Director of Production Planning
Board of Public Utilities

2. Resident Engineer
3. Lutz, Daily & Brain
Consulting Engineers

The Contractor shall be required to use the utmost care in protecting railroad property and in avoiding accident. All railroad tracks and grade shall be kept free, by Contractor, of construction materials, debris and any other obstructions, so as to permit safe and expeditious movement of rail traffic. All work shall be performed without interference with tracks, facilities, or the operations of the railroad or its tenants except under specific arrangements affected between the Contractor and the Railroad.

The Contractor shall provide a flagman at the authorized railroad crossing at such times as required to properly safeguard operations over crossing by workmen, vehicles and subcontractors associated with this Contract.

Contractor shall require the person in charge of each vehicle operating onto and over the tracks of the railroad via the crossing to first bring such vehicle to a full stop at a safe distance from the tracks of the railroad before operating thereover, and (2nd) receive a proceed sign from the flagman stationed at the intersection of said roadway and said tracks before attempting to operate said vehicle across the tracks.

If the Contractor shall operate over crossing when there is no flagman at the crossing, the Contractor shall require the person in charge of each vehicle operating onto and over the tracks of the railroad via the crossing to first bring said vehicle to a full stop and determine that there is no train approaching on railroad tracks so near as to strike him or any property in his custody before attempting to operate thereover.

Contractor shall promptly report to Railroad's representative any accident or casualty happening in or incident to the exercise by Contractor of the grant herein contained.

Contractor shall keep any snow, ice, earth, rock or other and different obstructions removed from about said crossing, as well as keep the tracks of railroad free and clear of earth, rock or other and different obstructions at said intersection by reason of Contractor's operations on or in the vicinity of said crossing.

This Contractor shall and will, and does hereby agree to, assume and discharge, and indemnify and save harmless the Missouri Pacific Railroad, its successors and assigns, from and against, any and all liability, loss, cost or expense for or on account of injuries or fatalities to all persons, or damage to or loss or destruction of any property, caused by, arising out of or incident to the provision, maintenance, operation, use, existence or removal of crossing on premises and regardless of whether any such injury, death, damage, loss or destruction shall have been caused or contributed to by any act or omission, negligent or otherwise, of the railroad or of railroad's officers, agents, servants or employees.

LIMITS OF CONTRACT: This Contract 75A shall include all installations shown on the accompanying plans and as described in these specifications.

SITE VISIT: It is required that the Contractor visit the site of the project before submitting his proposal for this work so that he might be fully informed of the existing field conditions and the obstacles he might encounter.

SITE ACCESS: It is intended that the Contractor and his employees use established crossings and roadways whenever it is possible in the execution of all work associated with this Contract.

BASELINES AND BENCHMARKS: The Engineer has established baselines and benchmark locations and elevations. From the baselines and benchmarks established by the Engineer, the Contractor shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the work to the lines and grades prescribed in the specifications or on the plans, and to such modifications as the Engineer may require as a result of necessary modifications to the Contract work. All field notes and data used by the Contractor for purposes of layout of the work shall be available for review by the Engineer. Such review will not relieve the Contractor of the responsibility for constructing the improvements to the lines and grades prescribed in the specifications or shown on the plans. The Contractor shall furnish, at his own expense, all labor, materials and equipment as may be required in laying out any part of the work from the baselines and benchmarks established by the Engineer. It shall be the responsibility of the Contractor to maintain and preserve all stakes and other marks established by the Engineer. If such marks are destroyed by the Contractor, without authorization by the Engineer, the marks may be replaced by the Engineer at the expense of the Contractor.

TESTING: Testing of materials in embankment and excavated areas for classification and compaction, stone riprap and bedding, shall be made by an independent testing laboratory selected and paid for by the Owner.

Stockpiled material and every operation of construction shall be subject to inspection by the Engineer and his representatives and they shall have free access to all operations and all parts of the work at all times, whether at, or away from the site.

WATER ELEVATIONS: The following are approximate elevations determined from the best data available to the Engineers, for the Missouri River at milepost 379 at the site of the proposed construction:

| | |
|--------------------------------------|----------------------|
| Low Water Elevation | 727.2 MSL (1-30-66) |
| Low Water Elevation | 727.4 MSL (Jan 1937) |
| Minimum Service Navigation Elevation | 734.5 |
| Full Service Navigation Elevation | 735.4 |
| Ordinary High Water Elevation | 741.6 |
| High Water Elevation | 755 (July 1951) |
| High Water Elevation | 758 (April 1952) |
| High Water Elevation | 756 (Oct 1973) |

The above data was obtained in discussions with the Kansas City District Corps of Engineers and is the best information available to the Engineers.

WATER DAMAGE: Any damage to partially or completed work of this Contractor due to high or flowing water shall be repaired to the final condition shown on these plans and described in these specifications by this Contractor as his sole responsibility and at no additional expense to the Owner until such time as all of the work included in this Contract is completed by the Contractor and accepted by the Owner.

SUBSURFACE EXPLORATION

GENERAL: The logs of the most recent borings of test holes in the borrow area and in the embankment fill areas are included in the back of these specifications for the information of the Contractor. The logs represent the soils only at the particular location at which each of the test holes were drilled. Any interpretation of soil conditions between test holes shall be the responsibility of the Contractor.

In addition to this information, reports of the soil conditions for the Nearman site were made in December 1975, March 1976, September 1976, October 1977, and additional borings were taken in May 1978 by Layne-Western Company, Inc., of Kansas City, Missouri. A report was made in November 1975 by R. J. Spiegel, Consulting Engineers, Kansas City, Missouri in regard to the flood protection system at the Nearman Power Plant which incorporates 106 borings made on the site and borrow areas by Layne-Western. All of the above reports are available for review at the office of the Owner or the Engineer.

This boring data is included and made available in order to give the Contractor all available information. The Owner does not guarantee the information to be factual. If the Contractor desires he may do additional subsurface exploration at his own expense.

Data included is as follows:

Summary of Soil Tests
Boring Logs

| | | | |
|--------|-------|-------|-------|
| D-3-74 | 47-75 | 52-75 | 57-75 |
| D-4-74 | 48-75 | 53-75 | 88-75 |
| 11-75 | 49-75 | 54-75 | 90-75 |
| 12-75 | 50-75 | 55-75 | 92-75 |
| 46-75 | 51-75 | 56-75 | 95-75 |

Locations of the above test holes are shown on Drawing 72-2P-AP-2.

CLEARING AND GRUBBING

SCOPE OF WORK: The work covered by this section consists of furnishing all labor, equipment, tools and materials and performing all operations necessary for clearing and grubbing the areas specified herein or indicated on the Drawings and for the removal or disposal of all cleared and grubbed materials as specified herein.

ORDER OF WORK: All clearing and grubbing shall be completed at least 300 feet in advance of embankment or fill construction, required excavation, road relocation and/or fill construction and ditch excavation, all areas where structures are to be located or other required construction. In locations where work on existing or proposed structures is performed or must be performed prior to the construction of the roadway embankment fills, drainage structures, ditch excavation or other work under this Contract, clearing and grubbing shall be completed in advance for at least 50 feet in all directions. Borrow areas shall be cleared in advance of their required use but only when it is apparent that their use will be required.

CLEARING: Clearing shall consist of the complete removal to the ground surface of trees, brush, trash, slash, stone, metal, stumps, down timber, structures and other obstructions. Clearing shall also consist of the removal of abandoned foundations, buildings, bridges, debris, and other materials which remain after buildings or other structures have been salvaged or removed by others. Trees shall be felled in such a manner as to avoid damage to trees to be left standing, to the existing structures and installations, or those under construction, as well as to safeguard employees and others.

Construction areas for roads, embankments and structures shall be cleared within the limits of the fill for this work, together with strips five feet wide, beyond and contiguous thereto.

Existing channels, ditches, and depressions to be filled shall be cleared within the limits of the proposed fills.

Construction areas for channels, ditches, and riprap shall be cleared within the excavation limits of 5 feet beyond and contiguous to the area of construction.

Borrow areas, including ditch excavation areas and other areas or embankments that are to be used as a source of borrow material, shall be cleared to the extent necessary to provide material meeting the specified requirements for fill materials. Vegetation on borrow area traverses, the strip of land along the river bank which is to be left unexcavated shall be left undisturbed to the maximum extent practicable and consistent with excavating for borrow and providing access for construction equipment.

GRUBBING: Grubbing shall consist of the removal of all stumps, roots, buried logs, pipes, debris, metal, existing structures of any kind that have been abandoned or are to be abandoned, and other objectionable matter below the ground surface.

Construction area for structures shall be thoroughly grubbed within the limits of the structure.

Borrow areas, including existing levees and fills or other embankments that are to be used as borrow shall be grubbed to the extent necessary to provide borrow materials acceptable to the Resident Engineer.

DISPOSAL: Except as hereinafter specified, all logs, brush, slash, trash, and other combustible debris, which are the products of the clearing and grubbing operation, may be disposed of by burning in an air-curtain type destructor upon permission obtained in writing by this Contractor from the Kansas City-Wyandotte County Department of Health. Air curtain open pit destructor shall be in strict accordance with the above agency's requirements. If burning is not permitted or desirable, all material shall be disposed of by the Contractor at offsite landfills approved by the governing agency. Open burning will not be permitted. The Contractor shall be responsible for compliance with all Federal, State, County and City laws and regulations relative to the disposal of combustibles by burning.

STREAM FLOW: The products of clearing and grubbing operation shall be placed in areas where they will not be carried away by stream flow.

Stumps or debris which, in the opinion of the Engineer, are impractical to burn and stones, broken concrete, metal, and other similar solid objects, which are the products of removal of structures and foundations, wire fencing metal fence-posts, and pipes to be removed, shall be disposed of by the Contractor at off-site landfills acceptable to the governing agency.

Disposal of riprap where removed shall be as follows. Riprap which meets the requirements of section RIPRAP, shall be stockpiled and reused.

FILLING OF DEPRESSIONS AND HOLES: The filling of depressions and holes excavated below the original ground surface as a result of clearing and grubbing operations is specified in section EMBANKMENT.

EMBANKMENT

SCOPE OF WORK: The work covered by this section consists of furnishing all plant, equipment, tools, labor and materials and performing all operations necessary for constructing all required fills, road embankment fills and any other required fill as shown on the drawings and/or as specified herein.

The natural and existing ground surfaces as shown on the drawings are approximate only. Embankments and fills shall be constructed to the net grade and cross section shown and except as otherwise specified without additional allowance for shrinkage of the fill.

MATERIALS: Embankment materials shall be obtained from designated borrow areas on the plant site, off-site borrow areas furnished by the Contractor or from required excavation as shown on the drawings. Material shall be free of roots, stone, debris, or similar objects larger than two inches in diameter.

Pervious materials shall be free-draining sand or gravelly sand consisting of sound durable particles and shall contain not over 10% passing the U.S. standard No. 200 sieve.

Impervious materials shall be fine-grained materials of low permeability consisting of clays, clay silts, or silts, and shall be free of plant growth, roots, and humus. In general, the particle size of impervious material shall be such that a minimum of 90 percent of the soil particles shall pass a U.S. Standard No. 200 screen and shall be material classified as CL on the plasticity chart of the Unified Soil Classification Chart and have a minimum P.I. of 12 and a maximum liquid limit of 45.

This impervious material is not available in borrow areas on the plant site and shall be provided by the Contractor.

Random materials shall consist of pervious materials, impervious materials or any combination thereof.

Natural blanket soils (or materials) refers to the natural deposit of fine-grained soils ranging from silts and sandy silts to clay and varying in thickness from being absent (i.e. sand occurs from the ground surface down to bedrock) to upwards of 25 feet. These soils are typically stratified having been water-deposited and reworked many times. The natural moisture of these materials varies generally with the season of the year and stage of the river.

Waste fill is any existing sanitary and trash landfill excavated. The waste fill shall be removed to an off site licensed sanitary landfill.

The degree of compaction for materials expressed hereinafter as a percentage of maximum density refers to a maximum density at optimum moisture, determined in accordance with test procedures presented in ASTM D-698 (Standard Proctor).

FOUNDATION PREPARATION: After stripping, horizontal surfaces to receive fill shall be thoroughly scarified to a depth of six inches immediately prior to compaction and compacted as specified. If, for any reason, the surface to receive fill becomes compacted in such a manner or growth of vegetation develops to such an extent that in the opinion of the Engineer, a plane, seepage, or weakness might be induced, the surface shall again be thoroughly scarified. Where embankments are constructed against an existing slope (either a natural or excavated slope or that of a previously placed portion of the embankment), the existing slope shall be cut or notched through any loose or dried material on the surface, and the compaction equipment shall work on both the existing material and the new fill to bond them together. Excavation for removal of objectionable material for embankment and drainage ditches, depressions and holes resulting from clearing and grubbing operations and voids caused by the removal or part removal of old foundations and structures or any other excavation required for removal of materials considered objectionable by the Engineer shall be backfilled and compacted to original grade or to the excavation shown on the applicable drawings, with impervious material compacted to at least 95 percent of maximum density and pervious material compacted to at least 80 percent of relative density.

GROUND WATER CONTROL: Where excavation is to be performed below ground water level and placement of compacted fill is required, placement of fill shall be conducted in the dry. If seepage occurs and results in any loosening of the foundation soils, or if, in the opinion of the Engineer, there is reason to believe loosening of the foundation soils will occur, the Contractor shall install a suitable dewatering system which will nullify the excess seepage gradient. Any loosened foundation material shall be compacted to at least 95 percent of maximum density. The water level shall be allowed to rise only after sufficient fill has been placed to offset the uplift pressure of the water. Methods for care of water and controlling the ground water level and seepage gradients shall be subject to review by the Engineer.

PLACEMENT AND COMPACTION REQUIREMENTS: The embankment and fills shall be constructed of compacted earth fill zones as indicated. Except on top of impervious fill material, the top six inches of material placed on ramps, turnaround, road and embankment fills and the top 12 inches of area fills shall consist of topping material consisting of friable clay silts possessing characteristics of representative soils in the vicinity which produce a heavy growth of vegetation. The material shall be free from stones or similar objects larger than two inches in diameter, stumps, roots, and any toxic substance or substances which may be harmful to plant growth or be a hindrance to grading, planting and maintenance operations. The fill areas shall be graded to drain and shall be left in a reasonably smooth condition that will not result in the ponding of water.

EQUIPMENT: Tamper-type rollers shall consist of a heavy-duty, double drum unit with a drum diameter not less than 60 inches and an individual drum length of not less than 60 inches. The drums shall be liquid, or sand and liquid ballasted during use. Each drum shall have staggered feet uniformly spaced over the cylindrical surface such as to provide approximately three tamping feet for each two feet of drum surface. The tamper feet shall be seven to nine and a half inches in clear projection from the cylindrical surface of the roller and

shall have a face area of not less than six or more than 10 square inches. The rolling units of multiple-type tamping rollers shall be pivoted on the main frame in a manner which will permit the units to adapt themselves to uneven ground surfaces and to rotate independently. The roller shall be equipped with cleaner bars, designed and attached to prevent the accumulation of material between the tamping feet; and these cleaner bars shall be maintained at their full length throughout the period of roller use. The weight of the roller shall be between 1000 pounds and 1500 pounds per linear foot of drum length empty and be capable of being ballasted to at least 2000 pounds per foot of linear drum length. The design and operation of the tamping roller shall be acceptable to the Engineer. At any time during prosecution of the work, repairs to the tamping feet, minor alterations in the rollers, and variations in the weight as may be found necessary to secure optimum compaction of the earth fill materials shall be performed. Rollers shall be self-propelled or drawn by a crawler-type tractor. Self-propelled rollers exceeding the empty weight requirement may be used provided that by the substitution of tamping feet having a face area not exceeding 14 square inches, the nominal foot pressure on the tamping feet of the self-propelled roller can be adjusted to approximate the nominal foot pressure of the towed roller for the particular working condition required for the tamped fill. If the self-propelled rollers cause shearing of the fill or laminations in the fill, the Engineer may direct that the self-propelled rollers be removed from the fill and that tractor-drawn tamping rollers be used. For self-propelled rollers, in which steering is accomplished through the use of rubber-tired wheels, the tire pressure shall not exceed 40 pounds per square inch. Rollers shall be operated at a speed not to exceed 3.5 miles per hour.

Crawler-type tractors used for compaction shall weigh not less than 40,000 pounds.

Power tampers will be acceptable subject to obtaining densities comparable to that specified for the material and zone of the embankment being compacted.

Sprinkling equipment shall consist of pressure distributors designed to apply water in controlled quantities to variable widths of surface. Sprinkling equipment depending solely on gravity flow for dispensing water to the fill will not be permitted.

COVERAGE:

- a. Tamping Rollers. A complete pass shall consist of complete coverage of the area to be compacted with each trip of the roller overlapping the adjacent trip by not less than one foot.
- b. Crawler Tractor. One pass shall consist of complete coverage by the tractor with sufficient overlap of successive tread paths to ensure complete coverage.
- c. Power Tampers. Surfaces to be compacted in confined areas inaccessible for rolling shall be tamped uniformly with power tampers to obtain densities equal to that obtained by rollers or crawler tractors as applicable.

PLACEMENT AND COMPACTION: Layers shall be started full width out to the slope stakes and shall be carried substantially horizontal with sufficient slope to provide satisfactory drainage during construction. Portions of the fill, which are inaccessible to rolling, shall be compacted in three inch uncompacted lifts with power tampers. Hauling equipment shall be operated to avoid tracking insofar as practicable. When ruts appear in the surface of any layer of material to be rolled, the surface shall be scarified so that all ridges and bridging between ruts are broken down and the surface of the layer regraded and made uniform before compaction. Where the surface of any layer in the impervious fill or random fill has been made too smooth to bond properly with the succeeding layer, it shall be loosened by scarifying and recompacted. If the work is stopped for 24 hours or more, or if rainfall is imminent and is anticipated in sufficient amounts to cause temporary shutdown of operations, the impervious or random zones (except where the random fill is pervious material) shall be smooth bladed to drain and sealed with rubber-tired rollers, or other acceptable equipment as required to inhibit absorption of rainfall. Embankment and fills shall be scarified and recompacted after becoming unduly wet or after freezing before additional fill material is placed. Finished slopes shall present a uniform appearance without pronounced irregularities.

An overbuild of 0.5 foot above the prescribed grades will be permitted in the final dressing, provided any excess material is so distributed that there are no abrupt humps or depressions in the surfaces or bulges in the width of the crown. The above grade tolerance may be modified at locations where such modifications will not impair the design or appearance of the embankment. Fill material shall not be placed upon frozen surfaces nor shall frozen earth, snow, or ice be placed in the fill.

Impervious materials shall be placed in approximately horizontal layers not exceeding eight inches in thickness. Each layer shall be compacted to at least 95 percent of maximum density at optimum moisture. Before rolling is started, each layer shall be dried by aeration or have moisture added as necessary to obtain a uniform moisture content within the limits of three percent above and three percent below the optimum moisture for maximum density.

When fill consists of pervious material it shall be placed in maximum 12 inch uncompacted lifts. Each lift of pervious material when placed as fill shall be wetted as directed to facilitate compaction by not less than three passes of a crawler type tractor or vibrating roller acceptable to the Engineer. Pervious material shall be compacted to at least 100 percent maximum density. When the fill is a combination of pervious and impervious material and there is a question as to which method of compaction should be used, the method of compaction shall be determined by the Engineer.

After each layer of material is finished, it shall be inspected by the Engineer or his representative before beginning a new layer. If the material fails to meet the density specified, the course shall be reworked as necessary to obtain the specified compaction, and the compaction method or subsequent work shall be altered to obtain the specified density. Such procedure shall be determined by the Engineer.

Materials placed in area fill shall meet the requirements for embankment fill.

Materials placed in the required area fill shall be placed and compacted as described for rolled fill.

ACCESS ROADS, HAUL ROADS AND RAMPS: At locations where access roads to fields or buildings are destroyed because of the work required under this Contract, the Contractor shall provide temporary access roads during the construction period. Such facilities shall be removed to the extent required by the Engineer. Excavated materials or stockpiles of supplies shall not be placed, nor shall equipment be stored or operated in such manner as to preclude ingress to or egress from the fields and buildings.

Haulroads and ramps constructed for the prosecution of the work shall be to such line, grade, and width as to fulfill the requirements for safe and efficient hauling operations. Construction of ramps by excavation into the side slopes of the new or existing embankments will not be permitted. Subsequent to the completion of the work prior to acceptance by the Owner, the Contractor shall, where so directed by the Engineer, remove temporary construction ramps, and plow, scarify or otherwise loosen all haul roads, the areas occupied by ramps, and the access way (other than existing roads) to a minimum depth of six inches and the surface left in a reasonably smooth condition.

TOPSOIL: Contractor shall place 6" topsoil on all side slopes except riprap areas prior to seeding.

EXCAVATION

SCOPE OF WORK: The work covered by this section consists of furnishing all labor, equipment, tools and materials, and the performing of all operations necessary for stripping, stockpiling materials, and excavation of borrow areas, drainage ditches, removal of objectionable material from embankment foundation and anywhere else within the project limits, and any and all other excavation incidental to the construction of appurtenant fills, all as shown on the drawings or as described herein. For the definitions of certain terms used herein refer to section EMBANKMENT.

EQUIPMENT AND OPERATIONS: The Contractor shall submit to the Engineer for review and acceptance a list of his excavating and hauling equipment, and plan of operations, prior to starting excavation and embankment construction. As the work progresses, the plan shall be modified as required to meet field conditions and shall be acceptable to the Engineer. The plan shall provide that excavation and disposal of materials is coordinated with the use of temporary stockpiles to provide the various required materials at the appropriate time for incorporation into the embankment. The plan shall indicate the proposed haul road pattern. In the event that public roads are used as haul roads, they shall be kept free of dirt, mud, rock or other material spilled or dropped from hauling equipment. The Contractor shall plan his operations to prevent interference with existing power, communications and underground utility lines, bridges, highways and railroads which cross the construction right-of-way. The plan shall also be modified to provide for coordinating this work with work of other contractors on facilities crossing or adjacent to this work. The Contractor shall also plan his operations to prevent interference with and operations on any railroad right-of-way without prior clearance from such railroads all as acceptable to the Engineer.

SHEETING AND BRACING: Sheeting and bracing shall be installed where required for the protection of existing facilities or for the safety of the workmen; however, sheeting and bracing will not be permitted in lieu of required excavation slopes. The sheeting and bracing shall be adequately designed and properly installed to withstand anticipated loads. The Contractor shall be fully responsible for the design of the sheeting and bracing which will not only prevent failure of the existing embankment but will also prevent the formation of cracks in the undisturbed soil. If any evidence of soil movement occurs, the Contractor shall make physical changes in the sheeting and bracing to check the soil movement. Sheeting and bracing shall be removed as backfill operations progress.

SURFACE AND GROUND WATER: Normal drainage in drainage channels and structures shall be provided. Where excavation extends below the ground water level and work on structures or placement of compacted fill is required in that location, the work shall be conducted in accordance with the applicable provisions of section EMBANKMENT.

MIXING OF MATERIALS: When materials in borrow areas and required excavations are considerably stratified or when the natural moisture content varies considerably from the optimum value for proper placement and obtaining maximum density in compacted fill, the Engineer may require that excavation be done in a manner to provide mixing during excavation to obtain a more homogenous material and with a more desirable moisture content after required manipulation of the fill.

LINES AND GRADES: The natural and existing ground surfaces shown on the drawings are approximate only. Material shall be excavated at the locations as specified and to the lines and grades as shown on the drawings. Any excessive excavation, including borrow excavation, shall be backfilled as specified herein.

COMMON EXCAVATION: Common excavation includes all excavation except borrow excavation. Excavation of road embankments and any required area fills shall be included as common excavation. Excavation outside the above limits or the limits of excavation shown on the drawings shall be considered as borrow excavation.

The Contractor should study the existing borings and visit the site so that he will be fully informed of the existing field conditions and obstacles which he might encounter. He may take additional borings if he so desires prior to submitting his proposal.

OBJECTIONABLE MATERIAL: In areas to be occupied by the embankment and related fills, any material designated as objectionable material by the Engineer, such as soft, low shear strength clays, muck, trash and excessively wet foundation soils or material determined to be objectionable because of high permeability, stability or is otherwise unsuitable as a foundation for compacted fill, shall be removed to the limits shown on the drawings, or as directed by the Engineer within reasonable limits.

Excavation for placement of riprap and bedding shall be performed at the locations and to the cross sections and grades shown.

STRUCTURES: Excavation for structures as shown on the drawings shall be "Common Excavation."

PLANT SITE BORROW AREAS: The borrow areas are foreshore borrow area and excess material from excavations for structures within the plant site all as shown on the drawings. Certain conditions apply to each area as delineated. The limits of this borrow are shown on the drawings. Construction haul roads and access ways along traverses and adjacent to borrow areas shall be maintained and left in a smooth and reasonably level condition. Upon completion of the embankments and berms, and prior to acceptance, all disturbed area surrounding excavated borrow areas and the borrow areas themselves shall be graded smooth and left in a clean, neat, and workmanlike condition. Drainage of the borrow areas shall be the Contractor's responsibility during his operations in the borrow area. The borrow areas are shown on the drawings and the types of borrow operations permissible in each of the borrow areas are described as follows:

EXCAVATED MATERIALS FROM ASH PONDS, DITCHES AND OTHER REQUIRED EXCAVATIONS: Materials obtained from these sources may be used in the embankments and required fills insofar as the materials meet the requirements of section EMBANKMENT.

FORESHORE BORROW: Material for fill may be obtained from the foreshore borrow area. The limits of this borrow pit and other details are shown on the drawings. In general, all borrow from the foreshore pit will be by land operated equipment.

STRIPPING: Vegetation shall be stripped from all areas to receive compacted fill to a depth sufficient to remove topsoil containing humus, grass, and grass roots. Stripping of borrow areas will be required insofar as it is necessary to provide suitable material for required fills. Stripped topsoil shall be stockpiled separately to be used later.

DISPOSITION OF MATERIALS: Excavated earth materials, except materials considered unsuitable, shall be utilized in the construction of fill areas provided they meet the requirements for these materials set forth in section EMBANKMENT.

Material unsuitable for use in the embankments or related fills shall be wasted back into the foreshore borrow areas at locations as directed by the Engineer.

SLOPE FINISHING: Finished slopes in the excavated areas shall present a uniform appearance without pronounced irregularities. The acceptability of any undercut (material remaining above lines and grades shown on the drawings) will be determined by the Engineer on the basis of the relation of the undercut to the performance and appearance of the completed work.

SLIDES: In case of slides in any part of the required excavation prior to final acceptance of the work, the Contractor may be required to remove and/or replace materials with compacted fill, as directed. Remedial measures will be at the expense of the Owner unless the slide is due to the failure of the Contractor to comply with stipulated restrictions on surcharging or over steepening slopes or to take reasonable precautions or exercise sound engineering and construction practices in the conduct of his work.

SLOPES AND SURCHARGES: During the construction period, temporary slopes for any channel, structure excavation, or other required excavation shall not be steeper than the indicated finished slope or the construction slope, if specified. With the review and acceptance of the Engineer, temporary slopes may be constructed by benching so that the average slope is not steeper than the finished slope or specified construction slope. In addition, no temporary, permanent, or construction slopes shall be surcharged with stockpiles of excavated or other materials or with heavy construction equipment which would have the same effect as the surcharge material. The toe of the slope of such stockpiled material will be maintained a distance back from the top of the finished slope (actual or theoretical) equal to the full depth of the excavation or channel. Any slide or adverse condition caused by failure of the Contractor to maintain these requirements shall be corrected by the Contractor at no additional cost to the Owner.

BEDDING

SCOPE OF WORK: This section of the specifications covers all plant, labor, equipment and materials to furnish and completely install the bedding under the riprap as required by the drawings and as herein specified.

The bedding material shall consist of crushed limestone or natural gravel materials of the thickness indicated at the option of the Contractor.

MATERIALS: The materials shall conform to the following requirements. Bedding shall be sound, durable limestone, free from cracks, seams, shale partings, and soil or shall be natural gravel composed of hard, tough and durable particles free from adherent coatings. Bedding larger than one inch standard sieve size shall be reasonably free from flat elongated particles. Bedding material shall be reasonably well graded within the limits specified:

| <u>Sieve Size</u> | <u>Per Cent Passing by Weight</u> |
|-------------------|-----------------------------------|
| 3 inch | Maximum Allowable Size |
| 1-1/2 inch | 75-95 |
| 1/2 inch | 40-60 |
| No. 4 | 5-25 |

PLACEMENT: Bedding shall be spread uniformly to the lines and grades indicated. Placement shall be by methods which will minimize segregation. Any damage to underlying surface during placing of the bedding shall be repaired before proceeding with the work. Compaction of the bedding layer will not be required, however, the bedding surface shall be reasonably smooth.

RIPRAP

SCOPE OF WORK: This section of the specifications covers the furnishing of all plant, labor, materials and equipment for constructing the riprap of the lines and grades shown on the drawings and as herein specified.

MATERIALS: Stone for riprap shall be sound durable limestone, free from cracks, seams, shale partings, and overburden spoil. Stone shall be approximately rectangular in cross section free from these slabby pieces having an elongation ratio greater than four and the quantity of stone having an elongation ratio greater than three shall not exceed 20 per cent by weight.

Deleterious substances such as shale and clay balls (in material retained on the 1/2 inch sieve) shall not exceed seven per cent by weight.

GRADATION: Stone shall be reasonably uniformly graded within the following limits:

| <u>Weight in Pounds</u> | <u>Percent of Total Weight Lighter Than</u> |
|-------------------------|---|
| 300 | Maximum Allowable Size |
| 200 | 85-95 |
| 50 | 30-50 |
| 10 | 0-15 |

PLACEMENT: Riprap shall be placed to full layer thickness in one operation in such a manner as to minimize segregation and avoid displacing the underlying material. Stone for riprap shall be placed, beginning at the bottom of the section, in a manner that will produce a well-keyed and stable mass of rock with a finished surface corresponding to the lines and grades shown on the drawings. Distribution shall be obtained by selective loading at the source of excavation, as applicable together with controlled dumping at the site, or by other acceptable methods. Hauling over bedding or riprap after placement will not be permitted. Stone shall be placed by direct dumping in place by means of truck, skip box, clam, rock bucket, or orange peel. The larger stones shall be well-distributed and the finished stone protection shall be free from pockets of small stones and clusters of large stones. Final finishing of the slope shall be done as material is being placed. Dumping of stone at the top of the slopes and rolling into place will not be permitted. Moving stone by drifting and manipulating stone by means of dozers or whole blade equipment will not be permitted. A tolerance of plus 0.5 feet from the thickness shown on the drawings will be allowed in the finished surface of the riprap. When necessary, the Contractor shall hand place riprap to the extent necessary to secure the results specified herein.

MAINTENANCE: The Contractor shall maintain the riprap until the project is completed and any material displaced by any cause shall be repaired to the lines and grades shown on the drawings.

EARTHWORK FOR STRUCTURES

SCOPE OF WORK: The Contractor shall furnish all materials, machinery, equipment, and labor necessary to do all excavation work, backfilling and grading indicated on the drawings or herein stipulated. This work shall include necessary preparation of the area around the structure, removal and disposal of all debris, the handling, storage, transportation and disposal of all excavated material, all necessary sheeting, shoring and protection work, preparation of subgrades, and final grading and dressing of the area around the structure to the grades and elevations shown on the drawings or called for in these specifications.

This Contract shall include excavation for all foundations or any other construction which shall require excavation to construct the project as shown on the accompanying plans.

This work shall be done so as to conform with all local and state ordinances and laws with respect to safety and excavation including safety provisions of the Williams-Steiger Occupational Safety and Health Act of 1970 and its latest revisions and regulations.

INSPECTION AND SOIL TESTS: The opened excavation shall be examined and approved by the Engineer before concrete or footings are poured. The Engineer may then order the surfaces to be placed in better condition or may order a test of the bearing capacity. Cost of such test would be borne by the Owner and shall not be a part of this Contract.

CLASSIFICATION OF EXCAVATION: There will be no classification of excavated materials, and the term "excavation" shall include all materials excavated or removed on the site or sites of the work regardless of the type, character, composition or condition of the materials so excavated, and shall further include all debris, junk, broken concrete, brick, stone, pipe, logs, stumps, roots and all other materials encountered within the specified excavation limits.

STRUCTURE EXCAVATION: Excavation shall be done carefully to lines and elevations shown on the drawings, and shall provide proper room for all construction operations. Work shall be done so that the premises shall be as free as possible from all obstructions and from interference with transportation, storage or handling of materials. Care shall be taken at all times to conduct the work safely, with all precautions against hazards of any kind. Before placing the concrete or other foundations upon any subgrade, all loose material shall be removed so that the structure will rest on solid, undisturbed ground.

Concrete forms will be required for wall and footings of any kind; therefore, the excavation shall provide adequate clearance for their installation and removal. In no case shall excavation faces be undercut to provide for extended footings.

SHEETING AND SHORING: The Contractor, as his subsidiary obligation, shall provide and construct all sheeting and shoring required to protect and maintain the stability of existing banks or sides of excavation, and to prevent caving, sliding or any movement of such banks into the excavated area. Sheeting, bracing and shoring shall be adequate in design and construction to withstand all loads that might be caused by earth movement or pressure, and it shall be rigid, maintaining its shape and position under all circumstances.

UNAUTHORIZED EXCAVATION: All material excavated below the bottoms of concrete walls, footings and foundations shall be replaced, by and at the expense of the Contractor, with concrete placed at the same time and monolithic with the concrete above.

REMOVAL OF WATER: The Contractor shall provide and maintain proper and adequate dewatering equipment for the removal and disposal of all surface and ground water entering excavations or other parts of the work, and shall keep each such excavation dry until the structure to be built therein is completed to the extent that no damage from hydrostatic pressure, flotation or otherwise will result from contact with such water. No reinforcement steel shall be placed in water, and no water shall be permitted to rise over such steel before the concrete has been deposited. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches, to the greatest extent practicable without causing damage to adjacent property.

SUBSOIL STABILIZATION: Subgrade soil for all concrete structures, regardless of type or location, shall be firm, dense, and thoroughly compacted and consolidated, shall be free from mud and muck, and shall be sufficiently stable to remain firm and intact under the feet of the workmen engaged in subgrade surfacing or laying reinforcement steel, and depositing concrete thereon.

Subsoil which is otherwise solid, but which becomes mucky on top due to construction operations, shall be reinforced with one or more layers of crushed stone or gravel as directed by the Engineer. The Contractor will be allowed the actual delivered cost of such granular material used, with no allowance for labor in placing or for profit.

EARTH BACKFILL: Well compacted backfill shall be placed around the exterior of all walls and footings and foundations to the elevations shown on the drawings accompanying these specifications.

Backfill shall be placed in layers not to exceed six inches in depth, well tamped and compacted to 95% of maximum density at optimum moisture content. All backfill shall be made from approved material. Each layer of backfill shall be thoroughly compacted by rolling or by mechanical or hand tamp as conditions may warrant.

EXCESS MATERIAL: All stumps, roots, rock or other debris uncovered in the excavation shall be disposed of beyond the site or as directed by the Engineer.

PIPE CULVERTS: Pipe culverts shall be of reinforced concrete of the size and type called for on the drawings and as described in these specifications.

Trenches for pipe culverts shall be cut along lines and to grades shown on the plans and/or established by the Engineer. Grades shown on the plans are flow line grades. Trenches shall be of sufficient width to provide free working space for satisfactory bedding and jointing and thorough tamping of the backfill and bedding material under and around the pipe.

Pipe culverts shall be bedded in an earth foundation of uniform density, carefully shaped by means of a template, at the grade established, to fit the lower part of the pipe exterior for at least 10 percent of its over-all height.

Backfill where required under pipes shall be placed and compacted as described for embankment fill to an elevation which is at least 10 percent of the overall height of the pipe above the bottom of the pipe elevation and then shaped as described above.

Proper facilities shall be provided for hoisting and lowering the sections of pipe into the trench without damaging the pipe or disturbing the prepared foundation and side of the trench. Unless otherwise authorized by the Engineer, the laying of pipes shall be started at the outlet end and proceed upstream. Outside laps of circumferential joints shall point upstream with longitudinal laps on the side. Multiple installations of pipe shall be laid with the center lines of individual barrels parallel. Clear distances between pipes shall be as shown on the plans.

Selected embankment material, free from large lumps, clods, or rock, shall be placed alongside the pipe in layers not exceeding six inches in depth and thoroughly compacted so that on each side of the pipe there shall be a berm of thoroughly compacted or undisturbed earth at least as wide as the external diameter of the pipe. Each layer, if dry, shall be moistened and then compacted by rolling, tamping with mechanical rammers, or by hand tamping with heavy iron tampers having a tamping face of not more than 25 square inches. Special care must be taken to thoroughly compact the fill under the haunches of the pipe. The above method of filling and compacting shall be continued until the embankment is level with the top of the pipe. The fill above the top of pipe shall be completed in the usual manner as specified under earthwork.

This item shall include the furnishing and construction of such joints, and such connections to endwalls, etc., as may be required to complete the work as shown on the plans.

All reinforced concrete pipe shall conform with serial designation C76 "Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe."

CRUSHED ROCK ROAD SURFACING AND BASE COURSE

SCOPE OF WORK: The work covered under this section consists of furnishing all plant, labor, supplies, equipment and materials, and performing all operations in connection with the preparation of subgrade and the construction of a crushed stone surface course for the top of the roads, as specified herein and shown on the drawings.

Hauling of surfacing materials will not be permitted on the subgrade or the finished surface when the road crown conditions are such that hauling operations will cause rutting of the surfaces.

MATERIALS: Crushed rock for surfacing shall be hard durable limestone. The material shall conform to the requirements of ASTM D1241. Soil-aggregate shall conform to the requirements of Section 3 for Type I, Gradation C.

SAMPLING AND TESTING: The source of the materials shall be designated, and suitably processed samples representative of the material proposed for use in the work shall be obtained by the Contractor. All tests necessary to determine the suitability of materials to conform to the requirements of these specifications will be performed by the Contractor at no expense to the Owner. The samples shall be delivered to a point designated at least 30 days in advance of the time when the need therefore arises, and all materials shall be reviewed prior to delivery to the site of the work. Material may be sampled periodically during the work for compliance with specification requirements.

SUBGRADE PREPARATION: The areas to be surfaced shall be shaped to line, grade, and cross section, and shall be compacted as specified below. This operation shall include any reshaping required along with the rolling of the subgrade to obtain compaction. When completed and ready for surfacing, the areas to be surfaced shall be reasonably smooth and uniform with irregularities bladed out or rolled down.

Compaction shall be accomplished with four passes of an acceptable smooth-drum roller weighing not less than 150 pounds per lineal inch of drum, or four passes of a crawler-type tractor weighing not less than 10,000 pounds or other acceptable roller.

COVERAGE: One pass is defined as one complete coverage of the entire surface with the roller or tractor treads.

PLACEMENT OF MATERIALS: Surfacing material shall be distributed evenly over the previously prepared subgrade in sufficient quantity to obtain the compacted depth shown on the drawings, and then spread to a reasonably smooth and uniform surface of proper crown and section. The material shall be placed and spread in such a manner that will cause a minimum of segregation. The material shall then be compacted with three passes of a smooth-drum roller as specified above. The rolling shall begin at the outside edge and shall progress to the center of the surfaced area, parallel with the road centerline, uniformly overlapping each preceding pass.

MAINTENANCE: Surfacing material shall be maintained until final acceptance and any material displaced by any cause shall be replaced at no additional cost to the Owner and to the lines, grades, and section shown.

MISCELLANEOUS STEEL

SCOPE OF WORK: This Contract shall include all labor, materials and equipment for the complete furnishing, fabrication and installation of all miscellaneous steel work as herein specified and/or shown on the accompanying plans.

DESIGN, FABRICATION AND ERECTION: The "Standard Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings," and the "Code of Standard Practice" of the American Institute of Steel Construction, including latest amendments, shall apply to all work included under this Contract.

MATERIALS AND WORKMANSHIP: Workmanship and finish shall be equal to the best practice in modern structural shops. All material shall have clean surfaces before being worked, and fabricated members shall be free from twists, bends or open joints. Shearing and clipping shall be neatly done and all work which will be exposed to view shall be neatly finished.

DELIVERY AND STORAGE: All miscellaneous steel is to be carefully handled at all times, in transit, delivery and storage. It shall not be dropped off cars or trucks and while stored at the site, it shall be set on blocking which will prevent distortion or contact with the ground. Any abrasions shall be touched up after erection, and before assembling, all contact surfaces shall be thoroughly cleaned.

REINFORCING STEEL: Reinforcing steel for concrete work is not a part of this section of the Contract but is furnished and installed under the PLAIN AND REINFORCED CONCRETE section of the specifications.

GALVANIZED MATERIAL: All material shown on the accompanying drawings as being galvanized shall be hot dipped galvanized after fabrication in accordance with the latest revision of ASTM Specification A525 (G210 min).

SHOP DRAWINGS: Shop drawings shall be furnished as specified under GENERAL SPECIFICATIONS. Each member shall be piece marked and an erection diagram shall be furnished with erection marks thereon.

PLAIN AND REINFORCED CONCRETE

SCOPE OF WORK: All concrete work shall conform to the requirements of these specifications and the Contract Drawings. This Contract shall include furnishing all materials, transportation costs, equipment, labor and tools necessary to complete the work as described in these specifications and as shown on the accompanying drawings. This work shall include all slabs, walls, structure foundations, and all other items shown on the accompanying plans to be constructed of plain and reinforced concrete.

INTENT OF SPECIFICATIONS: These specifications are intended to specify the mixing, placing, curing and finishing of all concrete included in this Contract. In case of conflict between specific published specifications referred to herein and the requirements which follow herein, the latter shall govern.

SHOP DRAWINGS: Shop drawings shall be furnished as specified under GENERAL SPECIFICATIONS. Predetermined construction joints have been shown on the engineering drawings for special reasons and the bar splices shall be detailed accordingly.

ACI STANDARD: It is intended to include herein by this reference ACI Standard 301-72 (revised 1975), Specifications for Structural Concrete for Buildings. This is the standard adopted by the American Concrete Institute in May, 1972. It is an industry standard and copies are available from the American Concrete Institute, P.O. Box 19150, Redford Station, Detroit, Michigan 48219. One copy of this standard shall be obtained by the Contractor prior to beginning construction and shall be kept in the field office of the Contractor for the duration of this project. Any difference between this standard and the requirements of this specification will be herein defined in detail and/or shown on the accompanying plans.

MATERIALS: Materials shall be as follows:

Cement - Portland cement shall conform to all applicable provisions of the latest revision of ASTM Standard Specification C-150, Type 1. The same brand of cement shall be used for all exposed concrete so that the concrete will have the same appearance throughout the structure.

Air Entraining Agent - All concrete shall have an air entraining agent added when the materials are placed in the mixer at the batch plant.

Air entraining agent shall meet the requirements of ASTM Standard Specifications C-260. Air entraining agent shall be rigidly controlled by proper testing to provide a minimum of 4.0% and a maximum of 6.0% entrained air.

Aggregate - Concrete aggregates shall conform to all applicable provisions of the latest revision of ASTM Standard Specification C-33. Fine aggregate shall consist of clean, well graded river sand having a fine-

ness modulus not smaller than 2.60 nor larger than 2.90 and shall be free from injurious amounts of dust, clay, loam, or other deleterious matter. In case of conflict between the Specification C-33 and the requirements which follow herein, the latter shall govern. All aggregates shall come from one source of supply. Coarse aggregate shall be crushed limestone with maximum size not to exceed 3/4 inch.

PROPORTIONING: This specification is intended to describe a concrete that will have both structural strength and durability of exposure to the elements of weather. Proportioning shall be as designated by Section 3.8.2 and 3.8.2.1 Method 1 on Page 9 of ACI Specification 301-72 (Revised 1975).

Each cubic yard of concrete shall contain a minimum of six sacks of cement and a maximum of six gallons of water per sack. In lieu of the specified cement content as stated above, the Contractor may use 5-1/2 bags of cement per cu yd plus an approved water reducing agent conforming to all applicable provisions of the latest revision of ASTM Standard Specification C-494 Type A, or approved equal. The use of a water reducing agent shall reduce the water requirements at least 10% when compared to a reference non-air entrained mix. When the water is reduced by 10% the same or greater workability shall be obtained as that of the referenced mix. The specified strength shall be maintained at all ages.

The water reducing agent used shall be of a type and amount as recommended by the manufacturer based on the temperatures encountered at the time of placing the concrete.

Before a water reducing agent is used, trial batches shall be made as herein before described by a qualified independent testing laboratory to insure that the mix will meet all of the strength, workability, consistency and other requirements of this specification.

Water Content: Only sufficient water to produce concrete of the required consistency and workability shall be used. All free water contained in the aggregates shall be taken into consideration in determining the amount of water to be added to each batch of concrete. The slump of the concrete produced shall be kept within 20%, plus or minus, of the slump obtained by tests made on the final approved trial batch.

If, in the opinion of the Engineer, any batch of concrete has too much water, it shall be discarded as waste material.

Workability: This term is used to describe the ease or difficulty which may be encountered in placing concrete in its final location in such a manner that the forms will be entirely filled and the surfaces will be smooth and free from honeycombs. It is apparent that the requirements of workability will vary in different parts of the structures and this fact must be recognized and met by proper adjustments in the proportioning of the aggregates. Workability will be the basis for determining the acceptability of concrete, provided of course the water-cement ratio has been adhered to. Since the total amount of aggregates which may be used depends upon the gradation of the aggre-

gates, it is to the Contractor's interest to provide well graded aggregates.

Consistency: Consistency is a term describing, or relating to, the state of fluidity of the concrete. In general, all concrete placed in forms and around reinforcement shall be of such consistency that all aggregates will float uniformly throughout the mass without segregation, the concrete will flow sluggishly when tamped or spaded, and can be readily puddled into corners and angles of forms. The consistency shall be checked by means of the standard slump tests.

Concrete slump for any one concrete mix shall be kept uniform regardless of variations in moisture content of the aggregate used and in no case shall the slump of any batch exceed that authorized for the concrete being mixed by more than 20%. The slump of any batch of concrete which exceeds this limit shall be rejected and wasted unless, by consent and approval of the Engineer, it is possible for the Contractor to add additional regular batch proportions to correct the water-cement ratio without exceeding the mixing time allowed.

The concrete shall contain a minimum of 4% and a maximum of 6% entrained air, the same as specified above under MATERIALS. The entrained air may be obtained through the addition of an approved neutralized Vinsol resin in the amount necessary to obtain the specified amount of air.

Strength - All concrete used throughout this Contract shall develop a minimum compressive strength of 4000 psi in 28 days.

Weight - Normal weight concrete shall be used throughout this Contract.

Slump - Slump requirements shall be four inches or less.

Admixtures - Admixtures shall be as previously specified. Calcium Chloride shall not be used.

FORMWORK: Metal wall forms shall not be used without written permission of the Engineer. Showing or exposed faces of concrete shall be constructed by placing them against a smooth plywood surface properly coated to prevent bond or some similar smooth flat type of form lining.

Foundations shall have a 3/4" chamfer on all exposed corners, excepting edges having steel angles embedded.

Earth cuts shall not be used as forms.

Shop drawings are not required for formwork.

REINFORCING STEEL: All reinforcing bars furnished by this Contractor shall be deformed bars of intermediate grade billet steel conforming to the requirements of ASTM Standard Specification A615 with a minimum yield point of 60,000 psi.

Within 30 days after the Contract is awarded, the Contractor shall have bending diagrams and lists of reinforcing bars prepared and submitted as specified under SHOP DRAWINGS in the GENERAL SPECIFICATIONS to the Engineer for checking and approval. Approval of any drawing shall not relieve the Contractor from furnishing any or all materials required by the plans or specifications.

Details of the fabrication of reinforcing steel shall, unless expressly shown otherwise on the drawings or specified herein, comply with the current standards of the American Concrete Institute. Such standards include the "Manual of Standard Practice for Detailing Reinforced Concrete Structures ACI 315," and also "Building Code Requirements for Reinforced Concrete ACI 318-77," or the latest revision thereof. In case of conflict, the Building Code ACI 318-77 shall govern.

Metal reinforcement shall be accurately formed to the dimensions indicated on the plans and by shop drawings and bending details approved by the Engineer. All bars shall be bent cold. Ties and stirrups shall be bent around a pin twice the bar diameter, and other bars around a pin at least six times the bar diameter. Bars with kinks or bends not called for in the details shall not be used. Heating and rebending of bars will not be permitted. Bars shall be cut either by shearing or sawing. Flame cutting will not be permitted.

After fabrication the bars shall be labeled with waterproof tags and stored in such a sequence that rehandling will be avoided. Reinforcing steel delivered to the job site shall be stored on cribbing off of the ground.

All reinforcement, before being placed, shall be thoroughly cleaned of mill and rust scale, oil, or any coating that would destroy or reduce the bond and shall be kept in this condition until the concrete is poured.

All reinforcing steel shall be accurately placed and secured in position by using 16 gauge annealed wire ties at intersections and shall be supported by metal spacers and chairs in accordance with the recommendations of the Concrete Reinforcing Steel Institute.

Reinforcing in slabs and footings resting on the ground shall be supported above the subgrade by hanging or tying to steel dowels driven into the subgrade or on suitable precast concrete supports or chairs if a thin concrete mat is poured for a working surface.

Welding of reinforcing steel or to reinforcing steel is prohibited.

CONSTRUCTION JOINTS: Construction joints have been predetermined and are shown on the drawings. Keyways shall be as shown for all construction joints.

Joints not shown on the plans shall not be made without the written approval of the Resident Engineer.

Where a joint is to be made, the surface of the concrete shall be thoroughly cleaned and all laitance removed.

EMBEDDED ITEMS: Items to be embedded in concrete shall be plumb and securely held in place by wiring to reinforcing steel while the concrete is being placed. The Contractor shall support these items adequately so that any movement of persons or equipment on adjacent bar steel will not create movement of the embedded item.

All frames for manhole openings shall be set in the position shown on the plans. Manhole steps shall be set in the position shown on the plans, aligned straight and set at 12 inch maximum spacing.

PRODUCTION OF CONCRETE: Ready-mixed concrete shall be used throughout this project except as hereinafter specified. Ready-mixed concrete shall conform to requirements set forth in ACI 301-72, Section 7.1.

MIXING: The mixing of concrete shall be done in a batch mixer of a type and construction which will insure uniform distribution of all ingredients throughout the entire mass of each batch. The mixer shall be equipped with a mechanically operated timing and signaling device which will indicate and insure the completion of the required mixing period. Mixer shall not be loaded in excess of its rated capacity.

The ingredients of each batch of concrete shall be mixed for a period of 1-1/2 minutes after all ingredients are in the mixer, during which period the mixer shall rotate at a peripheral speed of approximately 200 ft per minute. Water shall be measured and added to produce concrete of uniform consistency and slump regardless of fluctuations in moisture content of the aggregates used. Each batch shall be completely discharged before recharging the mixer.

Ready-mixed and transit-mixed concrete meeting the above specified requirements, that is, mixed and delivered in accordance with the requirements set forth in the ASTM C-94 "Standard Specifications for Ready Mixed Concrete," may be used. Non-agitating equipment shall not be used to transport concrete to the job.

All concrete mixing and transporting equipment shall be acceptable to and approved by the Resident Engineer prior to use on or for the Contract work and, after approval, shall be maintained in proper and acceptable condition and repair.

Hand mixed concrete shall not be made in batches exceeding one sack of cement.

Any and all concrete or mortar that has stiffened or hardened to the extent that it is no longer plastic and workable shall be wasted as directed by the Resident Engineer. In no case shall such material be retempered or otherwise reconditioned and used on this project.

BATCHING CONCRETE: Aggregate and bulk cement shall be measured to within one percent by weight. Cement in standard sacks need not be weighed. Water shall be measured by volume or weight to within one percent.

The complete batching and mixing shall be approved by the Resident Engineer and shall conform to the following requirements: ready adjustment of aggregate

weights for varying moisture content; proportion of water to cement accurately controlled and easily checked; accurate control of all materials with positive shutoff; facilities for prompt removal of excess materials in hoppers; visible dial or balance indicators; each specified size of aggregate measured separately on a separate beam scale; each unit of weighing shall be provided with an underweight indicator which shall indicate the filling of the last 100 lb of the batch, and an overweight indicator which will indicate at least 25 lb of overweight; bulk cement dropped through canvas drop chute or telescopic flexible hose tremie, ten 50 lb test weights provided. When checked in increments of 500 lb, the weighing apparatus shall be accurate to within 0.4% to and including the heaviest batch weight expected.

Batching plant equipment shall be so arranged that the operator may conveniently observe and inspect the operation of the bin gates and the materials in each weighing hopper. The under- and overweight indicators and the water measuring device shall be in full view of the operator when he is at the controls. All concrete batching equipment shall be acceptable to and approved by the Owner.

WEATHER CONDITIONS: Weather conditions for production of concrete shall be in accordance with ACI 301-72, Section 7.6, ACI 305 and ACI 306. One copy of these standards shall be obtained by the Contractor and shall be kept in the field office of the Contractor during the duration of the project.

NOTIFICATION: Twenty-four hours advanced notice of the intent to place concrete shall be given to the Resident Engineer by the Contractor indicating that all formwork, embedments, and reinforcing steel are ready for inspection. Notification nor inspection shall not relieve the Contractor of sole responsibility for the work performed.

PLACING: No concreting underwater will be allowed. Reinforcing steel shall always be placed in the dry. Trunks or pipe shall be used to restrict the free fall of concrete to a maximum of six feet.

Before any concrete is placed, all ice, snow, and frost should be completely removed and the temperature of all surfaces to be in contact with the new concrete should be raised to as close as may be practical to the temperatures of the new concrete that is to be placed thereon. No concrete should be placed on a frozen subgrade or on one that contains frozen materials. Where concrete is to be placed over permanently frozen ground, subgrade material must be thawed deep enough to insure that it will not freeze back up to the concrete during the required period of protection.

Arrangements for covering, insulating or housing newly-placed concrete should be made in advance of placement and should be adequate to maintain, in all parts of the concrete, the temperature and moisture conditions recommended herein for winter curing temperatures and methods.

If the Contractor elects to do so, he may place a thin layer (approximately two or three inches in thickness) of lean concrete at no cost to the Owner below the bottom of structural foundations to serve as a working platform and an aid to supporting the bar steel, etc. This concrete should have at least 3-1/2

sacks of cement to the yard and be a uniform reasonably well graded mix, screeded to a reasonably level surface. This is not a requirement and if the Contractor chooses to do so, this working slab shall be below and not a part of the structural foundation thickness as shown on the plans.

BONDING: Surfaces of unformed construction shall be cleaned of laitance and slightly roughened after initial and prior to final set wherever possible. Hardened surfaces and existing surfaces over which new concrete is to be placed shall be cleaned of all laitance, surface film, loose material, oil and other deleterious substances, and shall be roughened to provide aggregate exposure over the entire surface. Before the new concrete is placed the existing surface shall be saturated with clean water for at least 24 hours.

FINISHING OF FORMED SURFACES: All surfaces exposed to view which have been in contact with the forms shall receive a smooth rubbed finish in accordance with Section 10.3.1 of ACI 301-72 after the surfaces have been prepared as specified in Chapter 9 of ACI 301-72 excluding Section 9.4. All air bubbles shall be filled with a bonding grout and rubbed down with sacks before final rubbing as specified above. This shall include all exposed edges of foundations and walls.

FINISHING OF RELATED UNFORMED SURFACES: The top surface of the junction box shall receive a stiff broom finish. All other surfaces shall receive a tight wood troweled finish.

CONCRETE FILL: Where concrete fill is required, it shall be plain concrete as herein specified. Concrete fill shall be used in the junction box from the top of the base to the invert of the connecting pipes except for thicknesses of less than three inches, in which case plain grout consisting of one part normal cement, three parts sand and water to produce a zero slump, shall be used. Concrete fill on the sides of the junction box for the direction of channel flow shall be of plain concrete placed by use of forms except for heights of less than 12 inches, in which case plain grout may be used.

CURING AND PROTECTION: Curing and protection of all concrete work done in late fall, winter and early spring shall be in accordance with ACI 301-72 Sections 12.1, 12.2.1, 12.2.1.5, 12.3.1 and 12.2.3 (excluding the alternative). Preservation of moisture and cold weather protection shall be considered a simultaneous protective concern by this Contractor. Cold weather protection shall also include the applicable requirements of ACI 306, "Recommended Practice for Cold Weather Concreting." Protective measures proposed shall be submitted to the Engineer for review well in advance of the placing of any concrete in this Contract.

Curing and protection of all concrete work done in the late spring, summer and early fall shall be in accordance with ACI 301-72 Sections 12.1, 12.2.1.1 or 12.2.1.2, 12.2.2, 12.2.3 (excluding the alternative). Hot weather protection shall also include the applicable requirements of ACI 305-72 "Recommended Practice for Hot Weather Concreting."

SAMPLES AND TESTING: Obtaining samples and testing shall be in accordance with Chapter 16 of ACI 301-72 (Revised 1975). The testing agency will be determined by the Owner after the award of the Contract.

All specified slump tests, concrete tests of aggregates batched on the job, and the taking of concrete test specimens shall be done by the Contractor in the presence of the Resident Engineer.

The following items of testing shall be done and paid for by the Contractor:

1. Cement: All cement shall be mill tested before delivery to the site and mill test reports shall be submitted in triplicate to the Engineer for approval.
2. Concrete Aggregate: Concrete aggregates shall be tested in accordance with the "Standard Specifications for Concrete Aggregates," Serial Designation C33 of the ASTM. One such test shall be made for each 200 cu yd of fine aggregate and for each 400 cu yd of coarse aggregate. Test reports shall be submitted in triplicate to the Engineer.
3. Reinforcing Steel: All reinforcing steel shall be mill tested before delivery to the site, and mill test reports shall be submitted in triplicate to the Engineer for approval.
4. Trial Batches: After approval of the concrete materials to be used, the Contractor shall submit to the Owner for approval a tentative concrete mix for each slump and mix which he intends to use on the work. The design, batching and testing of each tentative concrete mix shall be performed by a qualified independent testing laboratory for this Contractor. When approved, each mix shall be subject to field adjustments by the Resident Engineer whenever necessary to produce concrete of proper workability, uniform consistency, and acceptable density and strength.

Each tentative concrete mix submitted by the Contractor for approval shall be based on the following:

Consistency - on which mix design is used.

Total water - per cu yd of freshly mixed concrete required to provide the design consistency with the aggregate used.

Cement factor - sacks per cubic yard.

Specific gravity and gradation - of each aggregate used.

Ratio - of fine to total aggregate.

Weight (surface dry) - of each aggregate per cu yd of freshly mixed concrete used, gallons of total water, and pounds of each aggregate.

Batch proportions - Expressed in sacks of cement (pounds if bulk cement is used), gallons of total water, and pounds of each aggregate.

Slump (in inches) - produced by the proposed concrete proportions.

Air content - percentage of air in proposed concrete mix.

In addition to the required design data and batch proportions, each concrete mix design submitted for approval shall be accompanied by laboratory test reports of compression test of specimens made from such mix as hereinafter specified.

The following procedure shall be followed with the Contractor providing the costs for services of field preparing the concrete compression test specimens and field storing, protecting and curing the specimens. Transportation of test specimens to the lab and testing of specimens shall be by the testing agency designated by the Owner at no cost to the Contractor.

Concrete: During the progress of the work, compression tests of the concrete used shall be made in accordance with the Standard Method of Making and Storing Compression Test Specimens of Concrete in the Field, Serial Designation C31, and Method of Sampling Fresh Concrete Serial Designation C172 of the ASTM, and tested in accordance with the Standard Method of Test for Compressive Strength of Molded Concrete Cylinders, ASTM Designation C39. In addition to the report outlined in C39, the WEIGHT, the SLUMP and LOCATION of the pour of the test cylinder is to be noted. Not less than three test cylinders shall be made for each test and not less than one test for each 100 cu yd of concrete, and not less than one test for each day's pour under 100 cu yd of concrete. Test cylinders shall be tested for compressive strength at the following age sequence:

One at seven days
Two at twenty-eight days

Slump tests shall be made for each 50 cu yd or less (as may be required) of concrete used in order that the consistency shall be kept uniform for each concrete mix.

The testing agency shall submit to the Engineer, Resident Engineer, Owner and the Contractor a report of all compression tests as described above.

SURFACE PROTECTION: All concrete surfaces shall be protected from injury by construction activities, until acceptance of the work by the Owner.

APPROVAL OF MATERIAL: All materials that will be incorporated in the structure shall be submitted to the Engineer for approval prior to installation.

SEEDING

SCOPE OF WORK: The work covered by this section consists of furnishing all materials and performing all work required for mulching, fertilizing and seeding the unprotected finish slopes of the Ash Pond levee roads, oil confinement berm and surrounding areas within limits shown on the accompanying drawings.

MATERIALS:

Fertilizer: Fertilizer of 12-12-12 grade, uniform in composition, free-flowing, and suitable for application with acceptable equipment, shall be provided. The fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name, trade name or trademark, and warranty of the producer.

Mulch: Mulch shall be straw of cereal grain such as oats, wheat or grass hay on flat or gentle sloping areas and wood fiber on extreme cuts and slopes. Materials that contain objectionable weed seeds as listed by the Kansas State Department of Agriculture or other species that might be detrimental to the planting being established or to adjacent farmland will not be acceptable.

Seed: Seed shall be labeled in accordance with the latest U. S. Department of Agriculture Rules and Regulations under the Federal Seed Act. Seed shall be furnished in sealed, standard containers unless otherwise acceptable to the Engineer. Seed that is wet or moldy or that has been otherwise damaged in transit or storage will not be acceptable. The pure live grass seed mixture and application rate to be used shall be as follows:

1. On slopes which are three feet horizontal to one foot vertical, or steeper:

| <u>Kind of Seed</u> | <u>Pounds per Acre</u> |
|---------------------|------------------------|
| Perennial Rye | 10 |
| K-31 Fescue | 35 |
| Smooth Brome | 15 |
| Crown Vetch | <u>20</u> |
| Total | 80 |

2. On slopes which are less than three feet horizontal to one foot vertical:

| <u>Kind of Seed</u> | <u>Pounds per Acre</u> |
|---------------------|------------------------|
| Perennial Rye | 10 |
| K-31 Fescue | 30 |
| Smooth Brome | <u>15</u> |
| Total | 55 |

Weed Seed: Weed seed shall not exceed 0.5 percent by weight of the total of pure live seed and other material in the mixture.

Pure Live Seed: The following formula shall be used to determine the amount of commercial seed required in pounds to provide in each kind of seed the specified quantities of pure live seed:

$$\frac{\text{Pounds Pure Live Seed} \times 100 \times 100}{\text{Purity (\%)} \times \text{Germination (\%)}} = \text{Pounds Commercial Seed Required}$$

Soil for Repairs: Soil for repairs shall be of at least equal quality to that which exists in areas adjacent to the area to be repaired. Soil shall be used that is free from roots, stones and other materials that hinder grading, planting and maintenance operations and that is reasonably free from objectionable weed seeds and toxic substances.

Water: Water shall be free from oil, acid, alkali, salt and other substances harmful to the growth of grass, and shall be from a source reviewed by the Engineer prior to use.

INSPECTION AND TESTS:

Fertilizer: The Engineer shall be furnished with duplicate copies of invoices for all fertilizer used on the project. Invoices for fertilizer shall show the grade furnished. Each lot of fertilizer shall be subject to sampling and testing at the discretion of the Engineer. Sampling and testing will be in accordance with the official methods of the Association of Official Agricultural Chemists. Upon completion of the project, a final check of the total quantities of fertilizer used will be made against the total area treated, and if the minimum rates of application have not been met, the Engineer may require the distribution of additional quantities of fertilizer to make up the minimum rates of application specified.

Seed: The Engineer shall be furnished signed copies of a statement from the vendor, certifying that each container of seed delivered complies with the specified requirements and is labeled in accordance with the Federal Seed Act. This certification shall be obtained from the vendor and shall be furnished on or with all copies of seed invoices. Each lot of seed will be subject to testing by the Owner in accordance with the latest Rules and Regulations under the Federal Seed Act.

PREPARATION OF SEEDBED: Equipment necessary for the proper preparation of the ground surface and for handling and placing all required materials shall be on hand, in good condition, and shall be reviewed before the work is started. The Contractor shall demonstrate to the Engineer before starting work that the application of the materials required will be made at the specified rates.

Clearing: Prior to grading and tillage operations, vegetation on the site that might interfere with grading, tillage or seeding operations shall be mowed, grubbed, raked and removed from the site and the ground surface cleared of

stones, roots, cable, wire, grade stakes, and any other materials that might hinder proper grading, tillage and seeding.

Grading: Previously established grades shall be maintained on the areas to be treated in a true and even condition; necessary repairs shall be made by adding soil as necessary to previously graded areas. Where grades have not been established, the areas shall be graded as shown, and all surfaces shall be left in an even and properly compacted condition to prevent formation of depressions.

Tillage: After the areas required to be treated have been brought to the grades shown, the areas shall be thoroughly tilled to a depth of at least three inches by plowing, disking, harrowing, or other accepted methods until the condition of the soil is acceptable. Tilling of slopes shall be in a direction at right angles to the slope. The work shall be performed only during periods where beneficial results are likely to be obtained. When conditions are such, by reason of drought, excessive moisture, or other factors, that satisfactory results are not likely to be obtained, the work will be stopped and shall be resumed only when directed. Undulations or irregularities in the surface that would interfere with further construction operations or maintenance shall be leveled before the next specified operation.

Fertilizer: Fertilizer shall be distributed uniformly at a rate of 400 pounds per acre over areas to be seeded, and shall be incorporated into the soil to a depth of at least two inches by disking, harrowing, or other acceptable methods. Incorporation of fertilizer may be part of the tillage operation.

Leveling: Surface irregularities resulting from tillage, fertilizing or other operations, before seeding, shall be leveled.

Cleanup: After completion of the above operations, the surface shall be cleared of stones or other objects larger than two inches in thickness or diameter, and of roots, brush, wire, grade stakes and other objects that might be a hindrance to maintenance operations.

PLANTING SEED: A satisfactory method of sowing which distributes the seed uniformly at the specified rate shall be employed, using acceptable mechanical powerdrawn drills or seeders, mechanical hand-seeders, hydro-seeders, or other acceptable methods. Equipment shall be provided with markers or other means to insure that the successive seeded strips will overlap or be separated by a space no greater than eight inches or equipment row spacing, whichever is less. When delays in operations extend the work beyond the most favorable planting season for species designated or when conditions are such by reason of drought, high winds, excessive moisture, or other factors that satisfactory results are not likely to be obtained, work shall be halted as directed and resumed only when conditions are favorable or when acceptable alternate or corrective measures and procedures have been effected. If during or after seeding operations a show of green indicates that strips wider than the space indicated above have been left unplanted; or other areas skipped, additional seed shall be sown if so directed.

APPLYING AND ANCHORING MULCH: Mulch shall be spread uniformly in a continuous blanket, using two tons per acre. Mulch shall be spread by hand or by a manure spreader, a modified grain combine with straw-spreader attachment, a blower type mulch spreader or other suitable equipment. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of a steep slope, and continued uniformly until the area is covered. The mulch shall not be bunched. Immediately following spreading, the mulch shall be anchored to the soil by a V-type wheel land packer, a scalloped disc land packer designed to force mulch into the soil, surface, or other suitable equipment. The number of passes required will be determined by the Engineer, but shall not exceed three.

REPAIRING AND RESEEDING: The Contractor is not required to guarantee a cover crop; however, the Contractor shall be fully responsible for any damage or lack of cover caused by elements under his control. The Engineer may direct that areas that do not attain the required cover or areas that become damaged shall be repaired and reseeded to specification requirements.

TOPSOIL: Contractor shall place 6" topsoil on all side slopes except riprap areas prior to seeding.

GENERAL SPECIFICATIONS

MATERIAL AND WORKMANSHIP: All materials shall be new materials of high quality which shall give long life and reliable operation. Parts subjected to high temperatures shall be of such design that serious deformations shall not occur within the normal life of the equipment. All equipment shall be modern in design and shall not have been in prior service except as required by factory tests. The workmanship shall be of high quality in every detail.

STATUS OF THE ENGINEER: The Engineer will make periodic visits to the site to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. He will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of work nor will he be responsible for the construction means, methods, techniques, sequences or procedures, or the safety precautions incidental thereto. His efforts will be directed toward providing assurance for the Owner that the completed Project will conform to the requirements of the Contract Documents, but he will not be responsible for the Contractor's failure to perform the Work in accordance with the Contract Documents. On the basis of his on-site observations as an experienced and qualified design professional, he will keep the Owner informed of the progress of the Work and will endeavor to guard the Owner against defects and deficiencies in the Work of Contractors.

The Engineer will not be responsible for the time it takes for this or any other contractor to complete any phase of this or other contractor's work. The Engineer will provide general information that is available as to the best estimate of schedule of construction as furnished to him by the contractors involved.

The Engineer will make an initial interpretation of the terms and conditions of the Contract Documents. In his capacity as Interpreter he will exercise his best efforts to insure faithful performance of the Contract. He shall not be liable for the result of any interpretation or decision rendered in good faith.

Neither Engineer's authority to act under these provisions nor any decision made by him in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of Engineer to Contractor, any subcontractor, supplier or manufacturer, any of their agents or employees, or any other person performing any of the work.

The duties and responsibilities and the limitations of authority of Engineer as Owner's consultant as set forth herein shall not be extended without written consent of the Owner and the Engineer.

ELECTRICAL EQUIPMENT: All electrical equipment furnished under these Specifications shall be of the best of their respective kinds. All equipment shall be designed, constructed and rated in accordance with the Standard of the IEEE, ANSI, IPCEA, ASTM, EEl; and shall pass temperature and voltage tests as recommended therein. In selecting capacities of equipment and machines, it shall be assumed that the equipment or driven machine will be operated continuously at

conditions of maximum stress and power requirements, unless otherwise stated. Under these conditions of maximum stress and power requirements, deleterious effects shall not exceed those permitted by the most stringent of the above applicable standards.

STRUCTURAL MATERIAL: All structural steel shall meet the minimum requirements of the American Institute of Steel Construction's "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings," including the "Code of Standard Practice for Steel Buildings and Bridges."

All concrete, both plain and reinforced, shall meet the minimum requirements of the American Concrete Institute, both as to standards of design and material.

LABOR AND TOOLS: Work which should properly be done with skilled labor shall not be attempted with common laborers. The Contractor shall have on the job at all times, ample equipment to carry on the work properly, including such tools as may be necessary to meet emergency requirements. He shall furnish necessary scaffolding, blocking, ladders, hoists, temporary lighting and other special equipment necessary to complete the projects in the time set forth. Such special tools and materials not required in the permanent installation shall remain the property of the Contractor and shall be removed by him on completion of the work.

SPECIAL TOOLS AND ACCESSORIES: The manufacturer will furnish one complete set of all special maintenance tools and all usual accessories, lubricating devices, gauges, etc., as required for safe and reliable operation. Tools will be shipped in a container marked to identify the use of the tools contained. These tools shall not be used by the Contractor for erection of the unit. This Contractor shall unload tools and place in storage as directed by the Resident Engineer.

PACKING AND SHIPMENT: All machines and equipment shall be carefully packed to prevent damage in shipment. The Contractor shall be responsible for the safe arrival of the equipment and shall replace or repair at his own expense any equipment lost or damaged prior to its delivery at the point of destination specified in this Contract. The Contractor's representative shall be responsible for receiving all material and equipment, paying demurrage, making arrangements for unloading and making all claims to the transportation company.

Covers and other means shall be used to prevent corrosion, moisture damage, mechanical damage and accumulation of dirt and dust in electrical equipment and machinery. Suitable rust-preventive compounds shall be applied to all exposed machined surfaces and unpainted iron and steel. All bearings and similar items shall be grease packed or oil lubricated prior to shipment.

Each item of equipment and material shall be tagged or marked as identified in the delivery schedule or on shop drawing and complete packing lists and bills of material shall be included with each shipment. Each piece of every item need not be marked separately provided that all pieces of each item are packed or bundled together and the packages or bundles are properly tagged or marked.

Bills of material and packing lists shall accompany all shipments. Bills of material and packing lists shall also be mailed to each of the following, two weeks in advance of equipment arrival at the job site:

Purchaser's Director of Production Planning
Receiving Contractor (if applicable)
The office of the Engineer

Bills of material shall contain the following information:

Contract number
Contract name
Complete list of items with tag numbers

ERECTION: The erection of materials and equipment by the Contractor shall be done in a first-class workmanlike manner and in accordance with the best engineering practice. Equipment shall be carefully handled to prevent damage during erection. All damage shall be repaired by the Contractor to the satisfaction of the Engineer. All equipment requiring foundations and foundation bolts shall be securely mounted in a level position by grouting with an approved grout.

COOPERATION: This Contractor shall cooperate with the Purchaser, Engineer and other contractors in performing the work involved in the entire Project. Fairness shall prevail as regards use of access roads, storage space, space for temporary office, utility services, work areas, and other facilities. In any arrangement as to the proportion of facilities between contractors, the decision of the Owner shall be final.

USE OF COMPLETED PORTIONS: The Purchaser shall have the right to use all completed portions of the work whether accepted or not and such use shall not relieve the Contractor from complying with any requirements herein outlined.

CONTROL LINES: The Contractor shall locate and lay out his work from the baselines as established on the accompanying plans. The Engineer will furnish the Contractor with field location of these baselines. The Engineer will also furnish the Contractor with a benchmark within one hundred feet of the Project. This elevation shall be used as a reference for all construction.

LINES, ELEVATIONS AND MEASUREMENTS: The Contractor shall verify the lines, levels and dimensions at the site as given on the plans before ordering any of the materials or doing any of the work. He alone shall be responsible for the correctness of same. Any real or apparent discrepancies are to be reported to the Engineer immediately for correction or interpretation.

PROTECTION DURING CONSTRUCTION: During the progress of construction, the Contractor shall protect all existing and new work from injury or defacement and particular care must be taken of all finished parts. All projections and other work subject to damage or liable to cause injury during construction shall be properly protected with boards, casing, planks, etc. This shall include pits, trenches and sumps. He shall be responsible for any and all damage done to the

streets, railroads, utilities, communication lines, buildings, or property near and about the site by reason of any work included in this Contract.

PROTECTION OF PERSONS: The Contractor shall take all necessary steps to protect his own men, other workers, the Board and their agents and the public from danger and hazards during the prosecution of his work. Danger signs, warning signs, flares, lanterns, railings, barriers, etc., shall be erected to prevent accidents from temporary construction, falling objects, rotating machinery, electric lines and other conditions which might present hazard.

CONTRACTOR'S SUPERVISION: The Contractor shall perform the work of this Contract as an independent contractor, at his sole risk. The Contractor shall employ all persons to perform the work, such persons to be his sole employees and subject to his direction and control and not the employees of the Purchaser or subject to its direction or control. The Contractor shall determine the manner and method in which the work shall be performed to accomplish the results required by the Contract. The Contractor or his agents and employees shall not become the agents or employees of the Purchaser.

The Contractor shall give his personal attention to the work at all times, and shall have a duly authorized representative on the site of the work continuously during working hours, prior to the arrival of any materials at the job site and throughout the progress of the work, to receive directions or instructions. Any instructions or directions given to the representative of the Contractor shall be considered the same as though given to a principal of the Contractor. The Contractor shall supervise and direct the work efficiently and with his best skill and attention. He shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction used. In case the construction work should stop, through no fault of the Contractor, for a period of ten days or longer, then the Superintendent may be removed from the job and returned when active work starts. All expense as a result of the removal and return of the Superintendent shall be borne by the Contractor. The Superintendent shall not be relieved except with the consent of the Owner, unless he proves to be unsatisfactory to the Contractor or Owner or ceases to be in the Contractor's employ. The Superintendent shall be a competent field engineer and shall have had previous experience of a similar nature and shall be thoroughly familiar with the requirements of the project. In the event that the Superintendent is not satisfactory to the Purchaser, the Superintendent shall be replaced with a Superintendent of proper qualifications. When the Superintendent is on vacation or otherwise absent a substitute against whom the Owner or the Engineer have no reasonable objection shall be provided. The Contractor's supervision shall be such as to produce a first-class job in every respect, including materials and workmanship.

The Contractor's Supervisor shall submit daily progress reports to the Resident Engineer. These reports shall also be required of all subcontractors. Report forms will be supplied by the Resident Engineer. The Contractor's Superintendent shall also be required to attend weekly Contractor's meetings as scheduled by the Resident Engineer.

CONTRACTOR'S CONSTRUCTION SCHEDULE: The Contractor shall furnish the Engineer with a proposed schedule of his construction before starting any construction work. It shall be the Contractor's responsibility to make all necessary allowances in the schedule for the work of other contractors. Schedule shall receive the approval of the Engineer before being used. After schedule has been approved and work has commenced, the Contractor shall revise the schedule at monthly intervals to show the work actually done and to reflect the anticipated sequence of events. Distribution of monthly revised schedules shall be one copy to the Purchaser, one copy to the Resident Engineer and six copies to the office of the Engineer. The schedule shall be in the form of a critical path method, man loaded Gantt chart and shall include shop drawings and all items mentioned in the DETAILED SPECIFICATIONS. Submission of the schedule revisions shall be a prerequisite for the approval of payments. A Daily Contractor's Report showing number of men and work accomplished shall be filled out and submitted to the Resident Engineer daily on a form as provided by the Resident Engineer.

SECURITY: The Contractor shall be responsible for provision of security for equipment, materials, tools, etc., in his care.

VARIATIONS FROM REQUIREMENTS AND SPECIFICATIONS: No change, variation, or deviation from the drawings or specifications shall be made, except by written order of the Engineer. Should the Contractor find, at any time during the progress of the work that in his opinion existing conditions demand, make desirable, or beneficial, a modification in requirements covering any particular item or items, he shall promptly report such matters in writing to the Engineer for his decision and instruction.

UTILITIES: The Purchaser will furnish temporary power for construction purposes at one metered location at the nearest available source on the construction site in accordance with the Purchaser's service policy. If there is an existing source on the construction site, it will determine the location of the temporary service. If temporary service is required at any other location or at more than one location, the Contractor will pay to the Purchaser all costs incurred in installing and removing all facilities required for such services.

For services of 200 amperes and less, the Purchaser will furnish a meter base and meter for installation by the Contractor. The Contractor shall furnish and install a disconnect switch, secondary protection, weatherhead, conduit and fittings, and the conductor required to connect the load to the secondary of the transformer. The Contractor shall wire all the required equipment and provide three feet of conductor length extending from the weatherhead for connection by the Purchaser.

Information as to what items are required for services greater than 200 ampere capacity can be obtained from the Purchaser's Metering Department.

The following 60 Hertz, alternating current nominal secondary voltages are available; the voltage or voltages supplied shall be selected by the Purchaser:

- a. 1 phase, 120/240 V, 3-wire
- b. 3 phase, 240 V, 3-wire

- c. 3 phase, 480 V, 3-wire
- d. 3 phase, 120/208 V, 4-wire
- e. 3 phase, 277/480 V, 4-wire

The Contractor will pay to the Purchaser the regular charge for electric energy consumed under the applicable published rate structure.

Water will be furnished in reasonable quantities to the Contractor, free of charge, at the nearest available source of supply. Any reservoirs, tanks etc., required by the Contractor for storage shall be furnished by the Contractor. The Contractor shall furnish and install necessary temporary piping for conveying water to the point of usage and shall remove such piping upon completion of the job.

Compressed air will not be available to the Contractor at the project site but shall be furnished as required by the Contractor.

TELEPHONE SERVICE: The Contractor shall maintain a telephone for use of those connected with the work and furnish free service for local calls. Charges for long distance messages shall be paid for by the person making them.

TEMPORARY BUILDINGS: The Contractor shall construct and maintain temporary trailers and/or frame buildings near the building site where directed by the Resident Engineer for the Contractor's office and storage of materials. The building shall be well constructed, shall have wood floors, a watertight roof and sides covered with matched boards. All materials subject to weather damage shall be kept in protected storage until immediately before use. The Contractor shall be responsible for the proper care and protection of his materials, equipment, etc., delivered to and stored at the site and materials and equipment that may be furnished to him by the Owner for installation under these specifications until the project is accepted.

TOILETS: This Contractor shall provide chemical toilet facilities for his workmen and they shall be removed by this Contractor upon completion of this Contract. The chemical toilet shall be kept in a clean and sanitary condition at all times. Location of toilet shall be determined by the Resident Engineer. (There shall be as many toilets provided, depending upon the number of workmen, as is required by code or union stipulations).

STANDARDS: Reference is made through these specifications to ASTM (American Society for Testing and Materials), ANSI (American National Standards Institute), AISC (American Institute of Steel Construction), ASME (American Society of Mechanical Engineers), IEEE (Institute of Electrical and Electronic Engineers), and other similar standards. In all such cases, the materials shall comply in all respects to the latest revised specifications quoted and such standards are as much a part of these specifications as if quoted verbatim herein.

CLEANING: The Contractor shall at all times keep the premises free from all debris, dirt, condemned materials, blocking, scaffolding, etc., as soon as possible after accumulation and after it has served its useful purpose. In case of dispute, the Owner may remove the rubbish and surplus materials and charge

the cost to the several contractors in a proportion as shall be determined to be just. After the job is completed, all floors, equipment, etc., shall be given a thorough cleaning prior to acceptance.

INTERFERENCE WITH EXISTING UTILITIES: All work scheduled by the Contractor shall be planned with the consent of the Resident Engineer and shall not in any way interfere with the Plant service unless consent is given by the authorized representatives of the Purchaser.

Damage to existing utilities caused by this Contractor shall be repaired promptly in a manner as directed by the Purchaser. The cost of such repairs shall be borne by the Contractor. The Contractor will be allowed extra compensation for such repair only if in the judgment of the Resident Engineer such damage was not caused through any negligence on his part.

COST BREAKDOWN: The Contractor shall furnish the Engineer, within 30 days after award of Contract, a cost breakdown of the project covering the labor and materials included in the lump sum price under each item of the Proposal. The Engineer must approve this estimate before the first monthly invoice is submitted for payment.

The breakdown shall itemize the cost of each of the special appurtenances and equipment, complete with quantities, unit prices, labor, bond, etc. The Contractor shall use care in determining that the various items listed in the cost breakdown are realistic. If the Engineer feels the information on the breakdown is inadequate or insufficient in detail, the Contractor shall supply the requested additional information.

EQUIPMENT DRAWINGS: Preliminary drawings showing principal dimensions of the equipment shall be submitted with the bidder's Proposal at the time bids are opened. All drawings submitted shall be identified with the following data: Purchaser's name, plant and unit designation, Contract number, specification item number if applicable, Contractor's name and Contractor's job reference number. Six folded copies of each drawing required to show detailed arrangements of equipment, foundation plans, foundation bolt locations, pipe connection locations, principal dimensions and wiring shall be submitted by the Contractor to the Engineer for approval as soon as possible after the Contract is awarded. One copy of all drawings shall be sent directly to the Purchaser. If the drawings are approved by the Engineer, five folded copies of each drawing will be kept for construction purposes and one copy bearing the Engineer's approval will be returned to the Contractor. If the drawings are not approved, one copy showing the reasons for disapproval will be returned to the Contractor, who shall make corrections as required and shall then submit six copies of the corrected drawings to the Engineer and one copy to the Purchaser. After the drawings have been approved, four additional copies of the drawings and one duPont photographic washoff, reproducible mylar #1HR4 shall be provided for final distribution. Approval of all detailed drawings must be accomplished in the time agreed to in the Proposal and before shipment of any material from the factory. Failure of the Contractor to have the necessary drawings approved within this time will be construed as a guarantee by the Contractor that the drawings submitted with his Proposal are correct and may be used for construc-

tion purposes. In the event that increased construction costs are incurred through the use of approved drawings, or drawings submitted with the Contractor's Proposal, if the drawings for approval are not submitted as outlined above, and failure of equipment furnished to match such drawings; such costs shall be borne by the Contractor and deducted from his final payment. Drawings other than schematics shall be made to scale. All drawings necessary for design, installation and operation shall be submitted as above outlined.

Approval of any drawings by the Engineer will not relieve the Contractor of responsibility for the accuracy and correctness of his work or for the construction and successful performance of the equipment furnished by him. Upon request, the Engineer will submit copies of his drawings for the installation of equipment to the manufacturer for his comments and suggestions.

SHOP DRAWINGS: The Contractor shall prepare in a neat and workmanlike manner, placement drawings and shop details for all material and equipment furnished under this Contract. All drawings submitted shall be identified with the following data: Purchaser's name, plant and unit designation, Contract number, specification item number if applicable, Contractor's name and Contractor's job reference number. These drawings shall be CHECKED by the Contractor before being submitted to the Engineer. After being checked, these drawings shall be folded and then submitted to the Engineer in triplicate for his approval in an expeditious manner after the Contract is awarded. One print will be returned to the Contractor either approved, approved as noted, or returned for correction. When corrections or changes on returned prints are required to be made by the Contractor, the corrected sets shall again be submitted to the Engineer for final approval. Upon approval, the Contractor shall furnish eight copies of the approved prints to the Engineer. Approval of any drawings by the Engineer will not release the Contractor of responsibility for the accuracy and correctness of his work.

SPECIFICATIONS AND DRAWINGS: The Contractor shall keep at the job site a copy of the drawings and specifications and shall at all times give the Purchaser and the Engineer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of differences between drawings and specifications, the specifications shall govern. In any case of discrepancy, either in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Engineer, who shall promptly make a determination in writing. Any adjustment by the Contractor without this determination shall be at his own risk and expense. The Engineer shall furnish from time to time such detail drawings and other information as he may consider necessary, unless otherwise provided.

REPAIR AND/OR REPLACEMENT OF DEFECTIVE PORTIONS: The Contractor shall be responsible for a period of one year from and after the date of acceptance by the Purchaser of the work covered by this Contract, for any repairs or replacements caused by defective materials, workmanship or equipment which in the judgment of the Engineer shall become necessary during such period. If certain portions are shown to be defective within the original warranty period, then the warranty period on those portions shall be extended one year from and after such time

that all defects are corrected. The Contractor shall undertake with due diligence to make the aforesaid repairs and/or replacements within ten days after receiving written notice that such repairs or replacements are necessary. If the Contractor should fail to begin such repairs or replacements within this period or in case of emergency, where in the judgment of the Engineer delay would cause serious loss or damage, the repairs and/or replacements may be made by the Purchaser and charged to the Contractor.

The Contractor warrants to the Purchaser that the work of this Contract will be free from defects in material, workmanship and title and will meet the specifications contained in the Contract of Sale.

LABORATORY TESTS: Upon request the Contractor shall make available samples of material furnished under this Contract for testing in a laboratory to be selected and paid for by the Owner.

TEMPORARY FIRE PROTECTION: This Contractor shall furnish temporary portable fire protection equipment for his own work during the progress of construction.

ORDINANCES: The Contractor shall conduct his work to conform to all municipal, state and national regulations affecting his work. All requirements affecting drayage, loading, hoisting, etc., shall be strictly adhered to.

CONTRACTOR'S ESTIMATED PAYMENT SCHEDULE: In order to provide the Purchaser with an accurate cash flow requirement for the total project, this Contractor shall submit an estimate of the payments which will become due in each month for the work which has been specified herein. The first schedule shall be submitted within 30 days after the date of contract award. In the event of any anticipated change in payments, the Contractor will be required to update the Payment Schedule on a monthly basis on forms provided by the Engineer. One copy shall be submitted to the office of the Engineer, one copy to the Resident Engineer and two copies shall be submitted to the Purchaser.

ACCESS ROADS: This Contractor shall use designated roads for access to the construction site. Employees of the Contractor shall park in areas assigned by the Resident Engineer. This Contractor shall not disturb any existing vegetation without the permission of the Resident Engineer.

CORRESPONDENCE: The Contractor shall send one copy of all correspondence with the Engineer to the Purchaser's Director of Production Planning and to the Resident Engineer. The Engineer is to receive two copies and Resident Engineer is to receive one copy each of all correspondence sent to the Purchaser by the Contractor. The Contractor shall submit in duplicate all correspondence addressed to the Engineer.

The Contractor warrants to the Purchaser that the work of this Contract will be free from defects in material, workmanship and title and will meet the specifications contained in the Contract of Sale.

STORAGE OF MATERIALS: The Contractor shall be responsible for the proper care and protection of his materials, equipment, etc., delivered to and stored at the site and materials and equipment that may be furnished to him by the Owner for installation under these specifications until the project is accepted. Materials and equipment furnished by the Owner shall be clear of all construction operations, except during the installation period. All material shall be protected from damage by weather or other possible damage. All material which is to be used in the construction shall be in first-class condition when placed or it will not be acceptable.