PROJECT MANUAL

FOR

THE TOWN OF ROUND TOP

WASTEWATER TREATMENT PLANT INCREASE TO 36,000 GALLONS/DAY

PURSUANT TO TPDES PERMIT NO. WQ0015025001

MARCIA LANE

ROUND TOP, TEXAS

Weishuhn Engineering, Inc. R.F. #66
425 Spring St #102
PO Box 358
Columbus Texas 78934
February 23, 2024

WEISHUHN ENGINEERING, INC.
ENVIRONMENTAL & ENGINEERING SOLUTIONS

TABLE OF CONTENTS

Item	Page
Advertisement and Invitation for Bids	1
Instructions to Bidders for Project	2
Standard Form of Agreement	6
Bid Form	7
General Contract Conditions for Construction	8
Bid Bond	20
Payment Bond	22
Performance Bond	24
Supplementary Conditions	26
01110 Summary of Work	30
01145 Use of Premises	32
01255 Change Order Procedures	36
01270 Measurement and Payment	41
01326 Construction Schedule	44
01330 Submittal Procedures	47
01504 Temporary Facilities and Controls	51
01576 Waste Material Disposal	60
01731 Cutting and Patching	62
01755 Starting Systems	65
01770 Closeout Procedures	67
01785 Project Record Document	70
02085 Valve Boxes, Meter Boxes & Meter Vaults	72
03315 Concrete for Utility Construction	75
06100 General Electrical Requirements	91
06119 Wire	100
06126 Secondary grounding	108
06129 Supporting Devices	112
06133 Conduit	114
06135 Boxes	122
06153 Electrical Identification	125
06226 Wiring Devices	130
07001 Intruder-Resistant Fence	133
07002 Barb Wire Fence	136

END OF TABLE OF CONTENTS

STATE OF TEXAS
JAMES W. WEISHUHN
69128
LICENSED
PROFESSIONAL ENGINEER

James W. Weishuhn
2-28-2024
F-66

Construction

Advertisement and Invitation for Bids

The Town of Round Top will receive bids for Wastewater Treatment Plant Increase to 36,000 GPD until 12:00 p.m. on Friday, April 5, 2024 at the Town of Round Top Office, 202 N. Live Oak Street, Round Top, Texas, 78954. The bids will be publicly opened and read aloud immediately following the bid receipt deadline.

Bids are invited for several items and quantities of work as follows:

1. 9,000 gallon per day biological wastewater treatment unit;
2. Filter bed piping replacement;
3. Associated piping, fitting and valves;
3. Automated rain gauge.
4. Electrical connections for a mobile electric generator; and
5. Fencing.

A Non-Mandatory Pre-bid Conference will be held on Tuesday, March 12, 2024 at 10:00 a.m. at the wastewater treatment plant, Marcia Lane, Round Top, Texas.

Electronic copies of Bid/Contract Documents, including Drawings and Technical Specifications are available on CIVCAST.

A bid bond in the amount of 5 percent of the bid issued by an acceptable surety shall be submitted with each bid. A certified check or bank draft payable to the Town of Round Top or negotiable U.S. Government Bonds (as par value) may be submitted in lieu of the Bid Bond.

The Town of Round Top reserves the right to reject any or all bids or to waive any informality in the bidding.

Bids may be held by the Town of Round Top for a period not to exceed 60 days from the date of the bid opening for the purpose of reviewing the bids and investigating the bidder's qualifications prior to the contract award. Submit bids in sealed envelopes marked **Wastewater Treatment Plant Increase to 36,000 GPD** in person by 12:00 p.m. on Friday, April 5, 2024 at the Town of Round Top Office, 202 N. Live Oak St, Round Top Texas.

Weishuhn Engineering, Inc. James W. Weishuhn, P.E. Consulting Engineer February 28, 2024

INSTRUCTION TO BIDDERS
FOR CONSTRUCTION

1. Use of Separate Bid Forms

These contract documents include a complete set of bid and contract forms which are for the convenience of the bidders. Print and complete the Bid Form and the Bid Bond to complete your project bid.

2. Interpretations or Addenda

No oral interpretations will be made to any bidder. Each request for an interpretation shall be made in writing to the Engineer no less than seven (7) days prior to the bid opening. Each interpretation made will be in the form of an Addendum to the contract documents and will be distributed to all parties holding contract documents no less than five (5) days prior to the bid opening. It is, however, the bidder's responsibility to make inquiry as to any addenda issued. All such addenda shall become part of the contract documents and all bidders shall be bound by such addenda, whether or not received by the bidders.

3. Non-Mandatory Pre-bid Conference

Bidders may attend a non-mandatory Pre-bid conference on Tuesday, March 12, 2024 at 10:00 a.m. at the wastewater treatment plant, Marcia Lane, Round Top, TX. Bidders will sign-in to demonstrate attendance.

4. Inspection of Site

Each bidder should visit the site of the proposed work and fully acquaint themselves with the existing conditions there and should fully inform himself as to the facilities involved, the difficulties and restrictions attending the performance of the contract. The bidder should thoroughly examine and familiarize himself with the drawings, technical specifications and all other contract documents. The contractor by the execution of the contract shall in no way be relieved of any obligation under it due to his failure to receive or examine any form or legal document or to visit the site or acquaint himself with the conditions there existing. The Town of Round Top will be justified in rejecting any claim based on lack of inspection of the site prior to the bid.

5. Alternate bid items

No alternate bids or bid items will be considered unless they are specifically requested by the technical specifications or drawings.

6. Bids

a. All bids must be submitted on the forms provided and are subject to all requirements of the Contract Documents, including the Drawings.

b. All bids must be regular in every respect and no interlineation, excisions or special conditions may be made or included by the bidder.

c. Bid documents, including the bid, the bid bond, and the statement of bidders'

qualifications shall be sealed in an envelope and clearly labeled with the words "Bid Documents", the project number, name of bidder and the date and time of bid opening.

d. The Town of Round Top, Texas may consider as irregular any bid on which there is an alteration of or departure from the bid form and, at its option, may reject any irregular bid.

e. If a contract is awarded, it will be awarded to a responsible bidder on the basis of the lowest/best bid and/or qualifications and the selected alternate bid items, if any. The contract will require the completion of the work in accordance with the contract documents.

7. Bid Modifications Prior to Bid Opening (Not Applicable This Contract)

a. Any bidder may modify his bid by telegraphic communication at any time prior to the scheduled closing time for receipt of bids, provided such telegraphic communication is received by the Town of Round Top, Texas prior to the closing time, and provided further, the Town of Round Top, Texas is satisfied that a written confirmation of the telegraphic modification over the signature of the bidder was mailed prior to the closing time. The telegraphic communication should not reveal the bid price but should provide the addition, subtractions or other modifications so that the final prices or terms will not be known by the Town of Round Top, Texas until the sealed bid is open. If written confirmation is not received within two (2) days from the closing time, no consideration will be given to the telegraphic modification.

b. Likewise, any bidder may modify a bid by submitting a supplemental bid in person prior to the scheduled closing time for receipt of bids. Such supplemental bid should mention only additions or subtractions to the original bid so as to not reveal the final prices or terms to the Town of Round Top until the sealed bid is open.

8. Statement of Bidders Qualifications

Each bidder shall submit a statement of the bidder's qualifications. The Town of Round Top, Texas shall have the right to take such steps as it deems necessary to determine the ability of the bidder to perform his obligations under the contract, and the bidder shall furnish the Town of Round Top, Texas all such information and data for this purpose as it may request. The right is reserved to reject any bid where an investigation of the available data does not satisfy the Town of Round Top, Texas that the bidder is qualified to carry out properly the terms of the contract.

9. Unit Price

The unit price for each of the several items in the bid shall include its pro rata share of overhead so that the sum of the products obtained by multiplying the quantity shown for each item by the unit price bid represents the total bid. Any bid not conforming to this requirement may be rejected as informal. Special attention is drawn to this condition, as the unit prices will be used to determine the amount of any change orders resulting from an increase or decrease in quantities.

10. Corrections:

Erasures or other corrections in the bid must be noted over the signature of the bidder.

11. Time for Receiving Bids (Not Applicable This Contract)

Bids received prior to the advertised hour of opening shall be kept securely sealed. The officer appointed to open the bids shall decide when the specified time has arrived and no bid received thereafter will be considered; except that when a bid arrives by mail after the time fixed for opening, but before the reading of all other bids is completed, and it is shown to the satisfaction of the Town of Round Top that the late arrival of the bid was solely due to delay in the mail for which the bidder was not responsible, such bid will be received and considered.

12. Opening of Bids

The Town of Round Top, Texas shall, at the time and place fixed for the opening of bids, open each bid and publicly read it aloud, irrespective of any irregularities therein. Bidders and other interested individuals may be present.

13. Withdrawal of Bids (Not Applicable This Contract)

Bidder may withdraw the bid before the time fixed for the opening of bids, by communicating his purpose in writing to the locality. Upon receipt of such notice, the unopened bid will be returned to the bidder. The bid guaranty of any bidder withdrawing his bid will be returned promptly.

14. Award of Contract/Rejection of Bids

a. The contract will be awarded to the responsive, responsible and best qualified Bidder submitting the lowest/best bid. The bidder selected will be notified at the earliest possible date. The Town of Round Top, Texas reserves the right to reject any or all bids and to waive any informality in bids received where such rejection or waiver is in its interest.

b. The Town of Round Top, Texas reserves the right to consider as unqualified to do the work any bidder who does not habitually perform with his own forces the major portions of the work involved in construction of the improvements embraced in this contract.

15. Execution of Agreement/Performance and Payment Bonds

a. Performance and Payment Bonds, Requires all prime contractors which enter into a formal contract in excess of $25,000 with the State, any department, board, agency, municipality, county, school district or any division or subdivision thereof, to obtain a Payment Bond in the amount of the contract before commencing with work and a performance bond for public works contracts in excess of $100,000.

b. The failure of the successful bidder to execute the agreement and supply the required bonds within ten (10) days after the prescribed forms are presented for signature, or within such extended period as the Town of Round Top, Texas may grant, shall

constitute a default and the Town of Round Top, Texas may, at its option either award the contract to the next lowest responsible bidder, or re-advertise for bids. In either case, the Town of Round Top, Texas may charge against the bidder the difference between the amount of the bid, and the amount for which a contract is subsequently executed irrespective of whether this difference exceeds the amount of the bid bond. If a more favorable bid is received through re-advertisement, the defaulting bidder shall have no claim against the Town of Round Top, Texas for a refund.

16. Equal Employment Opportunity

Attention is called to the requirements for ensuring that employees and applicants for employment are not discriminated against because of their race, color, creed, sex, gender, or national origin.

17. Sales Tax

Bidders should not include sales tax in their bid prices for materials purchased and installed for this project. The Town of Round Top, Texas will issue a Texas Sales and Use Tax Exemption Certificate to the successful bidder.

18. BID GUARANTEE

Each bidder shall furnish a bid guarantee equivalent to five percent of the bid price (Water Code17.183). If a bid bond is provided, the contractor shall utilize a surety company which is authorized to do business in Texas in accordance with Art 7.19-1. Bond of Surety Company; Chapter of Insurance Code.

The Town of Round Top, Texas

STANDARD FORM OF AGREEMENT
FOR OWNER-CONTRACTOR PROJECTS

STATE of TEXAS }

FAYETTE COUNTY }

THIS AGREEMENT, made and entered into this _____A.D. 2024 by and between The Town of Round Top, Texas of the County of Fayette in the State of Texas, thereunto duly authorized so to do, Party of the First Part, hereinafter termed OWNER, and contractor _____, of _____, Texas, of the County of _____ County in the State of Texas. Party of the Second Part, hereinafter termed CONTRACTOR.

WITNESSETH: That for and inconsideration of the payments and agreements hereinafter mentioned, to be made and performed by the Party of the First Part (OWNER) and under the conditions expressed in the bond bearing even date herewith, the said Party of the Second Part (CONTRACTOR), hereby agrees with the said Party of the First Part (OWNER) to commence and complete the construction of certain improvements described as follow:

Wastewater Treatment Plant Increase to 36,000 Gallons/Day; Marcia Lane for the Town of Round Top, Texas; Contract Amount: _____

and all extra work in connection therewith, under the terms as stated in the General Conditions of the Agreement and at his (or their) own proper cost and expense to furnish all materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said construction, in accordance with the Notice to Contractors, General and Special Conditions of Agreement, Plans and other drawings and printed or written explanatory matter thereof, and the Specifications and addenda numbered:_____ therefore, as prepared by Weishuhn Engineering, Inc, herein entitled the ENGINEER, each of which has been identified by the CONTRACTOR and the ENGINEER, together with the CONTRACTOR'S written proposal, the General Conditions of the Agreement, the Performance and Payment Bonds hereto attached; all of which are made a part hereof and collectively evidence and constitute the entire contract.

The CONTRACTOR hereby agrees to commence work within ten (10) calendar days after the date written notice to do so shall have been given to him, and to substantially complete in 120 days from date of contract, subject to such extensions of time as are provided by the General and Special Conditions.

The OWNER agrees to pay the CONTRACTOR in current funds the price or prices shown in the proposal, which forms a part of this contract, such payments to be subject to the General and Special Conditions of the contract.

IN WITNESS WHEREOF, the parties to these presents have executed this Agreement in the year and day first above written.

_____ ----------
Party of the First Part (OWNER) Party of the Second Part (CONTRACTOR)

By: ---------- By: ----------

ATTEST: ---------- ATTEST: ----------

Bid Form
Wastewater Treatment Plant Increase to 36,000 Gallons/Day, Marcia Lane
The Town of Round Top, Texas

Item	Description	Qty.	Unit	Unit Price	Total Price
1	Performance and Payment Bonds	1	LS		
2	Extended Air Aerobic Treatment Unit Rated for 9,000 gpd & 15 lb/day BOD_5, including crane to set tank, complete in place	1	LS		
3	Associated treatment unit piping and electrical, complete in place	1	LS		
4	Sand Filter Bed Header, Pipe Installation and Distribution Piping Installation for Four Filter Beds, Complete In Place	1	LS		
5	Automated Rain Gage, Complete In Place	1	LS		
6	Main Disconnect, Electrical Wire, Conduit, Manual Transfer Switch for Mobile Electric Generator and Blowers, Complete In Place	1	LS		
7	12" Thick Aggregate Pad And Driveway For Mobile Generator, Complete-In-Place	100	SY		
8	Treatment Plant Intruder Resistant Fencing with Gates, Complete In Place	550	LF		
9	Alternate Bid Item – 5 Strand Barb Wire Perimeter Fencing with Gates, Complete In Place	1,020	LF		
10	Alternate Bid Item – Six foot Height Wood Privacy Fence With Gates, (4"x4" Treated Posts @ 10' C-C W/ 2"X4" Runners Top & Bottom, And 1"X6"X6' Western Cedar Boards), Complete In Place	1,020	LF		
Total Bid Without Alternate Bid Items					

(Company Name)

(Signature of Representative) (Date)

Subcontractors Proposed for Project

1. **Contractor must be substantially complete with work in 120 days from date of contract.**

Addenda Acknowledgement

(Signature of Representative) ***Addenda Number***

GENERAL CONTRACT CONDITIONS FOR CONSTRUCTION

1. Contract and Contract Documents

(a) The project to be constructed pursuant to this contract is subject to all applicable Federal and State laws and regulations.

(b) The Plans, Specifications and Addenda, hereinafter shall form part of this contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth.

2. Definitions

Whenever used in any of the contract Documents, the following meanings shall be given to the terms here in defined:

(a) The term "Contract" means the Contract executed between the Town of Round Top, Texas (Round Top), hereinafter called the Owner and (Name of Construction Co.), hereinafter called Contractor, of which these GENERAL CONDITIONS, form a part.

(b) The term "Project Area" means the area within which the specified Contract limits of the Improvements contemplated to be constructed in whole or in part under this contract.

(c) The term "Engineer" means Weishuhn Engineering, Inc., Engineer in charge, serving the Owner with architectural or engineering services, his successor, or any other person or persons, employed by the Owner for the purpose of directing or having in charge the work embraced in this Contract.

(d) The term "Contract Documents" means and shall include the following: Executed Contract, Addenda (if any), Invitation for Bids, Instructions to Bidders, Signed Copy of Bid, General Conditions, Supplementary Conditions, Technical Specifications, and Drawings (as listed in the Schedule of Drawings).

3. Supervision By Contractor

(a) Except where the Contractor is an individual and gives his personal supervision to the work, the Contractor shall provide a competent superintendent, satisfactory to the owner and the Engineer, on the work at all times during working hours with full authority to act for him. The Contractor shall also provide an adequate staff for the proper coordination and expediting of his work.
(b) The Contractor shall lay out his own work and he shall be responsible for all work executed by him under the Contract. He shall verify all figures and elevations before proceeding with the work and will be held responsible for any error resulting from his failure to do so.

4. Subcontracts

(a) The Contractor shall not execute an agreement with any subcontractor or permit any subcontractor to perform any work included in this contract until he has notified Round Top.

(b) No proposed subcontractor shall be disapproved by the Round Top except for cause.

(c) The Contractor shall be as fully responsible to the Round Top for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by the contractors.

(d) The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work and required compliance by each subcontractor with the applicable provisions of the Contract.

(e) Nothing contained in the Contract shall create any contractual relation between any subcontractor and the Owner.

5. Fitting and Coordination of Work

The Contractor shall be responsible for the proper fitting of all work and for the coordination of the operations of all trades, subcontractors, or material suppliers engaged upon this Contract.

6. Termination, Delays, and Liquidated Damages

(a) Right of the Owner to Terminate Contract.

(b) In the event that any of the provisions of this contract are violated by the Contractor, or by any of his subcontractors, the Owner may serve written notice upon the Contractor and the Surety of its intention to terminate the contract. The notices shall contain the reasons for such intention to terminate the contract, and unless such violation or delay shall cease and satisfactory arrangement of correction be made within ten days, the contract shall, upon the expiration of said ten (10) days, cease and terminate. In the event of any such termination, the Owner shall immediately serve notice thereof upon the Surety and the Contractor. The Surety shall have the right to take over and perform the contract. Provided, however, that if the Surety does not commence performance thereof within ten (10) days from the date of the mailing to such Surety of notice of termination, the Owner may take over the work and complete the project by bid/contract or by force account at the expense of the Contractor and his Surety shall be liable to the Owner for any excess cost incurred. In such event the Owner may take possession of and utilize in completing the work, such materials, appliances, and plant as may be on the site of the work and necessary therefore.

(c) Liquidated Damages for Delays.

(d) If the work is not completed within the time stipulated in the applicable bid for Lump Sum or Unit Price Contract provided, the Contractor shall pay to the Owner as fixed, agreed, and liquidated damages (it being impossible to determine the actual damages occasioned by the delay) the amount of $500.00 for each calendar day of delay, until the work is completed. The Contractor and his sureties shall be liable to the Owner for the amount thereof.

(e) Excusable Delays.

1) The right of the Contractor to proceed shall not be terminated nor shall the Contractor be charged with liquidated damages for any delays in the completion of the work due to:

2) Any acts of the Government, including controls or restrictions upon or requisitioning of materials, equipment, tools, or labor by reason of war, national defense, or any other national emergency;

3) Any acts of the Owner;

4) Causes not reasonably foreseeable by the parties to this Contract at the time of the execution of the Contract which are beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God or of the public enemy, acts of another Contractor in the

performance of some other contract with the Owner, fires, floods, epidemics, quarantine, restrictions, strikes, freight embargoes, and weather of unusual severity such as hurricanes, tornadoes, cyclones and other extreme weather conditions.

5) Provided, however, that the Contractor promptly notifies the Owner within ten (10) days in writing of the cause of the delay. Upon receipt of such notification, the Owner shall ascertain the facts and the cause and extent of delay. If, upon the basis of the facts and the terms of this contract, the delay is properly excusable, the Owner shall extend the time for completing the work for a period of time commensurate with the period of excusable delay.

7. Assignment or Novation

The Contractor shall not assign or transfer, whether by an assignment or novation, any of its rights, duties, benefits, obligations, liabilities, or responsibilities under this Contract without the written consent of the Owner; provided, however, that assignments to banks or other financial institutions may be made without the consent of the Owner (if for payment). No assignment or novation of this Contract shall be valid.

8. Disputes

(a) All disputes arising under this Contract or its interpretation except those disputes covered by FEDERAL LABOR STANDARDS PROVISIONS whether involving law or fact or both, or extra work, and all claims for alleged breach of contract shall, within ten (10) days of commencement of the dispute, be presented by the Contractor to the Owner for decision. Any claim not presented within the time limit specified in this paragraph shall be deemed to have been waived, except that if the claim is of a continuing character and notice of the claim is not given within ten (10) days of its commencement, the claim will be considered only for a period commencing ten (10) days prior to the receipt of the Owner.

(b) The Contractor shall submit in detail his claim and his proof thereof.

(c) If the Contractor does not agree with any decision of the Owner, he shall in no case allow the dispute to delay the work but shall notify the Owner promptly that he is proceeding with the work under protest.

9. Technical Specifications and Drawings

Anything mentioned in the Technical Specifications and not shown on the Drawings or vice versa, shall be of like effect as if shown on or mentioned in both. In case of difference between Drawings and Technical Specifications, the Drawings shall govern. In case of any discrepancy in Drawings, or Technical Specifications, the matter shall be immediately submitted to the Owner, without whose decision, said discrepancy shall not be adjusted by the Contractor, save only at his own risk and expense.

10. Shop Drawings

(a) All required shop drawings, machinery details, layout drawings, etc. shall be submitted to the Engineer in 3 copies, or by electronic mail for approval sufficiently in advance of requirements to afford ample time for checking, including time for correcting, resubmitting and rechecking if necessary. The Contractor may proceed, only at his own risk, with manufacture or installation of any equipment or work covered by said shop drawings, etc. until they are approved and no claim, by the Contractor, for extension of the contract time shall be granted by reason of his failure in this

respect.

(b) Any drawings submitted without the Contractor's stamp of approval will not be considered and will be returned to him for proper resubmission. If any drawings show variations from the requirements of the Contract because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment of contract price and/or time, otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract even though the drawings have been approved.

(c) If a shop drawing is in accordance with the contract or involves only a minor adjustment in the interest of the Owner not involving a change in contract price or time; the engineer may approve the drawing. The approval shall not relieve the Contractor from his responsibility for adherence to the contract or for any error in the drawing.

11. Requests for Supplementary Information

It shall be the responsibility of the Contractor to make timely requests of the Owner for any additional information not already in his possession which should be furnished by the Owner under the terms of this Contract, and which he will require in the planning and execution of the work. Such requests may be submitted from time to time as the need approaches, but each shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay. Each request shall be in writing, and list the various items and the latest date by which each will be required by the Contractor. The first list shall be submitted within two weeks after Contract award and shall be as complete as possible at that time. The Contractor shall, if requested, furnish promptly any assistance and information the Engineer may require in responding to these requests of the Contractor. The Contractor shall be fully responsible for any delay in his work or to others arising from his failure to comply fully with the provision of this section.

12. Materials and Workmanship

(a) Unless otherwise specifically provided for in the technical specifications, all workmanship, equipment, materials and articles incorporated in the work shall be new and the best grade of the respective kinds for the purpose. Where equipment, materials, articles or workmanship are referred to in the technical specifications as "equal to" any particular standard, the Engineer shall decide the question of equality.

(b) The Contractor shall furnish to the Owner for approval the manufacturer's detailed specifications for all machinery, mechanical and other special equipment, which he contemplates installing together with full information as to type, performance characteristics, and all other pertinent information as required, and shall likewise submit for approval full information concerning all other materials or articles which he proposes to incorporate.

(c) Machinery, mechanical and other equipment, materials or articles installed or used without such prior approval shall be at the risk of subsequent rejection.

(d) Materials specified by reference to the number or symbol of a specific standard, shall comply with requirements in the latest revision thereof and any amendment or supplement thereto in effect on the date of the Invitation for Bids, except as limited to type, class or grade, or modified in the technical specifications shall have full force and effect as though printed therein.

(e) The Owner may require the Contractor to dismiss from the work such employee or employees

as the Owner or the Engineer may deem incompetent, or careless, or insubordinate.

13. Samples, Certificates and Tests

(a) The Contractor shall submit all material or equipment samples, certificates, affidavits, etc., as called for in the contract documents or required by the Engineer, promptly after award of the contract and acceptance of the Contractor's bond. No such material or equipment shall be manufactured or delivered to the site, except at the Contractor's own risk, until the required samples or certificates have been approved in writing by the Engineer. Any delay in the work caused by late or improper submission of samples or certificates for approval shall not be considered just cause for an extension of the contract time.

(b) Each sample submitted by the Contractor shall carry a label giving the name of the Contractor, the project for which it is intended, and the name of the producer. The accompanying certificate or letter from the Contractor shall state that the sample complies with contract requirements, shall give the name and brand of the product, its place of origin, the name and address of the producer and all specifications or other detailed information which will assist the Engineer in making a prompt decision regarding the acceptability of the sample. It shall also include the statement that all materials or equipment furnished for use in the project will comply with the samples and/or certified statements.

(c) Approval of any materials shall be general only and shall not constitute a waiver of the Owner's right to demand full compliance with Contract requirements. After actual deliveries, the Engineer will have such check tests made as he deems necessary in each instance and may reject materials and equipment and accessories for cause, even though such materials and articles have been given general approval. If materials, equipment or accessories which fail to meet check tests have been incorporated in the work, the Engineer will have the right to cause their removal and replacement by proper materials or to demand and secure such reparation by the Contractor as is equitable.

(d) Except as otherwise specifically stated in the Contract, the costs of sampling and testing will be divided as follows:

The Contractor shall furnish required testing and test reports without extra cost, including packing and delivery charges, all samples
required for testing purposes, except those samples taken on the project by the Engineer;

2) The Contractor shall assume all costs of re-testing materials, which fail to meet contract requirements;

3) The Contractor shall assume all costs of testing materials offered in substitution for those found deficient;

4) The Owner will pay all other expenses.

14. Permits and Codes

(a) The Contractor shall give all notices required by and comply with all applicable laws, ordinances, and codes of the Local Government. All construction work and/or utility installations shall comply with all applicable ordinances, and codes including all written waivers. Before installing any work, the Contractor shall examine the drawings and technical specifications for compliance with applicable ordinances and codes and shall immediately report any discrepancy to

the Owner. Where the requirements of the drawings and technical specifications fail to comply with such applicable ordinances or codes, the Owner will adjust the Contract by Change Order to conform to such ordinances or codes (unless waivers in writing covering the difference have been granted by the governing body or department) and make appropriate adjustment in the Contract Price or stipulated unit prices.

(b) Should the Contractor fail to observe the foregoing provisions and proceed with the construction and/or install any utility at variance with any applicable ordinance or code, including any written waivers (notwithstanding the fact that such installation is in compliance with the drawings and technical specifications), the Contractor shall remove such work without cost to the Owner.

(c) The Contractor shall at his own expense, secure and pay for all permits for street pavement, sidewalks, shed, removal of abandoned water taps, sealing of house connection drains, pavement cuts, buildings, electrical, plumbing, water, gas and sewer permits required by the local regulatory body or any of its agencies.

(d) The Contractor shall comply with applicable local laws and ordinances governing the disposal of surplus excavation, materials, debris and rubbish on or off the Project Area and commit no trespass on any public or private property in any operation due to or connected with the Improvements contained in this Contract.

(e) The Contractor will be required to make arrangements for and pay electrical power or any other utilities required during construction.

(f) During construction of this project, the Contractor shall use every means possible to control the amount of dust created by construction. Prior to the close of a day's work, the Contractor, if directed by the Owner, shall moisten the bank and surrounding area to prevent a dusty condition.

15. Care of Work

(a) The Contractor shall be responsible for all damages to person or property that occur as a result of his fault or negligence in connection with the prosecution of the work and shall be responsible for the proper care and protection of all materials delivered and work performed until completion and final acceptance.

(b) The Contractor at their discretion and cost, may provide sufficient competent watchmen.

(c) In an emergency affecting the safety of life, limb or property, including adjoining property, the Contractor, without special instructions or authorization from the Owner is authorized to act at his discretion to prevent such threatened loss or injury, and he shall so act. He shall likewise act if instructed to do so by the Owner.

(d) The Contractor shall avoid damage as a result of his operations to existing sidewalks, streets, curbs, pavements, utilities (except those which are to be replaced or removed), adjoining property, etc., and he shall at his own expense completely repair any damage thereto caused by his operations.

(e) The Contractor shall shore up, brace, underpin, secure, and protect as maybe necessary, all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be in any way affected by the excavations or other operations connected with the construction of the improvements included in this Contract. The Contractor shall be responsible for

the giving of any and all required notices to any adjoining or adjacent property owner or other party before the commencement of any work. The Contractor shall indemnify and save harmless the Owner from any damages on account of settlements or the loss of lateral support of adjoining property and from all loss or expense and all damages for which the Owner may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

16. Accident Prevention

(a) No laborer or mechanic employed in the performance of this Contract shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety as determined under construction safety and health standards promulgated by the Secretary of Labor.

(b) The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his prosecution of the work.

(c) The Contractor shall maintain an accurate record of all cases of death, occupational disease, or injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the Contract. The Contractor shall promptly furnish the Owner with reports concerning these matters.

(d) The Contractor shall indemnify and save harmless the Owner from any claims for damages resulting from property damage, personal injury and/or death suffered or alleged to have been suffered by any person as a result of any work conducted under this contract.

(e) The Contractor shall provide trench safety for all excavations more than five feet deep prior to excavation. All OSHA Standards for trench safety must be adhered to by the Contractor.

(f) The contractor shall at all times conduct his work in such a manner as to insure the least possible inconvenience to vehicular and pedestrian traffic. At the close of the work each day, all streets where possible in the opinion of the Owner, shall be opened to the public in order that persons living in the area may have access to their homes or businesses by the use of the streets. Traffic safety plans, barricades, warning signs, and necessary lighting shall be provided to the satisfaction of the Owner at the expense of the Contractor.

17. Sanitary Facilities

The Contractor shall furnish, install and maintain ample sanitary facilities for the workmen or may use the Town of Round Top's public restroom located on the south side of the town square. As the needs arise, a sufficient number of enclosed temporary toilets shall be conveniently placed as required. The Contractor will provide drinking water from an approved source, so piped or transported as to keep it safe and fresh and served from single service containers or satisfactory types of sanitary drinking stands or fountains. All such facilities and services shall be furnished in strict accordance with existing and governing health regulations.

18. Use of Premises

(a) **The Contractor shall confine his equipment, storage of materials, and construction operations to the contract limits as shown on the drawings,** and as prescribed by ordinances or permits, or as may be desired by the Owner, and shall not unreasonably encumber the site or public rights of way with his materials and construction equipment.

Storage or laydown may also be conducted at the wastewater treatment plant located at the dead end of Marcia Lane.

(b) The Contractor shall comply with all reasonable instructions of the Owner and all existing state and local regulations regarding signs, advertising, traffic, fires, explosives, danger signals, and barricades.

19. Removal of Debris, Cleaning, Etc.

The Contractor shall, periodically or as directed during the progress of the work, remove and legally dispose of all surplus excavated material and debris, and keep the Project Area and public rights of way reasonably clear. Upon completion of the work, he shall remove all temporary construction facilities, debris and unused materials provided for work, and put the whole site of the work and public rights of way in a neat and clean condition.

20. Inspection

(a) All materials and workmanship shall be subject to inspection, examination, or test by the Owner and Engineer at any and all times during manufacture or construction and at any and all places where such manufacture or construction occurs. The Owner shall have the right to reject defective material and workmanship or require its correction. Unacceptable workmanship shall be satisfactorily corrected. Rejected material shall be promptly segregated and removed from the Project Area and replaced with material of specified quality without charge. If the Contractor fails to proceed at once with the correction of rejected workmanship or defective material, the Owner may by contract or otherwise have the defects remedied or rejected materials removed from the Project Area and charge the cost of the same against any Monies which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.

(b) The Contractor shall furnish promptly all materials reasonably necessary for any tests which may be required. All tests by the Owner will be performed in such manner as not to delay the work unnecessarily and will be made in accordance with the provisions of the technical specifications.

(c) The Contractor shall notify the Engineer sufficiently in advance of backfilling or concealing any facilities to permit proper inspection. If any facilities are concealed without approval or consent of the Engineer, the Contractor shall uncover for inspection and recover such facilities at his own expense, when so requested by the Engineer.

(d) Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire work to make an examination of work already completed by uncovering the same, the Contractor shall on request promptly furnish all necessary facilities, labor, and material. If such work is found to be defective in any important or essential respect, due to fault of the Contractor or his subcontractors, the Contractor shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the actual cost of labor and material necessarily involved in the examination and replacement, shall be allowed the Contractor and he shall, in addition, if completion of the work of the entire Contract has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.

(e) Inspection of materials and appurtenances to be incorporated in the improvements included in this Contract may be made at the place of production, manufacture or shipment, whenever the quantity justifies it, and such inspection and acceptance, unless otherwise stated in the technical specifications, shall be final, except as regards (1) latent defects, (2) departures from specific

requirements of the Contract, (3) damage or loss in transit, or (4) fraud or such gross mistakes as amount to fraud. Subject to the requirements contained in the preceding sentence, the inspection of materials as a whole or in part will be made at the Project Site.

(f) Neither inspection, testing, approval nor acceptance of the work in whole or in part, by the Owner or its agents shall relieve the Contractor or his sureties of full responsibility for materials furnished or work performed not in strict accordance with the Contract.

21. Review by Owner

The Owner and its authorized representatives and agents shall have access to and be permitted to observe and review all work, materials, equipment, payrolls, personnel records, employment conditions, material invoices, and other relevant data and records pertaining to this Contract, provided, however that all instructions and approval with respect to the work will be given to the Contractor only by the Owner through its authorized representatives or agents.

22. Final Inspection

When the Improvements included in this Contract are substantially completed, the Contractor shall notify the Owner and Engineer in writing that the work will be ready for final inspection on a definite date which shall be stated in the notice. The Owner and Engineer will make the arrangements necessary to have final inspection commenced on the date stated in the notice, or as soon thereafter as is practicable.

23. Deduction for Uncorrected Work

If the Owner deems it not expedient to require the Contractor to correct work not done in accordance with the Contract Documents, an equitable deduction from the Contract Price will be made by agreement between the Contractor and the Owner and subject to settlement, in case of dispute, as herein provided.

24. Insurance

The Contractor shall not commence work under this contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner.

(a) Compensation Insurance: The Contractor shall procure and shall maintain during the life of this contract Worker's Compensation Insurance as required by the State of Texas for all of his employees to be engaged in work at the site of the project under this contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Worker's Compensation Insurance for all of the employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Worker's Compensation Insurance.

(b) Contractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance: The Contractor shall procure and shall maintain during the life of this contract Contractor's Public Liability Insurance, Contractor's Property Damage Insurance and Vehicle Liability Insurance in the following amounts: $1,000,000.00

(c) Proof of Insurance: The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates and date of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this

certificate will not be canceled or materially altered, except after ten (10) days written notice has been received by the Owner."

25. Warranty of Title

No material, supplies, or equipment to be installed or furnished under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale, lease-purchase or other agreement by which an interest is retained by the seller or supplier. The Contractor shall warrant good title to all materials, supplies, and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed by him to the Owner free from any claims, liens, or charges. Neither the Contractor nor any person, firm, or corporation furnishing any material or labor for any work covered by this Contract shall have any right to a lien upon any improvement or appurtenance. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this paragraph shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

26. Warranty of Workmanship and Materials

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use of the improvements included in this Contract by the Owner or the public shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting therefrom which shall appear within a period of 12 months from the date of final acceptance of the work.

27. Compliance with Air and Water Acts

(a) In compliance with the Clean Air Act, as amended, 41 U.S.C. Sec. 7401 et. seq., and the regulations of the Environmental Protection Agency with respect thereto, the Contractor agrees that:
1) Any facility to be utilized in the performance of this contract or any subcontract shall not be a facility listed on the EPA List of Violating Facilities pursuant to 40 CFR 15.20.

2) He will comply with all requirements of Section 114 of the Clean Air Act, as amended.

3) Materials utilized in the project shall be free of any hazardous materials, except as may be specifically provided for in the specifications.

(b) If the Contractor encounters existing material on sites owned or controlled by the Owner or in material sources that are suspected by visual observation or smell to contain hazardous materials, the Contractor shall immediately notify the Engineer and the Owner. The Owner will be responsible for testing for and removal or disposition of hazardous materials on sites owned or controlled by the Owner. The Owner may suspend the work, wholly or in part during the testing, removal or disposition of hazardous materials on sites owned or controlled by the Owner.

28. Affirmative Action for Workers with Disabilities

The Contractor will not discriminate against any employee or applicant for employment because of disability in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified individuals with disabilities without discrimination based upon their disability in all employment practices such as the following: employment, promotion, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

29. Section 109 of the Housing and Community Development Act of 1974

No person in the United States shall on the ground of race, color, national origin, or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this title.

30. The Provision of Local Training, Employment, and Business Opportunities

(a) To the greatest extent feasible opportunities for training and employment be given lower income residents of the project area and contracts for work in connection with the project be awarded to business concerns which are located in, or owned in substantial part by persons residing in the area of the project.

(b) The Contractor will include this clause in every subcontract for work in connection with the project.

31. Non Segregated Facilities

The Contractor certifies that he does not and will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not and will not permit his employees any segregated facilities at any of his establishments, or permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. As used in this paragraph the term "segregated facilities" means any waiting rooms, work areas, rest rooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise.

32. Job Offices

(a) The Contractor and his subcontractors may maintain such office and storage facilities on the site as are necessary for the proper conduct of the work. These shall be located so as to cause no interference to any work to be performed on the site. The Owner shall be consulted with regard to locations.

(b) Upon completion of the improvements, or as directed by the Owner, the Contractors shall remove all such temporary structures and facilities from the site, and leave the site of the work in the condition required by the Contract.

33. Partial Use of Site Improvements

The Owner may give notice to the Contractor and place in use those sections of the improvements which have been completed, inspected and can be accepted as complying with the technical specifications and if in its opinion, each such section is reasonably safe, fit, and convenient for the use and accommodation for which it was intended, provided:

(a) The use of such sections of the Improvements shall in no way impede the completion of the remainder of the work by the Contractor.

(b) The Contractor shall not be responsible for any damages or maintenance costs due directly to the use of such sections.

(c) The period of guarantee stipulated in the Section 29 hereof shall not begin to run until the date of the final acceptance of all work which the Contractor is required to construct under this Contract.

34. Contract Documents and Drawings

Round Top will furnish the Contractor, as requested, without charge 3 copies of the Contract Documents, including Technical Specifications and Drawings. Additional copies requested by the Contractor will be furnished at cost.

35. Contract Period

The work to be performed under this contract shall commence within the time stipulated by the Owner in the Notice to Proceed, and shall be fully completed within the date shown on the advertisement for bids. The Contractor must be substantially complete within 120 days following the notice to proceed.

36. Retainage

Retainage in the amount of 5% will be deducted from each contractor's invoice. Contractor will submit a single invoice for the total retainage amount after completion of the work and acceptance of the work by the Owner.

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned, _____ as PRINCIPAL, and_____, as SURETY are held and firmly bound unto_____ hereinafter called the "Owner", in the penal sum of _____ Dollars, ($ ____), lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the Accompanying Bid, dated _____ , for _____.

NOW, THEREFORE, if the Principal shall not withdraw said Bid within the period specified therein after the opening of the same, or, if no period be specified, within thirty (30) days after the said opening, and shall within the period specified therefore, or if no period be specified, within ten (10) days after the prescribed forms are presented to him for signature, enter into a written contract with the Owner in accordance with the Bid as accepted, and give bond with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such contract; or in the event of the withdrawal of said Bid within the period specified, or the failure to enter into such Contract and give such bond within the time specified, if the Principal shall pay the Owner the difference between the amount specified in said Bid and the amount for which the local Public Agency may procure the required work or supplies or both, if the latter be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS THEREOF, the above-bounded parties have executed this instrument under their several seals this_____ day of _____, 20___, the name and corporate seal of each corporate party being hereto affixed and these present signed by its undersigned representative, pursuant to authority of its governing body.

_____--
(SEAL)

_____
(SEAL)

Attest: By: _____

Affix
Corporate
Seal

Attest: By: _____

Affix
Corporate
Seal

Attest: By: _____

Countersigned

By

* Attorney-in-Fact, State of

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____ , certify that I am the Secretary of the Corporation named as Principal in the within bond; that_____, who signed the said bond on behalf of the Principal was then _____, of said corporation; that I know his/her signature, and his/her signature thereto is genuine; and that said bond was duly signed, sealed, and attested to, for and in behalf of said corporation by authority of this governing body.

Corporate Seal

_____

Title:

_____

* Power-of-attorney for person signing for surety company must be attached to bond.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor or Company)

_____
(Address)

A _____, hereinafter called Principal,
(Corporation / Partnership)

and _____
(Name of Surety Company)

_____
(Address)
hereinafter called Surety, are held and firmly bound unto

_____
(Name of Recipient)

_____
(Recipient's Address)

hereinafter called OWNER, in the penal sum of $ _____Dollars, $_____ in lawful money of the United States, for this payment of _____--which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONFIDENTIALITY OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, a copy of which is hereto attached and made a part hereof for the construction of:

_____
(Project Name)

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, SUB-CONTRACTORS, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK whether by SUB-CONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way

affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counter-parts, each on of (Number)
which shall be deemed an original, this the _____ day of _____ .

ATTEST: _____
(Principal)

By _____ (s)
(Principal Secretary)

(SEAL)

_____ _____
(Witness as to Principal) (Address)

(Address)

ATTEST: _____
(Surety)

By _____ _____
(Witness as to Surety) (Attorney in Fact)

_____ _____
(Address) (Address)

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____

(Name of Contractor or Company)

_____

(Address)

a _____ hereinafter called Principal, and

_____

(Name of Surety Company

_____

(Address)

hereinafter called Surety, are held and firmly bound unto

_____

(Name of Recipient)

_____

(Recipient's Address)

hereinafter called OWNER, in the penal sum of $_____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made we bind ourselves, successors, and assigns, jointly and severally, firmly in these presents.

THE CONDITION OF THIS OBBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER dated the _____day of_____ , a copy of which is hereto attached and made a part hereof for the construction of:

_____

NOW THEREFORE, if the Principal shall well, truly and faithfully perform its duties in all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____counterparts, each one of which shall be deemed an original, this the _____ day of _____.

ATTEST: _____
(Principal)

By _____ (s)
(Principal Secretary)

(SEAL)

_____ _____
(Witness as to Principal) (Address)

(Address)

ATTEST: _____
(Surety)

By _____ _____
(Witness as to Surety) (Attorney in Fact)

_____ _____

(Address) (Address)

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

SUPPLEMENTARY
CONDITIONS

1.0 LOCATION OF AND DAMAGE TO EXISTING UTILITIES

The Contractor shall exercise caution to prevent damage to existing facilities during the progress of the construction work, taking care to locate same, where possible, in advance of the actual Work. The Owner will render all assistance possible to the Contractor in the matter of determining the location of existing utilities by making available such maps, records and other information as may be accessible to him, when requested to do so, but the accuracy of such information will not be guaranteed. The Contractor shall make good all damage to existing utilities resulting from his operations.

2.0 UTILITIES FOR CONSTRUCTION

The Town of Round Top will provide electric power and water at no cost for the project.

3.0 RIGHT OF ENGINEER TO MODIFY METHODS AND EQUIPMENT

If at any time the Engineer finds that the methods or equipment used by the Contractor are inadequate to secure the quality of Work or the rate of progress required under this contract, the Engineer may, in writing, require the Contractor to improve the character-and efficiency and the Contractor shall comply with such requirements.

If at any time the working force of the Contractor is inadequate for securing the progress herein specified, the Contractor shall, if so notified in writing, increase his force or equipment, or both, to such an extent as to give reasonable assurance of compliance with the schedule of progress.

4.0 CONSTRUCTION OBSERVATION

There will be intermittent on-site construction observation during the contract.

5.0 CONTRACTOR'S DUTY

During his absence from the Work, the Contractor shall keep a superintendent or foreman upon the Work fully authorized to act for him in his absence and fully fluent in the English language. Any notice to the Contractor, when given to any superintendent, foreman or agent of the Contractor in charge of any operation of the Work in the absence of the Contractor, shall be considered as notice to the Contractor, provided any notice given under this paragraph shall be in writing. To ensure smoothness of work, the Contractor shall, use the same superintendent from start to finish, and in no case more than two. If the Contractor elects to change more than one superintendent, he must notify the Engineer in writing.

6.0 PROTECTION OF EXISTING AND ADJACENT PROPERTY

Existing facilities and permanent objects shall be adequately protected. Costs resulting from damage to property of owner or adjacent property due to negligence or lack of adequate protection shall be borne by Contractor.

7.0 TIME OF COMPLETION

1. The Contractor agrees to complete the Work within the time indicated in the Contract Documents. The Contractor shall begin the Work to be performed under this contract within 10 calendar days after the date of Notice to Proceed.
2. The Contractor's attention is invited to the fact that this is a calendar day contract.
3. Nothing in this item shall be construed as prohibiting the Contractor from working on Saturdays if he so desires; however, the Owner Representatives are not required to work on Saturdays, Sundays or legal holidays. Any Contractor doing work for the Owner under this contract who desires to work on Saturdays, Sundays or legal holidays shall notify the Engineer no later than 2:00 p.m. prior to the day of work so that an Owner Representative will be on the project.
4. Such Contractor requiring Owner Representative as set out above shall be required to pay to the Engineer a sum equal to his salary cost, plus 15%, plus expenses for such day of inspection.
5. In the event Contractor performs work on Saturday, Sunday or legal holiday without construction observation by Owner Representative, such Work shall, if directed by the Engineer, be removed and replaced by said Contractor before any acceptance is given, at no cost to the Owner.
6. No work will be permitted on Sunday except in the case of an extreme emergency and only after approval by the Owner.

8.0 CONDITIONS FOR FINAL PAYMENT

Contractor is advised that the Owner will not make final contract payment until all the Work has been approved and accepted by the Engineer, the Owner and all governmental agencies. The Owner will require the Contractor to furnish satisfactory evidence or payment in full for all materials, labor and equipment and to all subcontractors employed in the work prior to making final payment to the Contractor.

9.0 GUARANTEE

The Contractor shall deliver to the Engineer, upon completion of all Work under the Contract, his written guarantee, made out to the Owner and in form satisfactory to the Engineer, guaranteeing all of the Work under the Contract to be free from faulty materials in every particular, and free from improper workmanship, and against injury from proper and usual wear, and agreeing to replace or to re-execute without cost to the Owner such Work as may be found to be improper or imperfect, and to make good all damage caused to other Work or materials due to such required replacement or re-excavation. This guarantee shall be made to cover a period of one (1) year from the date of completion of all Work under this contract, as evidenced by the Engineer's final certificate. This

guarantee must be furnished to the Engineer and approved by him before acceptance and final payment is made.

10.0 ACCESS TO THE WORK

Access to the Work from existing roads shall be provided by the Contractor at his expense. The Owner assumes no responsibility for the conditions or maintenance of any existing road or structure thereon that may be used by the Contractor for performing the Work under these specifications. The cost of all Work described in this paragraph shall be included in the prices bid in the other items of Work.

11.0 STORAGE OF MATERIALS

No materials shall be stored nor shall any equipment be parked on adjacent property without the express consent of the owner of the property concerned. No materials shall be left overnight within the street or right-of-way.

12.0 BARRICADES AND WARNINGS

1. The safety of the public shall be regarded as of primary importance during construction. In all respects provisions for public safety shall be the Contractor's responsibility.
2. Should conditions be such that the public safety is involved, the Contractor shall provide warning lights which shall be kept burning between the hours of sunset and sunrise, and the Contractor shall maintain a watchman on the site during these hours and during all other hours in which work is not in progress. The watchman's primary responsibility shall be to maintain the lights and warnings. Barricades and warning shall be as approved by the Engineer.
3. Notify individual occupants and businesses in areas to be affected by the Work of the proposed construction and time schedule. Notification shall be 2 weeks prior to Work being performed. Engineer will be provided with a sample door hanger for approval showing form and content to be followed.

13.0 ACCIDENTS

The Contractor shall provide at the site such equipment and medical facilities as are necessary to supply first aid service to anyone who may be injured in connection with the Work. The Contractor must promptly report in writing to the Owner all accidents whatsoever arising out of, or in connection with, the performance of the Work, whether on or adjacent to the site, which caused death, personal injury, or property damages, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner. If any claim is made by anyone against the Contractor of subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Owner.

14.0 CLEAN-UP

The Contractor shall at all times keep the site and structures or facilities thereon free from accumulations of waste material, debris, or rubbish caused by his employees or work. No backfill material, pipe or waste material shall be left overnight. At the completion of the Work, he shall remove from the site all his tools, surplus materials and debris and shall leave the site and his work "broom clean" or its equivalent unless otherwise noted on the Drawings or specified herein.

15.0 TESTING

1. Contractor shall employ and pay for services of an independent testing laboratory to perform inspection and testing identified in individual Specification sections. The testing laboratory shall be approved by the Owner.
2. The Owner reserves the right to choose and employ an independent testing laboratory to perform any testing specified for this project.
3. Cement stabilized sand shall be tested per ASTM D1633 Compressive Strength of Molded Soil Cement Cylinders at the rate of one test for every 100 cubic yards of material or fraction thereof.
4. The Contractor shall furnish all sample materials and cooperate in the sampling and field testing activities. Contractor shall furnish personnel, equipment, and facilities to perform sampling and field testing and deliver samples and test specimens to the testing laboratory when so required by the specifications or owner.
5. The Engineer will receive 3 copies, and the Contractor will receive 2 copies of laboratory reports from the testing laboratory. One of the Contractor's copies shall remain at the site field office for the duration of the project. Test results which indicate non-conformance shall be transmitted immediately via fax from the testing laboratory to the Contractor and Engineer.

16.0 COORDINATION OF WORK OPERATIONS

The Contractor is responsible for coordinating his activity schedule and extending full cooperation to other contractors who have responsibilities either concurrent with, proceeding or following this Contractor's time along the work site. He shall ensure availability of access, availability of selected portions of this area to others and shall provide appropriate information for planning purposes to other contractors.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Summary of the work, work sequence, future work, Contractor's use of premises, and Owner occupancy.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. Work covered in this contract is for the Town of Round Top, Texas Wastewater Treatment Plant Increase to 36,000 Gallons/Day, Marcia Lane, Round Top, Texas.

1. 9,000 gallon per day biological treatment unit;

2. Filter bed piping replacement.

3. Associated piping fitting, valves and electrical.

4. Automated rain gage.

5. Electrical wire, conduit, manual transfer switch and connections for a portable electric generator.

6. Fencing.

1.03 ALTERNATES

A. Alternates are proposed as part of this Contract for fencing only.

1.04 WORK SEQUENCE

A. Construct Work in a sequence which will provide continuous water and wastewater service, minimize the disruption of traffic flow.

1.05 CONTRACTOR USE OF PREMISES

A. Comply with procedures for access to the site and Contractor's use of rights-of-way as specified in Section 01145 - Contractor's Use of Premises.

B. Limit construction operations to the public right-of-way and the Owner designated areas for the Contractor's operations as noted on the Drawings.

1.06 OWNER OCCUPANCY

A. The Owner will occupy the premises during the entire period of construction and will conduct normal operations.

B. Cooperate with the Owner to minimize conflict and facilitate the Owner's operations. Coordinate Contractor's activities with Owner Operations or Maintenance personnel through the Engineer.

C. Schedule Work to accommodate this requirement.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

General use of the site including properties inside of rights-of-way, private property, work affecting roads, streets and driveways and notification to adjacent occupants.

1.2 STORAGE AND LAYDOWN YARDS

The Contractor may utilize the Round Top Wastewater Treatment Plant located at the dead end of Marcia Lane for storage and laydown. Coordinated storage with Plant Operator.

1.3 RIGHTS-OF-WAY

A. Confine access, and operations and storage areas to Owner's property and public rights-of- way as stipulated in the General Conditions; or easements on private property secured by the Town of Round Top. Trespassing on abutting lands or other lands in the area is not allowed.

B. Make arrangements, at no cost to the Owner, for temporary use of private properties. Contractor and Surety shall indemnify and hold harmless the Owner against claims or demands arising from such use of properties outside of rights-of-way. Submit a copy of agreements between private property owners and Contractor prior to use of the area. Agreements between private property owners and Contractor shall be notarized or bear the signatures of two witnesses.

C. Obtain written permission from all applicable governing authorities for construction or storage of materials on esplanades and other areas within rights-of-way under that department's jurisdiction. Submit copies of written permission prior to use of the area.

D. Restrict total length of distributed materials along the route of construction to 250 linear feet unless otherwise approved in writing by the Engineer.

1.4 PROPERTIES OUTSIDE OF RIGHTS-OF-WAY

A. Do not alter the condition of properties adjacent to and along rights-of-way.

B. Do not use ways, means, methods, techniques, sequences, or procedures that result in damage to properties or improvements.

C. Restore damaged properties outside of rights-of-ways at no cost to the Owner.

1.5 USE OF SITE

A. Obtain approvals from governing authorities prior to impeding or closing public roads and streets. Do not close more than two consecutive intersections at one time.

B. Notify the Engineer and all governing authorities least 10 working days prior to closing a street or street crossing. Obtain permits for street closures in advance.

C. Maintain 10-foot-wide minimum access lanes for emergency vehicles including access to fire hydrants.

D. Avoid obstructing drainage ditches or inlets. When obstruction is unavoidable due to requirements of the Work, provide grading and temporary drainage structures to maintain unimpeded flow.

E. Locate and protect private lawn sprinkler systems that may exist within the site. Repair or replace damaged systems to condition existing at start of the Work, or better.

F. Clean any debris tracked onto the roadway daily.

G. Beware of overhead power lines existing in area and in close proximity of the Project. When 10 feet of clearance between energized overhead power line and construction-related activity cannot be maintained, request providers de-energize or move conflicting overhead power line. Schedule, coordinate and pay costs associated with de-energizing or moving conflicting overhead power lines. There is no separate pay item for this effort, include these costs in various items of bid that make such work necessary.

1.6 NOTIFICATION TO ADJACENT OCCUPANTS

A. Notify individual occupants in areas to be effected by the Work of proposed construction and time schedule. Notify not less than 72 hours or more than two weeks prior to work performed within 200 feet of homes or businesses.

B. Include in notification nature of the Work, and names and telephone numbers of two company representatives for resident contact available on 24-hour call.

C. Submit proposed notification to Engineer for approval. Consider ethnicity of the neighborhood where English is not the dominant language. Provide notice in an understandable language.

1.7 PUBLIC, TEMPORARY, AND CONSTRUCTION ROADS AND RAMPS

A. Construct and maintain temporary detours, ramps, and roads to provide for normal public traffic flow when it is necessary to close public roads or streets.

B. Provide mats or other means to prevent overloading or damage to existing roadways from tracked equipment, large tandem axle trucks or equipment that will damage the existing roadway surfaces.

C. Construct and maintain access roads and parking areas as specified in Division 1.

1.8 EXCAVATION IN STREETS AND DRIVEWAYS

A. Avoid hindering or inconveniencing public travel on streets or intersecting alleys for more than two blocks at any one time, except by permission of Engineer.

B. Obtain governing entities approval when nature of the Work requires closure of an entire street. Permits required for street closure are Contractor's responsibility. Avoid unnecessary inconvenience to abutting property owners.

C. Remove surplus materials and debris and open each block for public use, as work in that block is complete.

D. Acceptance of any portion of the Work will not be based on return of street to public use.

E. Avoid obstructing driveways or entrances to private property.

F. Provide temporary crossings or complete excavation and backfill in one continuous operation to minimize duration of obstruction when excavation is required across drives or entrances.

G. Provide barricades and signs in accordance with Section VI of the State of Texas Manual on Uniform Traffic Control Devices.

1.9 TRAFFIC CONTROL

A. Contractor to provide a Traffic Control Plan in accordance with TXDOT requirements.

1.10 SURFACE RESTORATION

A. Restore the site to the condition existing before construction, or better.

B. Repair paved areas per the requirements provided on the drawings.

C. Repair damaged turf areas, level with bank run sand conforming to Division 2. Water and level newly sodded areas with adjoining turf using appropriate steel wheel rollers for sodding. Do not use spot sodding or sprigging.

1.11 LIMITS OF CONSTRUCTION

A. Confine operations to lands within construction work limits shown on Drawings. Unless otherwise noted on Drawings adhere to the following:

1) Where utility alignment is within esplanade, and construction limits are shown on Drawings to extend to edge of esplanade, keep equipment, materials, stockpiles a minimum of five feet from back of curb.

2) Where construction limits shown on Drawings extend to property line, keep sidewalks free of equipment, materials, and stockpiles.

1.12 EQUIPMENT AND MATERIAL SALVAGE

A. Upon completion of the Work, carefully remove salvageable equipment and material. Deliver them to the Owner as directed by the Engineer. Dispose of equipment offsite and excavation spoil at no additional cost to the Owner when Owner deems equipment or material unfit for further use.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for processing Change Orders, including:

1. Assignment of a responsible individual for approval and communication of changes in the Work
2. Documentation of change in Contract Price and Contract Time
3. Change procedures, using proposals and Modifications
4. Execution of Change Orders
5. Correlation of Contractor submittals.

1.02 REFERENCES

A. Blue Book is defined as the Rental Rate Blue Book for Construction Equipment (a.k.a. Data Quest Blue Book).

B. Rental Rate is defined as the full-unadjusted base rental rate for the appropriate item of construction equipment.

1.03 RESPONSIBLE INDIVIDUAL

A. Provide a letter indicating the name and address of the individual authorized to execute

Modifications, and who will be responsible for informing others in Contractor's employ and Subcontractors of changes to the Work. Provide this information at the pre-construction meeting.

1.04 DOCUMENTATION OF CHANGE IN CONTRACT PRICE AND CONTRACT TIME

A. Maintain detailed records of changes in the Work. Provide full information required for identification and evaluation of proposed changes, and substantiate costs of changes in the Work.

B. Document each proposal for change in Contract Price or Contract Time with sufficient data to allow evaluation of proposal.

C. Include the following minimum information on proposals:

1. Quantities of items in original Bid Form with additions, reductions, deletions, and substitutions.

2. Quantities and cost of items in original Schedule of Values with additions, reductions, deletions and substitutions.

3. Provide Unit Prices for new items, with supporting information, for inclusion in Schedule of Unit Price Work.

4. Justification for changes in Contract Time.

5. Additional data upon request.

D. For changes in the Work performed on a time-and-material basis, provide the following additional information:

1. Quantities and description of Products.

2. Taxes, insurance and Bonds.

3. Overhead and profit as noted in General Conditions.

4. Dates, times and by who work was performed.

5. Time records and certified copies of applicable payrolls.

6. Invoices and receipts for Products, rental equipment, and subcontracts, similarly documented.

E. For changes in the Work performed on a time-and-materials basis, rental equipment is paid as follows:

1. Actual invoice cost for duration of time required to complete extra work without markup for overhead and profit. When extra work comprises only a portion of a rental invoice where equipment would otherwise be on site, compute hourly equipment rate by dividing the actual monthly invoice by 176. One day equals eight hours and one week equals 40 hours.

2. Do not exceed estimated operating costs given in Blue Book for items of equipment. Overhead and profit will be allowed on the operating cost.

F. For changes in the Work performed on a time-and-materials basis using Contractor-owned equipment, use Blue Book rates as follows:

1. Contractor-owned equipment will be paid at the Blue Book Rental Rate for the duration of time required to complete extra work without markup for overhead and profit. Utilize lowest cost combination of hourly, daily, weekly or monthly rates. Use 150 percent of Rental Rate for double shifts, one extra shift per day, and 200 percent of Rental Rate for more than two shifts per day. Standby rates shall be 50 percent of the appropriate Rental Rate shown in Blue Book. No other rate adjustments apply.

2. Do not exceed estimated operating costs given in Blue Book. Overhead and profit will be allowed on operating costs. Operating costs will not be allowed for equipment on standby.

1.05 CHANGE PROCEDURES

A. Changes to Contract Price or Contract Time can only be made by issuance of a Change Order. Changes will be in accordance with requirements of the General Contract Conditions for Construction.

B. Engineer will advise of Minor Changes in the Work as authorized by the General Conditions by issuing a Minor Change.

C. Request clarification of Drawings, Specifications, Contract documents or other information by using a Request for Information. Response by Engineer to Requests for Information does

not authorize Contractor to perform tasks outside scope of the Work. Changes must be authorized as described in this Section.

1.06 PROPOSALS AND CONTRACT MODIFICATIONS

A. Engineer may issue a Request for Proposal, which includes a detailed description of the proposed change with supplementary or revised Drawings and Specifications. Engineer may also request a proposal in response to a Request for Information. Prepare and submit the proposal within seven days or as specified in request.

B. Submit requests for Contract changes to the Engineer describing proposed change and its full effect on the Work, with a statement describing reason for change and effect on Contract Price and Contract Time including full documentation.

1.07 WORK CHANGE DIRECTIVE

A. Engineer may issue a signed Work Change Directive instructing Contractor to proceed with a change in the Work. Work Change Directive will subsequently be incorporated into a Change Order.

B. Work Change Directives will describe changes in the Work and designate the method of determining change in Contract Price or Contract Time.

C. Proceed promptly to execute changes in the Work in accordance with the Work Change Directive.

1.08 STIPULATED PRICE CHANGE ORDER

A. A Stipulated Price Change Order will be based on an accepted proposal.

1.09 UNIT PRICE CHANGE ORDER

A. Where Unit Prices for affected items of the Work are included in the Bid Form, the Change Order will be based on Unit Prices, subject to the General Conditions.

B. Where Unit Prices of the Work are not pre-determined in the Bid Form, the Work Change Directive or accepted proposal will specify the Unit Prices to be used.

1.10 TIME-AND-MATERIAL CHANGE ORDER

A. Provide itemized account and supporting data after completion of change, within time limits indicated for claims in the General Conditions.

B. Engineer will determine the change allowable in Contract Price and Contract Time as provided in the General Conditions.

C. Maintain detailed records for work done on time-and-material basis as specified in Paragraph 1.04 above.

D. Provide full information required for evaluation of changes and substantiate costs for changes in the Work.

1.11 EXECUTION OF CHANGE DOCUMENTATION

A. Engineer will issue Change Orders, Work Change Directives, or Minor Change in the Work for signatures of Parties as described in the General Conditions.

1.12 CORRELATION OF CONTRACTOR SUBMITTALS

A. For Stipulated Price Contracts, promptly revise Schedule of Values and Application for Payment forms to record authorized Change Orders as separate line item.

B. For Unit Price Contracts, the next monthly estimate of the Work after acceptance of a Change Order will be revised to include new items not previously included with appropriate Unit Prices.

C. Promptly revise progress schedules to reflect change in Contract Time, and to adjust time for other items of work affected by the change, and resubmit for review.

D. Promptly enter changes to on-site and record copies of Drawings, Specifications or Contract documents as required in Division 1.

PART 2 PRODUCTS -Not Used

PART 3 EXECUTION -Not Used

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for measurement and payment plus conditions for nonconformance assessment and nonpayment for rejected Products.

1.2 AUTHORITY

A. Measurement methods delineated in Specification sections are intended to complement criteria of this Section. In event of conflict, requirements of the Specification section shall govern.

B. Contractor will take all measurements and compute quantities accordingly. The Engineer will verify these quantities.

C. Assist by providing necessary equipment, workers, and survey personnel.

D. Measurement and Payment paragraphs are included only in those Specification sections of Division 01 where direct payment will be made. Include costs in the total bid price for those Specification sections in Division 1 that do not contain Measurement and Payment paragraphs.

1.3 UNIT QUANTITIES SPECIFIED

A. Quantity and measurement estimates stated in the Agreement are for contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the Engineer will determine payment as stated in the General Conditions.

B. When actual work requires greater or lesser quantities than those quantities indicated in the Bid Form, provide required quantities at Unit Prices contracted, except as otherwise stated in the General Conditions.

1.4 MEASUREMENT OF QUANTITIES

A. Measurement by Weight: Reinforcing steel, rolled or formed steel or other metal shapes are measured by CRSI or AISC Manual of Steel Construction weights. Welded assemblies are measured by CRSI or AISC Manual of Steel Construction or scale weights.

B. Measurement by Volume:

1. Stockpiles: Measured by cubic dimension using mean length, width, and height or thickness.

2. Excavation and Embankment Materials: Measured by cubic dimension using average end area method.

C. Measurement by Area: Measured by square dimension using mean length and width or radius.

D. Linear Measurement: Measured by linear dimension, at item centerline or mean chord.

E. Stipulated Price Measurement: By unit designated in the Agreement.

F. Other: Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed item or unit of the Work.

G. Measurement by Each: Measured by each instance or item provided.

H. Measurement by Lump Sum: Measure includes all associated work.

1.5 PAYMENT

A. Payment includes full compensation for all required supervision, labor, Products, tools, equipment, plant, transportation, services, and incidentals; and erection, application or Installation of an item of the Work; and Contractor's overhead and profit.

B. Total compensation for required Unit Price work shall be included in Unit Price bid in the Bid Form. Claims for payment as Unit Price work, but not specifically covered in the list of Unit Prices contained in the Bid Form, will not be accepted.

C. Interim payments for stored materials will be made only for materials to be incorporated under items covered in Unit Prices, unless disallowed in the Supplementary Conditions.

D. Progress payments will be based on the Engineer's observations and evaluations of quantities incorporated in the Work multiplied by Unit Price.

E. Final payment for work governed by Unit Prices will be made on the basis of actual measurements and quantities determined by the Engineer multiplied by the Unit Price for work which is incorporated in or made necessary by the Work.

1.6 NONCONFORMANCE ASSESSMENT

A. Remove and replace work, or portions of the Work, not conforming to the Contract documents.

B. When not practical to remove and replace work, Engineer will direct one of the following remedies:

1. Nonconforming work will remain as is, but Unit Price will be adjusted lower at discretion of the Engineer.

2. Nonconforming work will be modified as authorized by the Engineer, and the Unit Price will be adjusted lower at the discretion of the Engineer, when modified work is deemed less suitable than specified.

C. Specification sections may modify the above remedies or may identify a specific formula or percentage price reduction.

D. Authority of the Engineer to assess nonconforming work and identify payment adjustment is final.

1.7 NONPAYMENT FOR REJECTED PRODUCTS

A. Payment will not be made for any of the following:

1. Products wasted or disposed of in an unacceptable manner.

2. Products determined as nonconforming before or after placement.

3. Products not completely unloaded from transporting vehicles.

4. Products placed beyond lines and levels of required work.

5. Products remaining on hand after completion of the Work, unless specified otherwise.

6. Loading, hauling, and disposing of rejected Products.

PART 2 PRODUCTS-Not Used

PART 3 EXECUTION -Not Used

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide an initial Construction Schedule as required by this section for the Work. Do not start construction until the Engineer reviews the schedule.

1.02 FORM AND CONTENT OF INITIAL CONSTRUCTION SCHEDULE

A. Bar Chart:

1. Show major construction activities such as pipe laying, by traffic control phases or other approved key areas; tunnel construction, pavement removal, pavement replacement, pressure testing, chlorination, clean up and punch list as separate activities on the schedule.

2. Show week duration for each activity.

3. Show separate activities for each Shop Drawing and Product Data submittal critical to timely completion. Show submittal dates and dates Owner's Representative needs to provide approved submittals.

4. Provide separate horizontal bar for each activity. List start and finish date for each activity at left side of diagram.

5. Horizontal Time Scale: Identify first work day of each week.

6. Scale and Spacing: Notes must be legible. Allow space for notations and future revisions.

7. Order of Listings: Order bar chart listings by phases or other approved groups of activities that are contiguous. List activities in chronological order within each phase or group.

B. Narrative Description:

1. Submit narrative descriptions of anticipated work sequences as indicated by the sequence of activities presented in the schedule.

2. Discuss any activity that affects the public (such as phases of traffic control), interaction with specific forces of the Governing Authorities or Owner (such as valve operation, chlorination and testing) or other associated contractors.

1.03 PROGRESS REVISIONS

A. Submit progress revisions or necessary information to complete and process Payment Applications. When required, re-submittals for rejected revisions must be submitted and reviewed prior to the following month's processing of a Payment Application. The following month's Payment Application will not be processed until the re-submittal is reviewed and required progress revisions are received.

B. Provide a narrative report to describe

1. Major changes in scope.

2. Revised projections in progress, completion, or changes in activity duration.

3. Other identifiable changes.

4. Problem areas, anticipated delays, and the impact on schedule.

5. Corrective action recommended and its effect.

6. Effect of changes on schedules or other contractors.

7. Product delivery lead times.

C. Include additional data with Bar Chart described in Paragraph 1.03 A of this Section:

1. Show original dates for each activity in the approved initial progress schedule by narrow bar next to a wider bar for the current schedule.

2. Show date each activity actually started or finished when an event has occurred. Clearly identify actual dates in two right-most columns in left portion of an 11 x 17-inch chart.

3. Indicate the percentage progress to the date of submittal for each activity.

1.04 SUBMITTALS

A. Submit the initial progress schedule within 5 days after award of contract. The Engineer will review the schedule and return a reviewed copy within 5 days after receipt.

B. Cut-off dates for progress revisions may be as early as the 20th of the month to avoid delaying processing of Payment Applications. Use the cut-off date for the first approved revision for further revisions.

C. When required, re-submit within seven days after return of review copy.

D. Include connecting lines between bars in the schedule to indicate the sequence that activities will be accomplished. Connecting lines when the activity's start or finish is modified will identify impact of preceding or succeeding activities. Submit a minimum of six copies of the bar chart on 11 x 17-inch opaque reproductions. The Engineer will retain five copies and return the remaining copy.

PART 2 PRODUCTS-Not Used

PART 3 EXECUTION -Not Used

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures for:

1. Schedule of Values
2. Construction Schedules and Cash Flow Curve (billing forecast).
3. Shop Drawings, Product Data and Samples
4. Operations and Maintenance (O&M) Data
5. Manufacturer's Certificates
6. Construction Photographs
7. Project Record Documents and monthly certification.
8. Video Tapes
9. Design Mixes

1.2 SUBMITTAL PROCEDURES

A. Scheduling and Handling:

1. Submit Shop Drawings, data and Samples for related components as required by Specifications and Engineer.
2. Schedule submittals well in advance of need for construction Products. Allow time for delivery of Products after submittal approval.
3. Develop submittal schedule that allows sufficient time for initial review, correction, resubmission and final review of all submittals. Allow a minimum of 5 days for initial review. Engineer will review and return submittals to Contractor as expeditiously as possible but time required for review will vary depending on complexity and quantity of data submitted.
4. Engineer's review of submittals covers only general conformity to Drawings, Specifications and dimensions that affect layout. Contractor is responsible for quantity determination. No quantities will be verified by Engineer. Contractor is responsible for errors, omissions or deviations from Contract requirements; review of submittals does not relieve Contractor from the obligation to furnish required items in accordance with Drawings and Specifications.

5. Submit three copies of documents unless otherwise specified.

6. Revise and resubmit submittals as required. Identify all changes made since previous submittal.

7. Assume risk for fabricated Products delivered prior to approval. Do not incorporate Products into the Work, or include payment for Products in periodic progress payments, until approved by Engineer.

B. Transmittal Form and Numbering:

1. Transmit each submittal to Engineer with Transmittal letter which includes:

   a. Date and submittal number

   b. Project title and number

   c. Names of Contractor, Subcontractor, Supplier and manufacturer

   d. Identification of Product being supplied

   e. Location of where Product is to be Installed

   f. Applicable Specification section number

2. Identify deviations from Contract documents clouding submittal drawings. Itemize and detail on separate 8-1/2 x 11-inch sheets entitled "DEVIATIONS FOR _____." When no deviations exist, submit a sheet stating no deviations exist.

3. Have design deviations signed and sealed by an appropriate design professional, registered in the State of Texas.

4. Sequentially number transmittal letters beginning with number one. Use original number for resubmittals with an alphabetic suffix (i.e., 2A for the first resubmittal of submittal 2, or 15C for third resubmittal of submittal 15, etc.). Show only one type of work or Product on each submittal. Mixed submittals will not be accepted.

C. Contractor's Stamp:

10. Apply Contractor's Stamp certifying that the items have been reviewed in detail by Contractor and that they comply with Contract requirements, except as noted by requested variances.

11. As a minimum, Contractor's Stamp shall include:

    a. Contractor's name

    b. Job number

    c. Submittal number

    d. Certification statement Contractor has reviewed submittal and it is in compliance with the Contract

    e. Signature line for Contractor

D. Submittals will be returned with one of the following Responses:

1. "ACKNOWLEDGE RECEIPT" when no response and/or re-submittal is required.

2. "NO EXCEPTION" when sufficient information has supplied to determine that item described is accepted and that no re-submittal is required.

3. "EXCEPTIONS AS NOTED" when sufficient information has been supplied to determine that item will be acceptable subject to changes, or exceptions, which will be clearly stated. When exceptions require additional changes, the changes must be submitted for approval. Re-submittal is not required when exceptions require no further changes.

4. "REJECTED-RESUBMIT" when submittal does not contain sufficient information, or when information provided does not meet Contract requirements. Additional data or details requested by Engineer must be submitted to obtain approval.

1.3 MANUFACTURER'S CERTIFICATES

A. When required by Specification sections, submit manufacturers' certificate of compliance for review by Engineer.

B. Place Contractor's Stamp on front of certification.

C. Submit supporting reference data, affidavits, and certifications as appropriate.

D. Product certificates may be recent or from previous test results, but must be acceptable to Engineer.

1.4 DESIGN MIXES

A. When required by Specification sections, submit design mixes for review.

B. Place Contractor's Stamp, as specified in this section, on the front of each design mix.

C. Mark each mix to identify proportions, gradations, and additives for each class and type of mix submitted. Include applicable test results from samples for each mix. Perform tests and certifications within 12 months of the date of the submittal.

D. Maintain copies of approved mixes at mixing plant.

1.5 CHANGES TO CONTRACT

A. Changes to Contract may be initiated by completing a Request for Information form.

Engineer will provide a response to Contractor by completing the form and returning it to Contractor.

1. If Contractor agrees that the response will result in no increase in cost or time, a Minor Change in the Work will be issued by Engineer.

2. If Contractor and Engineer agree that an increase in time or cost is warranted, Engineer will forward the Request for Proposal for negotiation of a Change Order.

PART 2 PRODUCTS-Not Used

PART 3 EXECUTION -Not Used

END SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary facilities and necessary controls for the Project, including utilities, telephone, sanitary facilities, storage sheds and building, safety requirements, first aid equipment, fire protection, security measures, protection of the Work and property, access roads and parking, environmental controls, pest and rodent control and disposal of trash, debris and excavated material.

B. Facilities and controls specified in this section are considered minimum for the Project. Provide additional facilities and controls for proper execution of the Work and to meet Contractor's responsibilities for protection of persons and property.

1.02 CONTRACTOR'S RESPONSIBILITY

A. Comply with applicable requirements specified in other sections of Specifications.

1. Maintain and operate temporary facilities and systems to assure continuous service.

2. Modify and extend systems as the Work progress requires.

3. Completely remove temporary materials and equipment when no longer required.

4. Restore existing facilities used for temporary services to specified or original condition.

PART 2 PRODUCTS-NOT USED

PART 3 EXECUTION

3.01 TEMPORARY FACILITIES

A. Water:

1. Provided by the Town of Round Top.

B. Electricity and Lighting:

1. 110 volt electrical power provided by Town of Round Top. Contractor will provide lighting if needed.

2. Electric power service includes temporary power or generators required to maintain plant operations during scheduled shutdowns.

3. Minimum lighting level shall be 10-foot candles for open areas; 20-foot candles for stairs and shops. Provide a minimum of one 300-watt lamp for each 200 square feet of work area.

C. Temporary Heat and Ventilation:

1. Provide temporary heat necessary for protection or completion of the Work.

2. Provide temporary heat and ventilation to assure safe working conditions; maintain enclosed areas at a minimum of 50 degrees F.

D. Telephone:

1. Provide emergency telephone service at Project site for use by Contractor personnel and others performing work or furnishing services at the site.

E. Sanitary Facilities:

1. The Contractor will provide and maintain sanitary facilities for persons on the site; comply with regulations of State and local departments of health.

2. Enforce use of sanitary facilities by construction personnel at site. Enclose sanitary facilities. Pit-type toilets are not permitted. No discharge will be allowed from these facilities. Collect and store sewage and waste so as not to cause nuisance or health problems. Haul sewage and waste off-site and properly dispose in accordance with applicable regulations.

3. Locate toilets near the Work site and secluded from view insofar as possible. Toilets must be kept at least 150 lineal feet from well area. Keep toilets clean and supplied throughout the course of the Work.

4. The Town of Round Top's public restroom on the square may be used by the Contractor.

3.02 STORAGE SHEDS AND BUILDINGS

A. Provide adequately ventilated, watertight storage facilities with floor above ground level form products susceptible to weather damage.

B. Storage of Products not susceptible to weather damage may be on blocks off the ground.

C. Store Products in a neat and orderly manner. Place Products to permit easy access for identification, inspection and inventory.

D. Fill and grade site for temporary structures to provide drainage away from temporary and existing buildings.

3.03 SAFETY REQUIREMENTS

A. Submit a safety program at the pre-construction meeting and follow the program in accordance with the contract documents. Include documented response to trench safety requirements of Division 2.

B. Conduct operations in strict accordance with applicable Federal, State and local safety codes and statutes and with good construction practice. Establish and maintain procedures for safety of all work, personnel and equipment involved in the Work.

C. Observe and comply with Texas Occupational Safety Act (Art. 5182a, V.C.S.) and with all safety and health standards promulgated by Secretary of Labor under Section 107 of Contract Work Hours and Standards Act, published in 29 CFR Part 1926 and adopted by Secretary of Labor as occupational safety and health standards under Williams-Steiger Occupational Safety and Health Act of 1970, and to other legislation enacted for safety and health of Contractor employees. Safety and health standards apply to Subcontractors and Suppliers as well as to the Contractor.

D. Observance of and compliance with safety regulations is Contractor's responsibility without reliance or superintendence of or direction by the Engineer. Immediately advise the Engineer of investigation or inspection by Federal Safety and Health inspectors of Contractor's or Subcontractor's work or place of work on site under the Contract, and after investigation or inspection, advise the Engineer of results. Submit one copy of accident reports to the Engineer within 10 days of occurrence.

E. Protect areas occupied by workmen using the best available devices for detection of lethal and combustible gases. Test devices frequently to assure functional capability. Constantly observe infiltration of liquids into the Work area for visual or odor evidence of contamination, and immediately take appropriate steps to seal off entry of contaminated liquids to the Work area.

F. Implement safety measures, including but not limited to safety personnel, first-aid equipment, ventilating equipment and other safety equipment specified or detailed on Drawings.

G. Maintain required coordination with Police and Fire Departments during entire period covered by the Contract.

H. Include Project safety analysis in safety plan. Itemize major tasks and potential safety hazards. Plan to eliminate hazards or protect workers and public from each hazard.

3.04 FIRST AID EQUIPMENT

A. Provide a first aid kit throughout the construction period. List telephone numbers for physicians, hospitals, and ambulance services in each first aid kit.

B. Have at least one person thoroughly trained in first aid and CPR procedures present on the site when work is in progress. Contractor to conform to protocols and requirements for training and protection against "blood borne pathogens".

3.05 FIRE PROTECTION

A. Conform to specified fire protection and prevention requirements established by Federal, State, or local governmental agencies and as provided in Safety Program.

3.06 SECURITY MEASURES

A. Protect the Work, materials, equipment, and property from loss, theft, damage, or vandalism. Protect Owner property used in performance of the Contract.

B. If existing fencing or barriers are breached or removed for purposes of construction, provide and maintain temporary security fencing equal to existing.

3.07 PROTECTION OF UTILITIES AND PIPELINES

A. Prevent damage to existing public utilities during construction. Approximate locations of known utilities are shown on Drawings, but all lines may not be shown. Excavate with caution and repair lines damaged by construction operations.

B. Use the Utility Coordinating Committee One Call System, telephone number, (713) 223-4567, which must be called 48 hours in advance. The toll free telephone number is 1-800-669-8344, Texas One Call System.

C. Before excavating, locate underground utilities by appropriate means including the use of metal detection equipment, and probes, or by excavation or surveys. Repair damage caused by investigative work and by failure to locate or to preserve underground utilities.

D. Give utility owners a minimum five days notice before commencing excavation to allow time to locate utilities and make adjustments or relocations when they conflict with the Work. Include cost for temporary relocation of water, wastewater, and storm drainage lines, necessary to accommodate construction, in unit prices for utility construction unless otherwise noted. Bypassing of sanitary waste to storm drainage facilities is not allowed.

E. Prior to excavation near pipelines, request a representative of the pipeline company to meet with Contractor and the Engineer at the site to discuss procedures to be used. Request pipeline company's representative to locate the pipelines in at least three locations: at each side and at centerline of proposed excavation of proposed utility. Also request representative and the Engineer to be present to observe Contractor's operations when excavation is conducted within 15 ft of pipeline.

3.08 PROTECTION OF THE WORK AND PROPERTY

A. Preventive Actions

1. Take necessary precautions and actions to prevent damage, injury, or loss to the Work or public and private property, including:

   a) Storage of apparatus, supplies, and Products in an orderly, safe manner to limit interference with progress of the Work or work of other contractors, utility service companies, or the Owner's operations.

   b) Suitable storage for Products subject to damage by exposure to weather, theft, breakage, etc.

   c) Limitation of loading pressures imposed upon portions of the Work.

   d) Frequent clean up of refuse, scrap materials, and debris from construction operations, necessary to maintain the site in a safe and orderly condition.

   e) Provision of barricades and guard rails to protect pedestrian and traffic around openings, scaffolding, temporary stairs and ramps, excavations, elevated walkways, and other hazardous areas.

2. Protect public and private property adjacent to the site. Obtain written consent before entering or occupying privately-owned land except on easements provided for construction. Restore property damaged by construction operations to condition equal to or better than that existing before the damage.

B. Barricades and Warning Systems

1. Where work is performed on or adjacent to roadways, rights-of-ways, or public land, provide barricades, fences, lights, warning signs, danger signals, and other precautionary measures necessary for protection of persons or property and for protection of the Work.

   a) Erect sufficient barricades to keep vehicles and pedestrians from entering the Work. Paint barricades to be visible at night. From sunset to sunrise, provide at least one light at each barricade.

   b) Maintain barricades, signs, lights, and provide watchmen until the Engineer approves removal. Whenever work creates encroachment onto public roadways, station flagmen to manage traffic flow in accordance with approved traffic control plan.

   c) Conform to Division 1 requirements relating to traffic control and regulation

C. Protection of Existing Structures

1. Underground Facilities

a) Known Underground Facilities are shown on the Drawings but all Facilities may not be shown. Explore sufficiently ahead of trenching and excavation work to locate Underground Facilities in order to prevent damage to them and to prevent interruption of utility services. Restore damage to Underground Facilities to original condition at no additional cost to the Owner.

b) If necessary to avoid unanticipated Underground Facilities, the Engineer may make changes in location of the Work.

c) If permanent relocation of an Underground Facility is required and not provided for in the Contract documents, the Engineer will direct Contractor in writing to perform the Work under Modification provisions in the General Conditions.

2. Surface Structures include buildings, tanks, walls, bridges, roads, dams, channels, open drainage, piping, poles, wires, posts, signs, markers, curbs, walks, guard cables, fencing, and other facilities that are visible above the ground level.

3. Protection of Underground Facilities and Surface Structures:

a) Support in place and protect Underground Facilities and Surface Structures located within or adjacent to the limits of the Work from damage. Install supports as required by the owner of the structure. Satisfy the Engineer that the owner of the facility or structure has approved methods and procedures before installing structure supports.

b) Avoid moving or changing public utility or private corporation property without prior written consent of a responsible official of the facility or structure. Allow representatives of utilities to enter the construction site for maintenance and repair purposes or to make necessary changes.

c) Notify utility and pipeline owners and operators of the nature of construction operations and dates when operations will be performed. When construction operations are required in immediate vicinity of existing structures, pipelines, or utilities, give a minimum of five working days advance notice. Probe and flag location of Underground Facilities prior to commencement of excavation. Keep flags in place until construction operations uncover the facility.

d) Assume risk for damages and expenses to Underground Facilities and Surface Structures within or adjacent to the Work.

D. Employ a structural engineer to ensure protection measures are adequate for the safety and integrity of structures and facilities.

E. Protection of Installed Products

1. Provide protection of Installed Products to prevent damage from subsequent operations. Remove protection facilities when no longer needed, prior to completion of the Work.

2. Control traffic to prevent damage to Products and surfaces.

3. Provide coverings to protect Products from damage. Cover projections, wall corners, jambs, sills, and exposed sides of openings in areas used for traffic and passage of materials in subsequent work.

3.09 ROADS AND PARKING

A. Prevent interference with traffic and operations of the Owner on existing roads.

B. Designate temporary parking areas to accommodate construction, Owner and Personnel. When site space is not adequate, provide additional off-site parking. Locate as approved by the Engineer.

C. Minimize use by construction traffic on existing streets and driveways.

D. Do not allow heavy vehicles or construction equipment in existing parking areas.

3.10 ENVIRONMENTAL CONTROLS

A. Use methods, equipment, and temporary construction necessary for control of environmental conditions at the site and adjacent areas.

B. Comply with statutes, regulations, and ordinances relating to prevention of environmental pollution and preservation of natural resources including National Environmental Policy Act of 1969, PL 91 -190, Executive Order 11514.

C. Minimize impact to the surrounding environment. Do not use construction procedures that cause unnecessary excavation and filling of terrain, indiscriminate destruction of vegetation, air or stream pollution, or harassment or destruction of wildlife.

D. Limit disturbed areas to boundaries established by the Contract. Do not pollute on-site streams, sewers, wells, or other water sources.

E. Do not burn rubbish, debris or waste materials.

3.11 POLLUTION CONTROL

A. Provide methods, means, and facilities necessary to prevent contamination of soil, water or the atmosphere by discharge of Pollutants from construction operations.

B. Provide equipment and personnel to perform emergency measures to contain spillage, and to remove contaminated soils or liquids. Excavate and dispose of contaminated earth off-site in accordance with laws and regulations, and replace with suitable compacted fill and topsoil.

C. Provide systems necessary for control of Pollutants.

1. Prevent toxic concentrations of chemicals.

2. Prevent harmful dispersal of Pollutants into the environment.

D. Use equipment that conforms to current Federal, State, and local laws and regulations.

3.12 PEST AND RODENT CONTROL

A. Provide rodent and pest control as necessary to prevent infestation of construction or storage areas.

B. Employ methods and use materials that will not adversely affect conditions at site or on adjoining properties.

3.13 NOISE CONTROL

A. Provide vehicles, equipment, and use construction activities that minimize noise to the greatest degree practicable. Conform to all applicable local requirements. Do not permit noise levels to interfere with the Work or create a nuisance to surrounding areas.

B. Conduct construction operations during daylight hours except as approved by the Engineer.

C. Select construction equipment that operates with minimum noise and vibration. When directed by the Engineer, correct objectionable noise or vibration produced by operation of equipment at no additional cost to the Owner. Sound Power Level (PWL) of equipment shall not exceed 85 dbA (re: 10-12 watts) measured five feet from the equipment, or at a lower level if prescribed by local Ordinances. Equipment noise requirements are contained in equipment specifications.

3.14 DUST CONTROL

A. Use water or other methods approved by the Engineer to control amount of dust generated by vehicle and equipment operations.

3.15 WATER RUNOFF AND EROSION CONTROL

A. Conduct fill, grading and ditching operations and provide adequate methods necessary to control surface water, runoff, subsurface water, and water from excavations and structures in order to prevent damage to the Work, the site, or adjoining properties.

1. Plan and execute construction and earthwork by methods that control surface drainage from cuts and fills, and from borrow and waste disposal areas.

2. Minimize area of bare soil exposed at one time.

3. Provide temporary control measures, such as berms, dikes, and drains.

4. Provide, operate, and maintain equipment and facilities of adequate size to control surface water.

5. Construct fill and waste areas by selective placement of materials to eliminate erosion of surface silts or clays that may erode.

6. Direct water away from excavations, pits, tunnels, and other construction areas to prevent erosion, sedimentation, or damage.

7. Maintain existing drainage patterns adjacent to the site by constructing temporary earth berms, sedimentation basins, retaining areas, and temporary ground cover.

8. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to the site or adjoining areas, in conformance with environmental requirements.

9. Inspect earthwork periodically to detect any evidence of erosion. Take corrective measures as required to control erosion.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disposal of waste material and salvageable material.

1.02 SUBMITTALS

A. Conform to requirements of Division 1.

B. Obtain and submit disposal permits for proposed disposal sites, if required by local ordinances.

C. Submit copy of written permission from property owner, with description of property, prior to disposal of excess material adjacent to Project. Submit written and signed release from property owner upon completion of disposal work.

D. Describe waste materials expected to be stored on-site and a description of controls to reduce Pollutants from these materials, including storage practices to minimize exposure of materials to storm water.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

3.01 SALVAGEABLE MATERIAL

A. Excavated Material: Contractor must dispose of excavated material.

B. Base, Surface, and Bedding Material: Contractor must dispose of base, surface and bedding material.

C. Pipe Culvert: Load culverts designated for salvage into Owner's trucks.

D. Other Salvageable Materials: Conform to requirements of individual Specification Sections.

E. Coordinate loading of salvageable material on Owner's trucks with Owner's Representative.

F. Existing piping will be abandoned in place.

3.02 EXCESS MATERIAL

A. Remove and legally dispose of vegetation, rubble, broken concrete, debris, asphaltic concrete pavement, excess soil, and other materials not designated for salvage from job site.

B. Excess soil may be deposited on private property adjacent to Project when written permission is obtained from property owner. See Paragraph 1.02 C above.

C. Remove waste materials from site daily, in order to maintain site in neat and orderly condition.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cutting, patching and fitting of the Work or work under construction. Coordinating Installation or connection of the Work to existing facilities, or uncovering work for access, inspection or testing and related submittals.

1.2 CUTTING AND PATCHING

A. Perform activities to avoid interference with facility operations and work of others in accordance with the General Contract Conditions for Construction.

B. Execute cutting and patching, including excavation, backfill and fitting to:

1. Remove and replace defective work or work not conforming to Drawings and Specifications;

2. Take samples of installed work as required for testing;

3. Remove construction required to provide for specified alterations or additions to existing work;

4. Uncover work to allow inspection or reinspection by Owner's Representative or regulatory agencies having jurisdiction;

5. Connect uninstalled work to completed work in proper sequence;

6. Remove or relocate existing utilities and pipes that obstruct work;

7. Make connections or alterations to existing or new facilities;

8. Provide openings, channels, chases and flues and cut, patch, and finish; if required; or

9. Provide protection for other portions of the Work.

C. Restore existing work to a condition equal to or better than that which existed prior to cutting and patching, and to standards required by Specifications.

D. Support, anchor, attach, match, trim and seal materials to work of others. Unless otherwise specified, Furnish and Install sleeves, inserts, and hangers required for execution of the Work.

E. Provide shoring, bracing and support necessary to maintain structural integrity and to protect adjacent work from damage during cutting and patching. Request written

approval from Owner's Representative, before cutting structural members such as beams, anchors, lintels, or other supports. Follow approved submittals, as applicable.

F. Match new materials to existing materials by bonding, lapping, mechanically tying, anchoring or other effective means in order to prevent cracks and to minimize evidence of patching. Conceal effects of demolition and patching by blending new construction to existing surfaces. Avoid obvious breaks, joints or changes of surface appearance unless shown on Drawings or authorized by Owner's Representative.

1.3 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit a written request to Owner's Representative for consent to proceed, before conducting cutting operations that might affect structural integrity, design function, Owner operations, or work of another contractor.

C. Include the following in submittal:

a. Identification of Project

b. Description of affected work

c. Necessity for cutting

d. Effect on other work and on structural integrity

e. Describe the proposed work including:

i. Scope of cutting and patching

ii. Contractor, Subcontractor or Supplier who will execute the work

iii. Proposed Products

iv. Extent of refinishing

v. Schedule of operations

f. Alternatives to cutting and patching

D. When work conditions or schedules dictate the need for change of materials or methods, submit a written recommendation to Owner's Representative that includes:

a. conditions necessitating the change;

b. recommendations for alternative materials or methods; and

c. submittals required for proposed substitutions.

E. Notify Owner's Representative in writing when work will be uncovered for observation. Do not begin cutting or patching operations until authorized by Owner's Representative.

1.4 CONNECTIONS TO EXISTING FACILITIES

A. Perform construction operations necessary to complete connections and tie-ins to existing facilities. Keep existing facilities in continuous operation unless otherwise permitted in the Specifications or approved in writing by Owner's Representative.

B. Coordinate interruption of service requiring connection to existing facilities with Owner's Representative. Do not bypass wastewater or sludge to waterways. Provide temporary pumping facilities to handle wastewater if necessary. Use temporary bulkheads to minimize disruption. Provide temporary power and piping to facilitate construction where necessary.

C. Submit a detailed schedule of proposed connections, including shut-downs and tie-ins.

Include proposed time and date as well as anticipated duration of work. Coordinate the

connection schedule with the construction schedule.

1. Submit specific times and dates to Owner's Representative at least 48 hours in advance of proposed work.

D. Procedures and Operations:

1. Operate existing pumps, valves and gates in required sequence under supervision of Owner's Representative. Do not operate valves, gates or other items of equipment without Owner's Representative's knowledge.

2. If possible, test equipment under operating conditions before making final tie-ins to connect equipment to existing facility.

3. Coordinate work and schedules. Notify Project Manger at least 48 hours before shutdowns or bypasses are required.

PART 2 PRO DUCTS-Not Used

PART 3 EXECUTION -Not Used

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Starting systems.

B. Demonstration and instructions.

C. Testing, adjusting and balancing.

PART 2 PRODUCTS-Not Used

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Owner's Representative seven days prior to startup of each item.

C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other damage-causing conditions.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision in accordance with manufacturer's instructions.

G. When specified in individual Specification sections, require manufacturer to provide an authorized representative to be present at the site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit written report indicating that equipment or system has been properly installed and is functioning correctly.

3.02 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's Representative two weeks prior to Date of Substantial Completion.

B. Utilize O&M Manuals as the basis for instruction. Review contents of manual with Owner's Representative in detail to explain aspects of operation and maintenance.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at the equipment location.

D. Prepare and insert additional data in O&M Manuals when the need for additional data becomes apparent during instruction.

E. At a minimum, Contractor will demonstrate the following:

1. Products and procedures to be used in maintaining various surfaces, e.g., counter tops, toilet partitions, tile floors and carpeting;

2. Procedures to set and maintain landscape irrigation system;

3. Procedures to set and maintain security and fire alarm systems; and

4. Procedures to set and maintain HVAC systems.

3.03 TESTING, ADJUSTING AND BALANCING

A. Contractor shall appoint, employ and pay for the services of an independent firm to perform testing, adjusting and balancing.

B. Submit reports by the independent firm to Owner's Representative describing observations and results of tests and signifying compliance or non-compliance with specified requirements and requirements of the Contract.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures to establish Date of Substantial Completion.

B. Closeout procedures for final submittals, O&M data, warranties, spare parts and maintenance materials.

C. Texas Department of Licensing and Regulation (TDLR) inspection for Texas Accessibility Standards (TAS) compliance.

1.02 SUBSTANTIAL COMPLETION

A. Comply with the General Contract Conditions for Construction regarding Date of Substantial Completion when Contractor considers the Work, or portion thereof designated by Owner's Representative, to be substantially complete.

B. Insure the following items have been completed when included in the Work, prior to presenting a list of items to be inspected by Owner's Representative for issuance of a Certificate of Substantial Completion:

1. Cutting, plugging, and abandoning of water, wastewater, and storm sewer lines, as required by Contract documents for each item;

2. Construction of, and repairs to, pavement, driveways, sidewalks, and curbs and gutters;

3. Sodding and hydromulch seeding, unless waived by Owner's Representative in writing;

4. General clean up including pavement markings, transfer of services, successful testing and landscape;

5. Additional requirements contained in Division 1.

C. Assist Owner's Representative with inspection of Contractor's list of items and complete or correct the items, including items added by Owner's Representative, within specified time period.

D. Should Owner's Representative's inspection show failure of Contractor to comply with requirements to obtain Date of Substantial Completion, including those items in Paragraph 1.02 B. of this section, Contractor shall complete or correct the items, before requesting another inspection by Owner's Representative.

1.03 CLOSEOUT PROCEDURES

A. Comply with the General Contract Conditions for Construction regarding final completion and final payment when the Work is complete and ready for Owner's Representative's final inspection.

B. Provide Project Record Documents in accordance with Division 1.

C. Complete or correct items on punch list, with no new items added. Address new items during warranty period.

D. The Owner will occupy portions of the Work as specified in other sections.

1.04 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. For facilities, clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to sanitary condition.

D. Clean or replace filters of operating equipment.

E. Clean debris from roofs, gutters, down spouts, and drainage systems.

F. Clean site; sweep paved areas, and rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and temporary construction facilities from site following final test of utilities and completion of the Work.

1.05 ADJUSTING

A. Adjust operating equipment to ensure smooth and unhindered operation. Value of this testing and adjusting is five percent of Lump Sum Price in the Schedule of Values for item being tested.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit O&M data as noted in Division 1.

B. Five percent of lump sum amount of each piece of equipment as indicated in Schedule of Unit Price Work or Schedule of Values will be paid after the required O&M data submittals are received and approved by Owner's Representative.

1.07 WARRANTIES

A. Provide one original of each warranty from Subcontractors, Suppliers, and manufacturers.

B. Provide Table of Contents and assemble warranties in a 3-ring/D binder with durable plastic cover.

C. Submit warranties prior to final progress payment.

D. Warranties shall commence in accordance with the requirements in the General Contract Conditions for Construction.

1.08 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide Products, spare parts, maintenance, and extra materials in quantities specified in individual Specification sections.

B. Deliver to a location as directed by Owner's Representative. Applicable items must be delivered prior to issuance of a final Certificate for Payment.

PRODUCTS -Not Used

EXECUTION -Not Used

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Maintenance and submittal of record documents and Samples.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Maintain one record copy of documents at the site in accordance with the General Contract Conditions for Construction.

B. Store record documents and Samples in field office, if a field office is required by the Contract, or in a secure location. Provide files, racks, and secure storage for record documents and Samples.

C. Label each document "PROJECT RECORD" in neat, large, printed letters.

D. Maintain record documents in a clean, dry, and legible condition. Do not use record documents for construction purposes. Do not use permit drawings to record Modifications to the Work.

E. Keep record documents and Samples available for inspection by Owner's Representative.

F. Bring record documents to progress review meetings for viewing by Owner's Representative and, if applicable, Design Consultant.

1.03 RECORDING

A. Record information legibly with red ink pen on a set of blueline opaque drawings, concurrently with construction progress. Maintain an instrument on site at all times for measuring elevations accurately. Do not conceal work until required information is recorded.

B. Contract Drawings and Shop Drawings: Mark each item to record completed Modifications, or when minor deviations exist, the actual construction including:

1. Measured depths of elements of foundation in relation to finish first floor datum.

2. Measured horizontal locations and elevations of Underground Facilities and appurtenances, referenced to permanent surface improvements.

3. Elevations of Underground Facilities referenced to benchmarks utilized for the Work.

4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

5. Dimensions and details of field changes.

6. Changes made by Modifications.

7. Details not on original Drawings.

8. References to related Shop Drawings and Modifications.

C. Survey all joints of water mains at the time of construction. Record on Drawings, water main invert elevation, elevation top of manway, and centerline horizontal location relative to baseline.

D. For large diameter water mains, mark specifications and addenda to record:

1. Manufacturer, trade name, catalog number and Supplier of each Product actually installed.

2. Changes made by Modification or field order.

3. Other matters not originally specified.

E. Annotate Shop Drawings to record changes made after review.

1.04 SUBMITTALS

A. At closeout of the Contract, deliver Project record documents to Owner's Representative.

PART 2 PRODUCTS-Not Used

PART 3 EXECUTION -Not Used

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Valve boxes for water service.

B. Meter boxes for water service.

C. Meter vaults for water service.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.
1. No separate payment will be made for valve boxes under this Section. Include payment in unit price for Division 2.
2. No separate payment will be made for meter boxes under this Section. Include payment in unit price for Division 2.
3. Refer to Division 1.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.03 REFERENCES

A. ASTM A 48 - Standard Specification for Gray Iron Castings.

B. ASTM D 256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

C. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.

D. ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

E. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

F. ASTM D 2240 - Standard Test Method for Rubber Property-Durometer Hardness.

1.04 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit manufacturers' product data for following items for approval:

1. Each type of valve box and lid.
2. Each type of meter box and cover.
3. Each type of meter vault frame and cover.

C. Submit design calculations and shop drawings for precast vault elements, sealed by an Engineer registered in State of Texas.

D. Submit manufacturer's certification that plastic meter boxes meet requirements of Paragraph 2.05, Plastic Meter Boxes.

PART 2 PRODUCTS

2.01 VALVE BOXES

A. Provide approved Type A, cast-iron/ductile-iron, slide-type, valve boxes. Design of valve box shall minimize stresses on valve imposed by loads on box lid.

B. Cast letter "W" into lid, 1/2 inch in height and raised 3/32 inch, for valves serving potable water lines.

C. Unless otherwise specified, uncoated cast iron.

D. Riser Pipe.

1. Provide 6-inch PVC, Class 150, DR 18, riser pipes in accordance with Division 2, or
2. 6-inch ductile-iron, thickness Class 51 riser pipes in accordance with Division 2.
3. Provide single section of pipe.

E. Concrete for valve box placement:

1. For locations in new concrete pavement, provide strength and mix design of new pavement.
2. For other locations, provide concrete for sidewalks conforming to requirements of Division 2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Obtain approval from Owner’s Representative for location of meter vault.

B. Verify lines and grade are correct.

C. Verify compacted subgrade will support loads imposed by vaults.

3.02 VALVE BOXES

A. Install riser pipe with suitable length for depth of cover indicated on Drawings or to accommodate actual finish grade.

1. Install with bell on top of valve
2. Place riser pipe in plumb, vertical position

B. Install valve box and riser piping plumbed in a vertical position. Provide 6-inches telescoping freeboard space between riser pipe top butt end, and interior contact flange of valve box, for vertical movement damping. End of pipe resting on valve shall be notched out sufficiently to provide a snug fit around the valve bonnet and to center valve inside of pipe.

C. Set, align, and adjust valve box so that lid is level with final grade.

3.03 BACKFILL

A. Provide bank run sand in accordance with Division 2 and backfill and compact in accordance with Division 2.

B. In unpaved areas, slope backfill around meter boxes and vaults to provide a uniform slope 1- to-5 slope from top to natural grade.

C. In paved areas, slope concrete down from meter box or vault to meet adjacent paved area.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cast-in-place concrete work for utility construction or rehabilitation, such as slabs on grade, small vaults, site-cast bases for precast units, and in-place liners for manhole rehabilitation.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices

1. No payment will be made for concrete for utility construction under this Section. Include cost in applicable utility structure.

2. Obtain services of and pay for certified testing laboratory to prepare design mixes.

3. Refer to Division 1 for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.03 REFERENCES

A. ACI 117 - Standard Tolerances for Concrete Construction and Materials.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.

C. ACI 302.1R - Guide for Concrete Floor and Slab Construction.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

E. ACI 308 - Standard Practice for Curing Concrete.

F. ACI 309R - Guide for Consolidation of Concrete.

G. ACI 311 - Guide for Concrete Plant Inspection and Field Testing of Ready-Mix Concrete.

H. ACI 315 - Details and Detailing of Concrete Reinforcement.

I. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary.

J. ACI 544 - Guide for Specifying, Mixing, Placing, and Finishing Steel Fiber Reinforced Concrete.

K. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

L. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

M. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

N. ASTM A 767 - Standard Specifications for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

O. ASTM A 775 - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

P. ASTM A 820 - Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.

Q. ASTM A 884 - Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.

R. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

S. ASTM C 33 - Standard Specification for Concrete Aggregates.

T. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

U. ASTM C 42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

V. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.

W. ASTM C 138 - Standard Test Method for Unit Weight Yield and Air Content (Gravimetric) of Concrete.

X. ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

Y. ASTM C 150 - Standard Specification for Portland Cement.

Z. ASTM C 172 - Standard Practice for Sampling Freshly Mixed Concrete.

AA. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by Volumetric Method.

BB. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

CC. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete.

DD. ASTM C 309 - Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

EE. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete.

FF. ASTM C 595 - Standard Specification for Blended Hydraulic Cements.

GG. ASTM C 685 - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.

HH. ASTM C 1064 - Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

II. ASTM C 1077 - Standard Practice for Laboratory Testing of Concrete and Concrete Aggregate for Use in Construction and Criteria for Laboratory Evaluation.

JJ. CRSI MSP-1 - Manual of Standard Practice.

KK. CRSI - Placing Reinforcing Bars.

LL. Federal Specification SS-S-210A - Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints

MM. NRMCA - Concrete Plant Standards.

1.04 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit proposed mix design and test data for each type and strength of concrete in Work.

C. Submit laboratory reports prepared by independent testing laboratory stating that materials used comply with requirements of this Section.

D. Submit manufacturer's mill certificates for reinforcing steel. Provide specimens for testing when required by Owner's Representative.

E. Submit certification from concrete supplier that materials and equipment used to produce and deliver concrete comply with this Specification.

F. When required on Drawings, submit shop drawings showing reinforcement type, quantity, size, length, location, spacing, bending, splicing, support, fabrication details, and other pertinent information.

G. For waterstops, submit product information sufficient to indicate compliance with this Section, including manufacturer's descriptive literature and specifications.

1.05 HANDLING AND STORAGE

A. Cement: Store cement off of ground in well-ventilated, weatherproof building.

B. Aggregate: Prevent mixture of foreign materials with aggregate and preserve gradation of aggregate.

C. Reinforcing Steel: Store reinforcing steel to protect it from mechanical injury and formation of rust. Protect epoxy-coated steel from damage to coating.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Cementitious Material:

1. Portland Cement: ASTM C 150, Type II, unless use of Type III is authorized by Owner's Representative; or ASTM C 595, Type IP. For concrete in contact with sewage use Type II cement.

2. When aggregates are potentially reactive with alkalis in cement, use cement not exceeding 0.6 percent alkali content in form of Na20 + 0.658K20.

B. Water: Clean, free from harmful amounts of oils, acids, alkalis, or other deleterious substances, and meeting requirements of ASTM C 94.

C. Aggregate:

1. Coarse Aggregate: ASTM C 33. Unless otherwise indicated, use following ASTM standard sizes: No. 357 or No. 467; No. 57 or No. 67, No. 7. Maximum size: Not larger than 1/5 of narrowest dimension between sides of forms, nor larger than 3/4 of minimum clear spacing between reinforcing bars.

2. Fine Aggregate: ASTM C 33.

3. Determine potential reactivity of fine and coarse aggregate in accordance with Appendix to ASTM C 33.

D. Air Entraining Admixtures: ASTM C 260.

E. Chemical Admixtures:

1. Water Reducers: ASTM C 494, Type A.

2. Water Reducing Retarders: ASTM 494, Type D.

3. High Range Water Reducers (Superplasticizers): ASTM C 494, Types F and G.

F. Prohibited Admixtures: Admixtures containing calcium chloride, thiocyanate, or materials that contribute free chloride ions in excess of 0.1 percent by weight of cement.

G. Reinforcing Steel:

1. Use new billet steel bars conforming to ASTM A 615, ASTM A 767, or ASTM A 775, grade 40 or grade 60, as shown on Drawings. Use deformed bars except where smooth bars are specified. When placed in work, keep steel free of dirt, scale, loose or flaky rust, paint, oil or other harmful materials.

2. Where shown, use welded wire fabric with wire conforming to ASTM A 185 or ASTM A884. Supply gauge and spacing shown, with longitudinal and transverse wires

electrically welded together at points of intersection with welds strong enough not to be broken during handling or placing.

3. Wire: ASTM A 82. Use 16 1/2 gauge minimum for tie wire, unless otherwise indicated.

H. Fiber:

1. Fibrillated Polypropylene Fiber:

a. Addition Rate: 1.5 pounds of fiber per cubic yard of concrete.
b. Physical Properties:

1. Material: Polypropylene
2. Length: 1/2 inch or graded
3. Specific Gravity: 0.91

c. Acceptable Manufacturer: W. R. Grace Company, Fibermesh, or approved equal.

2. Steel Fiber: Comply with applicable provisions of ACI 544 and ASTM A 820.

a. Ratio: 50 to 200 pounds of fiber per cubic yard of concrete.
b. Physical Properties:

1. Material: Steel
2. Aspect Ratio (for fiber lengths of 0.5 to 2.5 inch, length divided by diameter or equivalent diameter): 30:1 to 100:1
3. Specific Gravity: 7.8
4. Tensile Strength: 40-400 ksi.
5. Young's Modulus: 29,000 ksi
6. Minimum Average Tensile Strength: 50,000 psi
7. Bending Requirements: Withstand bending around 0.125-inch diameter mandrel to angle of 90 degrees, at temperatures not less than 60 degrees F, without breaking

I. Curing Compounds: Type 2 white-pigmented liquid membrane-forming compounds conforming to ASTM C 309.

2.02 FORM WORK MATERIALS

A. Lumber and Plywood: Seasoned and of good quality, free from loose or unsound knots, knot holes, twists, shakes, decay and other imperfections which would affect strength or impair finished surface of concrete. Use S4S lumber for facing or sheathing. Forms for bottoms of caps: At least 2 inch (nominal) lumber or 3/4 inch form plywood backed adequately to prevent misalignment. For general use, provide lumber of 1-inch nominal thickness or form plywood of approved thickness.

B. Form work for Exposed Concrete Indicated to Receive Rubbed Finish: Form or form-lining surfaces free of irregularities; plywood of 1/4 inch minimum thickness, preferably oiled at mill.

C. Chamfer Strips and Similar Moldings: Redwood, cypress, or pine that will not split when nailed and which can be maintained to true line. Use mill-cut molding dressed on all faces.

D. Form Ties: Metal or fiberglass of approved type with tie holes not larger than 7/8 inch in diameter. Do not use wire ties or snap ties.

E. Metal Forms: Clean and in good condition, free from dents and rust, grease, or other foreign materials that tend to disfigure or discolor concrete in gauge and condition capable of supporting concrete and construction loads without significant distortion. Countersink bolt and rivet heads on facing sides. Use only metal forms which present smooth surface and which line up properly.

2.03 PRODUCTION METHODS

A. Use either ready-mixed concrete conforming to requirements of ASTM C 94, or concrete produced by volumetric batching and continuous mixing in accordance with ASTM C 685.

2.04 MEASUREMENT OF MATERIALS

A. Measure dry materials by weight, except volumetric proportioning may be used when concrete is batched and mixed in accordance with ASTM C 685.

B. Measure water and liquid admixtures by volume.

2.05 DESIGN MIX

A. Use design mixes prepared by certified testing laboratory in accordance with ASTM C 1077 and conforming to requirements of this section.

B. Proportion concrete materials based on ACI 211.1 to comply with durability and strength requirements of ACI 318, Chapters 4 and 5, and this specification. Prepare mix design of Class A concrete so minimum cementitious content is 564 pounds per cubic yard. Submit concrete mix designs to Owner's Representative for review.

C. Proportioning on basis of field experience or trial mixtures in accordance with requirements at Section 5.3 of ACI 318 may be used, when approved by Owner's Representative.

D. Classification:

Class	Type	Minimum Compressive Strength (LBS/Sq.In.)		Maximum W/C Ratio	Air Content (Percent)	Consistency Range in Slump (Inches)
		7-Day	28-Day			
A	Structural	3200	4000	0.45	4+ 1	2 to 4*
B	Pipe Block Fill, Thrust Block	—	1500	—	4+1	5 to 7

***When ASTM C 494, Types F or Type G admixture is used to increase workability, this range may be 6 to 9.**

E. Add steel or polypropylene fibers only when called for on Drawings or in another section of these Specifications.

F. Determine air content in accordance with ASTM C 138, ASTM C 173 or ASTM C 231.

G. Use of Concrete Classes: Use classes of concrete as indicated on Drawings and other Specifications. Use Class B for unreinforced concrete used for plugging pipes, seal slabs, thrust blocks, trench dams, tunnel inverts and concrete fill unless indicated otherwise. Use Class A for all other applications.

2.06 PVC WATERSTOPS

A. Extrude from virgin polyvinyl chloride elastomer. Use no reclaimed or scrap material. Submit waterstop manufacturer's current test reports and manufacturer's written certification that material furnished meets or exceeds Corps of Engineers Specification CRD-C572 and other specified requirements.

B. Flat Strip and Center-Bulb Waterstops:

1. Thickness: not less than 3/8 inch

2. Acceptable Manufacturers:

a. Kirkhill Rubber Co., Brea, California
b. Water Seals, Inc., Chicago, Illinois
c. Progress Unlimited, Inc., New York, New York
d. Greenstreak Plastic Products Co., St. Louis, Missouri
e. Approved equal.

2.07 RESILIENT WATERSTOP

A. Resilient Waterstop: Where shown on Drawings; either bentonite- or adhesive-type material.

B. Bentonite Waterstop:

1. Material: 75 percent bentonite, mixed with butyl rubber-hydrocarbon containing less than 1.0 percent volatile matter, and free of asbestos fibers or asphaltics.

2. Manufacturer's rated temperature ranges: For application, 5 to 125 degrees F; in service, -40 to 212 degrees F.

3. Cross-sectional dimensions, unexpanded waterstop: 1 inch by 3/4 inch

4. Provide with adhesive backing capable of producing excellent adhesion to concrete surfaces.

C. Adhesive Waterstop:

1. Preformed plastic adhesive waterstop at least 2 inches in diameter.

2. Meets or exceeds requirements of Federal Specification SS-S-210A.

3. Supplied wrapped completely by 2 part protective paper

4. Submit independent laboratory tests verifying that material seals joints in concrete against leakage when subjected to minimum of 30 psi water pressure for at least 72 hours.

5. Provide primer, to be used on hardened concrete surfaces, from same manufacturer who supplies waterstop material.

6. Acceptable Manufacturer: Synko-Flex Preformed Plastic Adhesive Waterstop, Synko-Flex Products, Inc.; or approved equal.

PART 3 EXECUTION

3.01 FORMS AND SHORING

A. Provide mortar-tight forms sufficient in strength to prevent bulging between supports. Set and maintain forms to lines designated such that finished dimensions of structures are within tolerances specified in ACI 117. Construct forms to permit removal without damage to concrete. Forms may be given slight draft to permit ease of removal. Provide adequate clean out openings. Before placing concrete, remove extraneous matter from within forms.

B. Install rigid shoring having no excessive settlement or deformation. Use sound timber in shoring centering. Shim to adjust and tighten shoring with hardwood timber wedges.

C. Design Loads for Horizontal Surfaces of Forms and Shoring: Minimum fluid pressure, 175 pounds per cubic foot; live load, 50 pounds per square foot. Maximum unit stresses: 125 percent of allowable stresses used for form materials and for design of support structures.

D. Back form work with sufficient number of studs and wales to prevent deflection.

E. Re-oil or lacquer liner on job before using. Facing may be constructed of 3/4 inch plywood made with waterproof adhesive backed by adequate studs and wales. In such cases, form lining will not be required.

F. Unless otherwise indicated, form outside corners and edges with triangular 3/4 inch chamfer strips (measured on sides).

G. Remove metal form ties to depth of at least 3/4 inch from surface of concrete. Do not burn off ties. Do not use pipe spreaders. Remove spreaders which are separate from forms as concrete is being placed.

H. Treat facing of forms with approved form coating before concrete is placed. When directed by Owner's Representative, treat both sides of face forms with coating. Apply coating before reinforcement is placed. Immediately before concrete is placed, wet surface of forms which will come in contact with concrete.

3.02 PLACING REINFORCEMENT

A. Place reinforcing steel accurately in accordance with approved Drawings. Secure steel adequately in position in forms to prevent misalignment. Maintain reinforcing steel in place using approved concrete and hot-dip galvanized metal chairs and spacers. Place reinforcing steel in accordance with CRSI Publication "Placing Reinforcing Bars." Request inspection of reinforcing steel by Owner's Representative and obtain acceptance before concrete is placed.

B. Minimum spacing center-to-center of parallel bars: 2 1/2 times nominal bar diameter. Minimum cover measured from surface of concrete to face of reinforcing bar unless shown otherwise on Drawings: 3 inches for surfaces cast against soil or subgrade, 2 inches for other surfaces.

C. Detail bars in accordance with ACI 315. Fabricate reinforcing steel in accordance with CRSI Publication MSP-1, "Manual of Standard Practice." Bend reinforcing steel to required shape while steel is cold. Excessive irregularities in bending will be cause for rejection.

D. Do not splice bars without written approval of Owner's Representative. Approved bar bending schedules or placing drawings constitute written approval. Splice and development length of bars shall conform to ACI 318, Chapters 7 and 12, and as shown on Drawings. Stagger splices or locate at points of low tensile stress.

3.03 EMBEDDED ITEMS

A. Install conduit and piping as shown on Drawings. Accurately locate and securely fasten conduit, piping, and other embedded items in forms.

B. Install waterstops as specified in other sections and according to manufacturer's instructions. Securely position waterstops at joints as indicated on Drawings. Protect waterstops from damage or displacement during concrete placing operations.

3.04 BATCHING, MIXING AND DELIVERY OF CONCRETE

A. Measure, batch, mix, and deliver ready-mixed concrete in accordance with ASTM C 94, Sections 8 through 11. Produce ready-mixed concrete using automatic batching system as described in NRMCA Concrete Plant Standards, Part 2 - Plant Control Systems.

B. Measure, mix and deliver concrete produced by volumetric batching and continuous mixing in accordance with ASTM C 685, Sections 6 though 8.

C. Maintain concrete workability without segregation of material and excessive bleeding. Obtain approval of Owner's Representative before adjustment and change of mix proportions.

D. Ready-mixed concrete delivered to site shall be accompanied by batch tickets providing information required by ASTM C 94, Section 16. Concrete produced by continuous mixing shall be accompanied by batch tickets providing information required by ASTM C 685, Section 14.

E. When adverse weather conditions affect quality of concrete, postpone concrete placement. Do not mix concrete when air temperature is at or below 40 degrees F and falling. Concrete may be mixed when temperature is 35 degrees F and rising. Take temperature readings in shade, away from artificial heat. Protect concrete from temperatures below 32 degrees F until concrete has cured for minimum of 3 days at 70 degrees F or 5 days at 50 degrees F.

F. Clean, maintain and operate equipment so that it thoroughly mixes material as required.

G. Hand-mix only when approved by Owner's Representative.

3.05 PLACING CONCRETE

A. Give sufficient advance notice to Owner's Representative (at least 24 hours prior to commencement of operations) to permit inspection of forms, reinforcing steel, embedded items and other preparations for placing concrete. Place no concrete prior to Owner's Representative's approval.

B. Schedule concrete placing to permit completion of finishing operations in daylight hours. However, when necessary to continue after daylight hours, light site as required. When rainfall occurs after placing operations are started, provide covering to protect work.

C. Use troughs, pipes and chutes lined with approved metal or synthetic material in placing concrete so that concrete ingredients are not separated. Keep chutes, troughs and pipes clean and free from coatings of hardened concrete. Allow no aluminum material to be in contact with concrete.

D. Limit free fall of concrete to 4 feet. Do not deposit large quantities of concrete at one location so that running or working concrete along forms is required. Do not jar forms after concrete has taken initial set; do not place strain on projecting reinforcement or anchor bolts.

E. Use tremies for placing concrete in walls and similar narrow or restricted locations. Use tremies made in sections, or provide in several lengths, so that outlet may be adjusted to proper height during placing operations.

F. Place concrete in continuous horizontal layers approximately 12 inches thick. Place each layer while layer below is still plastic.

G. Compact each layer of concrete with concrete spading implements and mechanical vibrators of approved type and adequate number for size of placement. When immersion vibrators cannot be used, use form vibrators. Apply vibrators to concrete immediately after depositing. Move vibrator vertically through layer of concrete just placed and several inches into plastic layer below. Do not penetrate or disturb layers previously placed which have partially set. Do not use vibrators to aid lateral flow concrete. Closely supervise consolidation to ensure uniform insertion and duration of immersion.

H. Handling and Placing Concrete: Conform to ACI 302.1R, ACI 304R and ACI 309R.

3.06 WATERSTOPS

A. Embed waterstops in concrete across joints as shown. Waterstops shall be continuous for extent of joint; make splices necessary to provide continuity in accordance with manufacturer's instructions. Support and protect waterstops during construction operations; repair or replace waterstops damaged during construction.

B. Install waterstops in concrete on one side of joints, leaving other side exposed until next pour. When waterstop will remain exposed for 2 days or more, shade and protect exposed waterstop from direct rays of sun during entire exposure and until exposed portion of waterstop is embedded in concrete.

C. Splicing PVC Waterstops:

1. Splice waterstops by heat-sealing adjacent waterstop sections in accordance with manufacturer's printed instructions.

2. Butt end-to-end joints of two identical waterstop sections may be made in forms during placement of waterstop material.

3. Prior to placement in form work, prefabricate waterstop joints involving more than two ends to be joined together, angle cut, alignment change, or joining of two dissimilar waterstop sections, allowing not less than 24 inch long strips of waterstop material beyond joint. Upon inspection and approval by Owner's Representative, install prefabricated waterstop joint assemblies in form work, and butt-weld ends of 24 inch strips to straight-run portions of waterstop in forms.

D. Setting PVC Waterstops:

1. Correctly position waterstops during installation. Support and anchor waterstops during progress of work to ensure proper embedment in concrete and to prevent folding over of waterstop by concrete placement. Locate symmetrical halves of waterstops equally

between concrete pours at joints, with center axis coincident with joint openings. Thoroughly work concrete in joint vicinity for maximum density and imperviousness.

2. Where waterstop in a vertical wall joint does not connect with any other waterstop, and is not intended to be connected to waterstop in future concrete placement, terminate waterstop 6 inches below top of wall.

E. Replacement of Defective Field Joints: Replace waterstop field joints showing evidence of misalignment, offset, porosity, cracks, bubbles, inadequate bond or other defects with products and joints complying with Specifications.

F. Resilient Waterstop:

1. Install resilient waterstop in accordance with manufacturer's instructions and recommendations.

2. When requested by Owner's Representative, provide technical assistance by manufacturer's representative in field at no additional cost to Owner.

3. Use resilient waterstop only where complete confinement by concrete is provided; do not use in expansion or contraction joints.

4. Where resilient waterstop is used in combination with PVC waterstop, lap resilient waterstop over PVC waterstop minimum of 6 inches and place in contact with PVC waterstop. Where crossing PVC at right angles, melt PVC ribs to form smooth joining surface.

5. At free top of walls without connecting slabs, stop resilient waterstop and grooves (where used) 6 inches from top in vertical wall joints.

6. Bentonite Waterstop:

   a. Locate bentonite waterstop as near as possible to center of joint and extend continuous around entire joint. Minimum distance from edge of waterstop to face of member: 5 inches.
   b. Where thickness of concrete member to be placed on bentonite waterstop is less than 12 inches, place waterstop in grooves at least 3/4 inch deep and 1 1/4 inches wide formed or ground into concrete. Minimum distance from edge of waterstop placed in groove to face of member: 2.5 inches.
   c. Do not place bentonite waterstop when waterstop material temperature is below 40 degrees F. Waterstop material may be wanned so that it remains above 40 degrees F during placement but means used to warm it shall in no way harm material or its properties. Do not install waterstop where air temperature falls outside manufacturer's recommended range.
   d. Place bentonite waterstop only on smooth and uniform surfaces; grind concrete smooth when necessary to produce satisfactory substrate, or bond waterstop to irregular surfaces using epoxy grout which completely fills voids and irregularities beneath waterstop material. Prior to installation, wire brush

concrete surface to remove laitance and other substances that may interfere with bonding of epoxy.

e. In addition to adhesive backing provided with waterstop, secure bentonite waterstop in place with concrete nails and washers at 12 inch maximum spacing.

7. Adhesive Waterstop:

a. With wire brush thoroughly clean concrete surface on which waterstop is to be placed and then coat with primer.
b. If surface is too rough to allow waterstop to form complete contact, grind to form adequately smooth surface.
c. Install waterstop with top protective paper left in place. Overlap joints between strips minimum of 1 inch and cover back over with protective paper.
d. Do not remove protective paper until just before final form work completion. Place concrete immediately, time that waterstop material is uncovered prior to concrete placement shall be minimized and shall not exceed 24 hours.

3.07 CONSTRUCTION JOINTS

A. Definitions:

1. Construction joint: Contact surface between plastic (fresh) concrete and concrete that has attained initial set.

2. Monolithic: Manner of concrete placement to reduce or eliminate construction joints; joints other than those indicated on Drawings will not be permitted without written approval of Owner's Representative. Where so approved, make additional construction joints with details equivalent to those indicated for joints in similar locations.

3. Preparation for Construction Joints: Roughen surface of concrete previously placed, leaving some aggregate particles exposed. Remove laitance and loose materials by sandblasting or high-pressure water blasting. Keep surface wet for several hours prior to placing of plastic concrete.

3.08 CURING

A. Comply with ACI 308. Cure by preventing loss of moisture, rapid temperature change and mechanical injury for period of 7 curing days when Type II or IP cement has been used and for 3 curing days when Type III cement has been used. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. A curing day is any calendar day in which temperature is above 50 degrees F for at least 19 hours. Colder days may be counted when air temperature adjacent to concrete is maintained above 50 degrees F. In continued cold weather, when artificial heat is not provided, removal of forms and shoring may be permitted at end of calendar days equal to twice required number of curing days. However, leave soffit forms and shores in place until concrete has reached specified 28 day strength, unless directed otherwise by Owner's Representative.

B. Cure formed surfaces not requiring rubbed-finished surface by leaving forms in place for full curing period. Keep wood forms wet during curing period. Add water as needed for other

types of forms. Or, at Contractor's option, forms may be removed after 2 days and curing compound applied.

C. Rubbed Finish:

1. At formed surfaces requiring rubbed finish, remove forms as soon as practicable without damaging surface.

2. After rubbed-finish operations are complete, continue curing formed surfaces by using either approved curing/sealing compounds or moist cotton mats until normal curing period is complete.

D. Unformed Surfaces: Cure by membrane curing compound method.

1. After concrete has received final finish and surplus water sheen has disappeared, immediately seal surface with uniform coating of approved curing compound, applied at rate of coverage recommended by manufacturer or as directed by Owner's Representative. Do not apply less than 1 gallon per 180 square feet of area. Provide satisfactory means to properly control and check rate of application of compound.

2. Thoroughly agitate compound during use and apply by means of approved mechanical power pressure sprayers equipped with atomizing nozzles. For application on small miscellaneous items, hand-powered spray equipment may be used. Prevent loss of compound between nozzle and concrete surface during spraying operations.

3. Do not apply compound to dry surface. When concrete surface has become dry, thoroughly moisten surface immediately prior to application. At locations where coating shows discontinuities, pinholes or other defects, or when rain falls on newly coated surface before film has dried sufficiently to resist damage, apply additional coat of compound at specified rate of coverage.

3.09 REMOVAL OF FORMS AND SHORING

A. Remove forms from surfaces requiring rubbing only as rapidly as rubbing operation progresses. Remove forms from vertical surfaces not requiring rubbed-finish when concrete has aged for required number of curing days. When curing compound is used, do not remove forms before 2 days after concrete placement.

B. Leave soffit forms and shores in place until concrete has reached specified 28-day strength, unless directed otherwise by Owner's Representative.

3.10 DEFECTIVE WORK

A. Immediately repair defective work discovered after forms have been removed. When concrete surface is bulged, uneven, or shows excess honeycombing or form marks which cannot be repaired satisfactorily through patching, remove and replace entire section.

3.11 FINISHING

A. Patch honeycomb, minor defects and form tie holes in concrete surfaces with cement mortar mixed one part cement to two parts fine aggregate. Repair defects by cutting out unsatisfactory material and replacing with new concrete, securely keyed and bonded to existing concrete. Finish to make junctures between patches and existing concrete as inconspicuous as possible. Use stiff mixture and thoroughly tamp into place. After each patch has stiffened sufficiently to allow for greatest portion of shrinkage, strike off mortar flush with surface.

B. Apply rubbed finish to exposed surfaces of formed concrete structures as noted on Drawings. After pointing has set sufficiently, wet surface with brush and perform first surface rubbing with No. 16 carborundum stone, or approved equal. Rub sufficiently to bring surface to paste, to remove form marks and projections, and to produce smooth, dense surface. Add cement to form surface paste as necessary. Spread or brush material, which has been ground to paste, uniformly over surface and allow to reset. In preparation for final acceptance, clean surfaces and perform final finish rubbing with No. 30 carborundum stone or approved equal. After rubbing, allow paste on surface to reset; then wash surface with clean water. Leave structure with clean, neat and uniform-appearing finish.

C. Apply wood float finish to concrete slabs.

3.12 FIELD QUALITY CONTROL

A. Testing shall be performed under provisions of Division 1.

B. Unless otherwise directed by Owner's Representative, following minimum testing of concrete is required. Testing shall be performed by qualified individuals employed by approved independent testing agency, and conform to requirements of ASTM C 1077.

1. Take concrete samples in accordance with ASTM C 172.

2. Make one set of four compression test specimens for each mix design at least once per day and for each 150 cubic yards or fraction thereof. Make, cure and test specimens in accordance with ASTM C 31 and ASTM C 39.

3. When taking compression test specimens, test each sample for slump according to ASTM C 143, for temperature according to ASTM C 1064, for air content according to ASTM C 231, and for unit weight according to ASTM C 138.

4. Inspect, sample and test concrete in accordance with ASTM C 94, Section 13, 14, and 15, and ACI311-5R.

C. Test Cores: Conform to ASTM C 42.

D. Testing High Early Strength Concrete: When Type III cement is used in concrete, specified 7 day and 28 day compressive strengths shall be applicable at 3 and 7 days, respectively.

E. If 7-day or 3-day test strengths (as applicable for type of cement being used) fail to meet established strength requirements, extended curing or resumed curing on those portions of structure represented by test specimens may be required. When additional curing fails to produce required strength, strengthening or replacement of portions of structure which fail to develop required strength may be required by Owner's Representative, at no additional cost to Owner.

3.13 PROTECTION

A. Protect concrete against damage until final acceptance by Owner.

B. Protect fresh concrete from damage due to rain, hail, sleet, or snow. Provide protection while concrete is still plastic, and whenever precipitation is imminent or occurring.

C. Do not backfill around concrete structures or subject them to design loadings until components of structure needed to resist loading are complete and have reached specified 28 day compressive strength, except as authorized otherwise by Owner's Representative.

END OF SECTION

PART 1-GENERAL

1.01 SUMMARY

A. Work includes general requirements for all electrical work.

B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern Work in this section.

1.02 REFERENCES

A. ANSI/NFPA 70-National Electrical Code (NEC).

B. ANSI/IEEE C2-National Electrical Safety Code.

1.03 CONTRACT DOCUMENTS

A. Any equipment roughed in improperly and/or not positioned on implied centerlines or as dictated by good practice shall be repositioned at no cost to OWNER.

B. The Drawings are generally diagrammatic, and CONTRACTOR shall coordinate the Work so that interferences are avoided. Provide all offsets in conduit, fittings, etc., necessary to properly install the work. All offsets, fittings, etc., shall be provided without additional expense to OWNER.

1.04 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70.

B. Conform to ANSI/IEEE C2.

C. The rules and regulations of the federal, state, local, and civil authorities and utility companies in force at the time of execution of the Contract shall become a part of this specification.

D. Obtain electrical permits and inspections from authority having jurisdiction. Costs for permits and inspections shall be paid by CONTRACTOR.

1.05 CODES AND ORDINANCES

A. CONTRACTOR is expected to know or to ascertain, in general and in detail, the requirements of all codes and ordinances applicable to the construction and operation of systems covered by this Contract. CONTRACTOR shall know or ascertain the rulings and interpretations of code requirements being made by all authorities having jurisdiction over the work to be performed by them.

B. In preparing a Bid, CONTRACTOR shall include the cost of all items and procedures necessary to satisfy the requirements of all applicable codes, ordinances, and authorities, whether or not these are specifically covered by the Drawings and Specifications. All cases of apparent conflicts between the Drawings, Specifications, and codes shall be brought to ENGINEER's attention, as herein before specified. CONTRACTOR shall carry out work and complete construction as required by applicable codes and ordinances and in such a manner as to obtain approval of all authorities whose approval is required.

C. When requested by ENGINEER, CONTRACTOR shall provide written calculations to show compliance with applicable codes or the Contract Documents. This shall include, but not be limited to, conduit and wire sizing, junction and pull box fill and sizing, manhole/handhole sizing, conductor derating, and voltage drop. CONTRACTOR shall indicate calculation method used as well as compliance with applicable code, drawing, or specification.

1.06 ELECTRICAL DISTRIBUTION SYSTEM

A. Provide a complete electrical distribution system consisting of components indicated on the Drawings or specified herein including, but not limited to:
1. 480-volt, three-phase, 4-wire service entrance conductors.
2. Feeders, branch wiring, and electrical distribution equipment.
3. All control wiring.
4. Access panels and access doors for access to equipment installed by Division 6.
5. Wiring between system components if equipment is not prewired
6. Support system design and supports for electrical raceways.

B. Provide a standby power system consisting of components indicated on the Drawings.

C. Provide balancing and adjusting of electrical loads.

D. CONTRACTOR shall instruct OWNER's representative in the operation and maintenance of all equipment. The instruction shall include a complete operating cycle on all apparatus.

E. Provide miscellaneous items for a complete and functioning system as indicated on the Drawings and specified herein.

F. A partial list of work not included in Division 6 is as follows: Painting (except as otherwise specified herein).

1.07 NOISE

A. Eliminate any abnormal noises that are not considered by ENGINEER to be an inherent part of the systems as designed. Abnormal buzzing in equipment components will not be acceptable.

1.08 DRAWINGS

A. The Drawings indicate approximate locations of the various items of the electrical systems. These items are shown approximately to scale and attempt to show how these items should be integrated with building construction. Locate all the various items by on-the-job measurements in conformance with Contract Documents and cooperation with other trades.

B. Prior to locating equipment, confer with ENGINEER as to desired location in the various areas. In no case should equipment locations be determined by scaling drawings. Relocate equipment and bear cost of redoing work or other trades' work necessitated by failure to comply with this requirement.

C. In certain instances, receptacles, switches, or other electrical devices and equipment, etc., may be relocated. Where relocation is within 10 feet of location shown on the Drawings, and when CONTRACTOR is informed of necessary relocation before work is begun on this portion of the job, the relocation shall be at CONTRACTOR's expense.

D. The Drawings are schematic in nature and are not intended to show exact locations of conduit, but rather to indicate distribution, circuitry, and control.

1.09 EXISTING UNDERGROUND UTILITIES

A. Record drawings of existing underground utilities are not available for this facility. CONTRACTOR shall excavate and verify the location of all underground utilities prior to installing new electrical equipment and prior to making modifications to existing electrical. This shall include, but not be limited to, feeders to structures and equipment, branch circuit wiring, phone and communication cabling, instrument wiring, and control wiring. CONTRACTOR shall temporarily relocate existing underground utilities to keep the existing facility in operation and for any new construction, and all costs for relocating existing electrical shall be included in the Bid.

1.10 SUBMITTALS

A. CONTRACTOR shall submit to ENGINEER for approval prior to beginning work, shop drawings on the equipment and materials proposed to be furnished and installed. See Section 01330-Submittal Procedures for requirements.

B. CONTRACTOR shall, in addition, submit drawings and/or diagrams for review and for job coordination in all cases where deviation from the Contract drawings are contemplated because of job conditions, interference or substitution of equipment, or when requested by ENGINEER for purposes of clarification of CONTRACTOR's intent. CONTRACTOR shall also submit detailed drawings, rough-in sheets, etc., for all special or custom-built items or equipment. Drawings and details under this section shall include, but not be limited to, the following, where applicable to this project: Major feeder routing in plan and elevation, including service entrance raceways and cable.

C. These drawings and diagrams shall show applicable electrical switch and breaker sizes as well as the manufacturer's name and catalog number for each piece of equipment used.

D. Equipment and material submittals must show sufficient data to indicate complete compliance with Contract Documents as follows:
1. Proper sizes and capacities.
2. That the item will fit in the available space in the manner that will allow proper service.
3. Construction materials and finishes.

E. When the manufacturer's reference numbers are different from those specified, provide correct cross-reference number for each item. The shop drawings shall be clearly marked and noted accordingly.

F. When equipment and items specified include accessories, parts, and additional items under one designation, shop drawings shall be complete and include all components.

G. See additional requirements of shop drawings under Division 1-General Requirements.

PART 2-PRODUCTS

2.01 STANDARD PRODUCTS

A. All equipment and products shall be of new manufacture per applicable specifications.

B. All equipment shall be UL and NEMA approved.

C. Unless specified otherwise, major distribution equipment shall each be by the same manufacturer.

D. All equipment and wiring shall be selected and installed for conditions in which it will perform (e.g., general purpose, weatherproof, raintight, dustproof, or any other special type).

2.02 SUBSTITUTION OF MATERIALS AND EQUIPMENT

A. While it is not the intention of OWNER to discriminate against any manufacturer of equipment which may be equivalent to specified equipment, a strict interpretation of such equivalency will be exercised in considering any equipment offered as a substitute for specified equipment. CONTRACTOR shall submit with each request for approval of substitute material or equipment sufficient data to show conclusively that it is equivalent to that specified in the following respects:

1. Performance:
   a. Capacity at conditions and operating speeds scheduled shall be equal to or greater than that of the specified equipment.
   b. Energy consumption at the point of rating shall not exceed that of the specified equipment.
   c. Vibration and noise production at the point of rating shall not exceed that of the specified equipment.
2. Materials of construction.
3. Gauges, weights, and sizes of all portions and component parts.
4. Design arrangements, methods of construction, and workmanship.
5. Coatings, finishes, and durability of wearing parts.
6. National reputation of the manufacturer as a producer of first quality equipment of the type under consideration.
7. Availability of prompt, reliable, and efficient service facilities franchised by or affiliated with the equipment manufacturer. This shall include the maintenance of local stocks of critical replacement parts equal to those maintained for the specified equipment.

B. Requests for substitution shall include CONTRACTOR's reason for the request.

C. If ENGINEER does not consider the items equivalent to those specified, CONTRACTOR shall provide those specified.

D. See General Conditions for additional requirements.

PART 3-EXECUTION

3.01 UTILITY SERVICES

A. All costs for temporary service, temporary routing of piping, or any other requirements of a temporary nature associated with the utility service shall be included in the Base Bid.

3.02 CONTINUITY OF SERVICE

A. CONTRACTOR shall provide and maintain continuous services (power, controls, alarms, etc.) during the entire construction period.

B. No service shall be interrupted or changed without permission from OWNER. Written permission shall be obtained before any work is started.

C. When interruption of service is required, all persons concerned shall be notified and a prearranged time agreed upon. Notice shall be a minimum of 72 hours prior to the interruption.

3.03 CLEANUP AND REMOVAL OF RUBBISH

A. All lighting and appliance panelboards, junction boxes, and pull boxes shall be cleaned of debris and wires neatly arranged with surplus length cut off before installation of covers.

B. Equipment shall be thoroughly cleaned of all stains, paint spots, dirt, and dust. All temporary labels not used for instruction or operation shall be removed.

3.04 CONCRETE WORK

A. All new equipment shall be set on 3 1/2-inch minimum leveling slabs including generators, etc.

B. Provide all anchor bolts, metal shapes, and templates to be cast in concrete or used to form concrete for support of electrical equipment.

3.05 PAINTING

A. All painting of electrical equipment shall be done by CONTRACTOR unless equipment is specified to be furnished with factory-applied finish coats.

B. All electrical equipment shall be provided with factory-applied prime finish, unless otherwise specified.

C. If the factory finish on any equipment furnished by CONTRACTOR is damaged in shipment or during construction, the equipment shall be refinished by CONTRACTOR.

D. One can of touch-up paint shall be provided for each different color factory finish which is to be the final finished surface of the product.

3.06 CAULKING

A. Caulk with a caulking sealant, where indicated on the electrical drawings or hereinafter specified.

B. Caulking sealant shall be silicone construction sealant as manufactured by General Electric or two-part polysulfide conforming to the requirements and bearing the seal of the Thiokol Chemical Corporation.

C. Caulking sealant shall contain no acid or ingredients that will stain stone, corrode metal, or have injurious effect on painting. It shall be colored to match adjacent surroundings.

3.07 BUILDING ACCESS

A. CONTRACTOR shall arrange for the necessary openings in the building to allow for admittance of all apparatus.

B. When the installation requires openings and access through existing construction and the openings are not provided, CONTRACTOR shall provide the necessary openings.

3.08 COORDINATION

A. Provide wiring for all electrically powered or electrically controlled equipment.

B. CONTRACTOR shall provide all power and control wiring.

C. CONTRACTOR shall connect and wire all apparatus according to approved wiring diagrams furnished by the various trades.

3.09 EXCAVATION AND BACKFILL

A. Backfill of exterior trenches shall be compacted granular fill, unless otherwise noted. Refer to Section 06133-Conduit for additional requirements associated with PVC conduit installed in earth.

B. Lines passing under foundation walls shall have a minimum of 1 1/2-inch clearance.

C. Care shall be taken so that there is no disturbance of bearing soil under foundations.

D. CONTRACTOR shall follow underground pipe runs where possible to avoid additional rock excavation.

3.10 EQUIPMENT ACCESS AND LOCATION

A. CONTRACTOR shall coordinate work of this division with that of other divisions so that all systems, equipment, and other components of the building will be installed at the proper time, will fit the available space, and will allow proper service access to those items requiring maintenance. This means adequate access to all equipment not just that installed under this division. Any components for the electrical systems that are installed without regard to the above shall be removed and relocated as required to provide adequate access at CONTRACTOR's expense.

B. Where various items of equipment and materials are specified and scheduled, the purpose is to define the general type and quality level, not to set forth the exact trim to fit the various types of ceiling, wall, or floor finishes. Provide materials that will fit properly the types of finishes installed.

C. All equipment, junction and pull boxes, and accessories shall be installed to permit access to equipment for maintenance. Any relocation of conduits, equipment, or accessories to provide maintenance access shall be accomplished by CONTRACTOR at no additional cost.

D. Electrical equipment, devices, instruments, hardware, etc., shall be installed with ample space allowed for removal, repair, calibration, or changes to the equipment. Ready accessibility to equipment and wiring shall be provided without moving other equipment that is to be installed or that is already in place.

E. Locate electrical outlets and equipment to fit the details, panels, decorating, or finish of the space. ENGINEER shall reserve the right to make minor position changes of the outlets before the work has been installed.

3.11 WORKMANSHIP

A. All work shall be performed in compliance with the NEC.

B. Install work using procedures defined in NECA Standard of Installation.

C. Unless otherwise noted, conduit shall be fastened to building structure or equipment framework and not placed on the floor.

D. Where materials, equipment apparatus, or other products are specified by manufacturer, brand name, and type or catalog number, such designation is to establish standards of desired quality and style and shall be the basis of the Bid.

E. Materials and equipment of the types for which there are National Board of Fire Underwriters Laboratories (UL) listings shall be so labeled and shall be used by CONTRACTOR.

3.12 AREA CLASSIFICATION

A. Where referenced herein, damp, and wet locations shall include, but not be limited to, all areas below grade and exterior locations.

3.13 MODIFICATIONS TO EXISTING CONSTRUCTION

A. Alterations:
   1. Alter, extend, and reconnect conduits as necessary.
   2. Reconnect existing conduits that were reused, cut, or exposed because of construction as quickly as possible.
   3. Where wiring is involved, new wires shall be "pulled in" between the nearest available accessible reused outlets to the extent allowed by the governing code.
   4. Provide new conduits for wires if they cannot be "pulled in" to existing conduits.
   5. All new conduits, wiring, and electrical items shall be connected to the existing systems to function as a complete unit.
   6. Where existing electrical equipment, devices, fixtures, electrically operated items, etc., interfere with any remodeling work, they shall be removed and reinstalled in another location to avoid such interferences. All existing and relocated equipment shall be left in good operating condition.

B. CONTRACTOR shall remove all electrical equipment, conduit, and wiring associated with the equipment and materials specified herein and/or shown on the Drawings to be removed.

C. Include in Bid removal of existing electrical material and equipment as specified herein after, as noted on the Drawings, or as needed by field conditions.

D. Provide stainless steel cover plates for all existing recessed outlet and junction boxes not being reused. Seal or cap all existing conduit penetrations not being reused.

-END OF SECTION-

PART 1-GENERAL

1.01 SUMMARY

A. Work Included:
   1. Wire.
   2. Terminal blocks and accessories.
   3. Wiring connections and terminations.

B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 QUALITY ASSURANCE

A. Manufacturers of Wire: Firms regularly engaged in the manufacture of electrical wire products of the types and ratings needed whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work like that in this project.

C. Code Compliance: Comply with National Electrical Code (NFPA 70) and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.

D. UL Labels: Provide electrical material, which has been listed and labeled by Underwriters Laboratories.

E. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.03 SUBMITTALS

A. Submit shop drawings and product data under the provisions of Section 01330-Submittals.

B. Submit shop drawings for wiring system including layout of distribution devices, branch circuit conduit and cables, circuiting arrangement, and outlet devices.

C. Submit manufacturer's instructions.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Provide factory-wrapped, waterproof, flexible-barrier material for covering wire on wood reels, where applicable, and weather-resistant fiberboard containers for factory-packaging of wire, connectors, outlets, boxes, lamps, fuses, etc., to protect

against physical damage in transit. Do not install damaged wire or other material; remove from project site.

B. Store wire and other material in factory-installed coverings in a clean, dry, indoor space which provides protection against the weather.

PART 2-PRODUCTS

2.01 WIRE

A. All wire for permanent installation shall be new stranded copper delivered to project in unopened cartons or reels, except where specifically noted and be UL listed for the use intended. No wire smaller than 12 AWG shall be used unless specifically noted. The use of multiconductor cable is not allowed.

B. All wiring within control panels that do not extend outside of the enclosure shall be insulation-type MTW, minimum size 16 AWG.

C. Wiring in dry locations shall be THHN. Wiring in damp and wet locations shall be XHHW-2.

D. Refer to Section 06153-Electrical Identification for required wire insulation color coding and conductor labeling requirements. Initial phase color shall be used throughout the run, even for switch legs. Colors must meet code requirements for each class voltage. Do not duplicate colors, including neutral, on different voltages.

E. Circuits 150 feet or over shall be sized for a maximum 2% voltage drop.

2.02 LOW-VOLTAGE WIRING (LESS THAN 100 VOLTS)

A. Low-voltage wiring specified in this section shall be applicable to all systems installed that utilize low-voltage wiring where such wiring is not specified in other technical sections.

B. All wiring shall have copper conductors with 300-volt insulation rating and meet the requirements of NEC Article 725.

C. All conductors must be suitable for the application intended. Conductors 16 AWG and larger shall be stranded. Conductors 18 AWG and smaller may be solid or stranded.

D. Control Cable for Class 1 Remote Control and Signal Circuits: Individual conductors twisted together shielded, and covered with an overall PVC jacket. Cable shall be UL listed, temperature rated, and plenum or nonplenum rated for the application as required in the National Electrical Code.

E. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits shall be constructed, UL listed, temperature rated, and plenum or nonplenum rated for the application as required in the NEC Article 725.

2.03 WIRING CONNECTIONS AND TERMINATIONS

A. Provide crimp type UL or ETL listed terminations for 6 AWG and smaller stranded conductor connections to electrical devices and equipment such as receptacles, switches, and terminal strips. Crimp devices shall be Sta-kon, or equal.

B. Provide insulated, silicone-filled spring wire connectors with plastic caps for 8 AWG conductors and smaller. Connectors shall be King Silicone-Filled Safety Connectors, or equal. Spring wire connectors shall only be allowed in junction, outlet, or switch boxes. Spring wire connectors are not allowed for terminating motor conductors.

C. No splices will be allowed unless reviewed by ENGINEER. Where allowed, provide in-line splices for all conductor connections, 6 AWG and larger. Splice crimp component shall be Burndy UGSKIT2 or equal. Splice shall be made with crimp tool by manufacturer that allows expanded conductor ranges. Splice insulation component shall be Raychem heavy-wall, low-voltage tubing, type WCSM, or equal.

2.04 TERMINAL BLOCKS AND ACCESSORIES

A. Terminal Blocks: ANSI/NEMA ICS 4: UL listed or UL recognized under UL 467, UL 486E, UL1059, and UL 1953 (power terminals only).

B. Power Terminal Blocks: Unit construction type, closed-back type, tin-plated copper, with tubular pressure screw connectors, rated 600 volts as manufactured by Allen-Bradley 1492-PDL, or equal.

C. Signal and Control Terminal Blocks:

1. General-Purpose Terminal Blocks:
   a. Terminal blocks shall be rated up to 600 volts AC/DC.
   b. Terminal blocks shall accept center-mounted jumper bars without increasing the installed space.
   c. Terminal blocks shall be Allen-Bradley Bulletin 1492-J, or equal.
   d. Terminal block color shall be gray.

2. Grounding Terminal Blocks:
   a. Terminal blocks shall be Allen-Bradley Bulletin 1492-JG, or equal.
   b. Terminal block color shall be green/yellow.

3. Disconnect-type Terminal Blocks (300-Volt Class):
   a. Terminal blocks shall be feed-through type with a knife-blade disconnect.
   b. Terminal blocks shall be Allen-Bradley Bulletin 1492-JKD, or equal, depending on the application.
   c. Terminal block color shall be gray.

4. Fuse-type Terminal Blocks with Indicator (300-Volt Class):
   a. Terminal blocks for applications from 100 to 300 volts AC shall be Allen-Bradley Bulletin 1492-H4, or equal, with neon blown-fuse indicator.
   b. Terminal blocks for applications from 10 to 50 volts AC/DC shall be Allen-Bradley Bulletin 1492-H5, or equal, with LED blown-fuse indicator.
   c. Terminal block color shall be black.

5. Terminal blocks shall have self-locking screw compression clamps rated for the size or conductors being terminated and upstream overcurrent protection for each application.
6. The same manufacturer and style of terminal block shall be used throughout the entire project for all applications.
7. Terminal blocks shall have tin-plated copper current bars and tin-plated steel screws. Terminal housings shall be completely finger safe from all live circuits and be constructed of self-extinguishing material with minimum UL 94-V0 flammability rating.
8. Terminal blocks accept pre-printed, snap-in labeling cards on both sides without increasing the installed space. Provide terminal block manufacturer's end barriers and screw-type retainers for all terminal block groupings.
9. Terminal blocks shall mount on standard DIN rail and shall be able to be removed without removing adjacent terminal blocks.
10. Multi-level terminal blocks and stacked, single-level terminal block installations are not acceptable.

D. Refer to Section 06153-Electrical Identification for terminal block labeling requirements.

PART 3-EXECUTION

3.01 GENERAL WIRING METHODS

A. Install electrical wire and connectors in accordance with the manufacturer's written instructions, applicable requirements of the NEC, the National Electrical Contractors Association's "Standard of Installation," and in accordance with

recognized industry practices so that products serve the intended functions. Use appropriate wiring methods and materials for the equipment or environment.

B. Stranded conductors shall be terminated using crimp-type devices specified herein. Conductors may not be wrapped around a terminal screw.

C. Place an equal number of conductors for each phase of a circuit in the same raceway.

D. Torque conductor connections and terminations with calibrated torque wrench to manufacturer's recommended values. Provide permanent marking on lug, bolt, nut, or connection for conductors larger than 4 AWG.

E. Splice only in junction or outlet boxes. Splicing is not allowed in disconnects, panelboards, control panels, equipment, etc. Avoid splices between terminals of interconnecting power and control wiring.

F. Spring wire connectors shall only be used in junction, outlet, or switch boxes. Equipment wireways (e.g., panelboards, disconnects, etc.), and control panels shall not have any spring-wire connectors installed; all terminations shall be on terminal strips.

G. Neatly train, lace, and tie wrap all wiring inside boxes, equipment, control panels, and panelboards.

H. Make conductor lengths for parallel circuits equal.

I. The same color shall be used for each numbered wire throughout its entire length.

J. Terminate all wiring on terminal blocks in control panels, and similar equipment. This shall include all spare or unused wires.

K. Provide a dedicated neutral for each branch circuit or feeder requiring a neutral. Ampacity of neutral conductor shall match that of the branch circuit or feeder.

L. Do not use a pulling means that can damage the raceway.

M. Signal wiring (below 100 volts) must be in a conduit separate from power and/or control wiring (over 100 volts). Signal wire shall include, but not be limited to communication wiring (i.e., DeviceNet, RS-232, etc.). Analog wiring shall be in a conduit separate from all other wiring.

N. Provide junction or pull boxes to facilitate the "pulling in" of wires or to make necessary connections. All raceways and apparatus shall be thoroughly blown out and cleaned of foreign matter prior to pulling in wires.

O. Thoroughly clean wires before installing lugs and connectors.

P. Make splices, taps, and terminations to carry full capacity of conductors without perceptible temperature rise.

Q. Terminate spare conductors within equipment, control panels, etc., on terminal strips and label as "SPARE." Spare wiring in pull or junction boxes may be terminated with electrical tape and labeled as "SPARE." All spare conductor labels shall indicate where the conductors terminate. Refer to Section 06153-Electrical Identification, for additional requirements.

3.02 GENERAL LOW-VOLTAGE WIRING METHODS (LESS THAN 100 VOLTS)

A. Low-voltage wiring installation requirements specified herein shall be applicable to all systems installed that utilize low-voltage wiring where such wiring installation is not specified in other technical sections.

B. Low-voltage wiring shall be installed in conduit.

C. Low-voltage cable splices shall only be allowed in junction boxes.

3.03 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use UL-listed wire-pulling lubricant for pulling 4 AWG and larger wires. Wax-based pulling lubricant is not allowed unless it includes a Teflon additive.

B. Completely and thoroughly swab raceway system before installing conductors.

C. Conductors No. 6 AWG and larger shall be pulled into conduits by hand or by utilizing a tugger with built-in tension meter. Other motorized machines of any type are not allowed for any wire pulling. CONTRACTOR shall provide a report to ENGINEER for each pull indicating maximum tension reached during the pull along with manufacturer's maximum pulling tension.

D. Conductors shall be installed in conduit system in such a manner that insulation is not damaged, conductors are not overstressed in pulling, and walls are not damaged. No splices are permitted except in junction boxes or outlet boxes.

E. CONTRACTOR shall observe code limitation on the number and size of wires in an outlet box. CONTRACTOR shall either lay out work so that the wires do not exceed the box limitation or provide larger boxes approved for additional capacity.

F. Panel riser feeder conductors shall be identified with colored tape at panel lugs. The same phase relation shall be maintained throughout.

G. Circuiting is indicated diagrammatically on the Drawings.

3.04 TERMINAL BLOCK INSTALLATION

A. A maximum of one conductor shall be installed on the field-wired side of each terminal block. If rated to accept more than one conductor, a maximum of two conductors shall be installed on the enclosure-wired side of each terminal block. Provide additional terminal blocks and shorting jumpers as required.

B. Maintain a minimum of 1 1/2 inches between terminal blocks and adjacent devices and enclosure wireways.

3.05 FIELD QUALITY CONTROL

A. Inspect wire for physical damage and proper connection.

B. Prior to energizing, check conduit, raceways, outlet boxes, and wire for continuity of circuitry and for short circuits. Correct malfunction when detected.

C. After wire hookups, energize circuitry and demonstrate functionality in accordance with these specifications.

D. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

E. Perform field inspection and testing according to provisions of this section.

3.06 ACCEPTANCE TESTS

A. CONTRACTOR shall furnish all materials, labor, and equipment necessary for the acceptance tests specified herein. Acceptance tests shall be performed in the presence of OWNER or OWNER's representative and must be passed before final acceptance of the work.

B. CONTRACTOR shall be responsible for powered tests of each field-installed device unless specifically noted otherwise. CONTRACTOR shall be responsible for device operation as powered from its power source.

C. Operation Test: By operational testing, OWNER will give final acceptance of the wiring system when all the wiring is considered a complete system. All equipment shall function and operate in the proper manner as indicated in the details of the specifications and on the Drawings.

D. At the request of OWNER's representative, demonstrate by test the compliance of the installation with these specifications and Drawings, the

National Electrical Code, and the accepted standards of good workmanship. These tests shall include operation of equipment, continuity of the conduit system, grounding resistance and insulation resistance.

E. A written record of performance tests on electrical equipment shall be supplied to OWNER. Such tests shall show compliance with governing codes.

3.07 WIRE INSTALLATION SCHEDULE

A. Install all wiring in raceways.

END OF SECTION

PART 1-GENERAL

1.01 SUMMARY

A. Work Included:
   1. Power system grounding.
   2. Electrical equipment and raceway grounding and bonding.
   3. Grounding must be in accordance with generator manufacturer's printed instructions.

B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 SUBMITTALS

A. Indicate location of system grounding electrode connections and routing of grounding electrode conductor.

B. Submit shop drawings and product data in accordance with provisions of Section 01330- Submittals.

PART 2-PRODUCTS

2.01 MATERIALS

A. Ground Rods: Copper-bonded, 5/8-inch diameter; minimum length 10 feet.

B. Ground Connections Below Grade: Exothermic type by Cadweld, compression type by ABB (Thomas & Betts), or equal. Compression connectors shall be prefilled with an oxide inhibitor.

C. Ground Fittings: O-Z/Gedney, Type ABG, CG, TG, GBL, or equal.

PART 3-EXECUTION

3.01 INSTALLATION

A. Compression-type connectors shall be installed with the manufacturer recommended tools. Compression dies shall emboss index on the connector when installed correctly. An indenter crimp shall be made on ground rods prior to connection of grounding conductor.

B. Provide a separate insulated equipment grounding conductor for each feeder and branch circuit. Terminate each end on a grounding lug, bus, or bushing.

C. Bond together system neutrals, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and cold-water plumbing systems.

D. Connect grounding electrode conductors to metal water piping and metal frame of building or structure, using suitable ground clamps. Make connections to flanged piping at a point ahead of meter or service shutoff valve. Provide jumper connection across meter or service shutoff valve.

E. Ground system and equipment as required by code and local ordinances.

F. All feeder neutrals shall be connected to neutral at only one point in the service entrance ATS.

G. All bare copper conductors installed outdoors shall be buried a minimum of 2 feet below grade.

H. Water system grounds and a minimum of three ground rods at 15-foot separations near service or feeder entrance of each building shall be provided and ground wires must attach to point ahead of meter or service shutoff valve. These shall be connected to ground bus by conductors sized to code requirements. The above are minimumrequirements.

I. All grounding electrode conductors shall be installed in PVC conduit. All conduit bends shall be made using sweep elbows. Conduit bodies and 90-degree bends are not allowed.

J. Include ground for grounded receptacles and equipment items shown on the drawings.

K. Flexible connections do not qualify for ground. All flexible connections must have separate green ground wire from equipment frame to conduit system.

L. Separately derived systems as defined by the National Electrical Code shall be grounded as such.

3.02 TESTING

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Provide ground system resistance test report for each ground grid. Test reports shall document ground system resistance following the three-point "Fall-of-Potential" test. The test results shall include a graph of the results plus a diagram of the testing

layout. The remote current probe (C2) shall be placed a minimum of 100 feet from the ground system potential/current probe (P1/C1) or as required to provide sufficient spacing to demonstrate a resistance plateau on the graph. The ground resistance shall be tested with the potential probe (P2) between the P1/C1 probe and the C2 probe at 10% intervals starting at 0% and ending at 100% of the distance between P1/C1 and C2, 11 points total. A single point of measurement is not acceptable, and the two-point method of ground system testing shall only be used where there is no or insufficient "open earth" area to use the three-point Fall-of-Potential method. Resistance at any point in the grounding system shall not exceed 5 ohms. All ground system tests shall be witnessed by ENGINEER or OWNER ENGINEER shall be notified a minimum of 72 hours in advance of all ground system testing.

C. The test meter shall be Associated Research Vibroground test set with null balance, or equal. All ground system tests shall be performed in accordance with the procedures outlined in the instruction manuals of the ground system test equipment.

D. Ground resistance testing shall be performed with all rods connected and shall be isolated from all metallic connections, such as from the ground rod to other grounded structures and electrical system neutrals.

E. Provide test report using the attached Form 06126. Each ground grid, including service entrance transformers, etc., shall have a form submitted.

-END OF SECTION-

FORM 06126

GROUND ROD RESISTANCE TO EARTH
TEST RECORD

1. DATE _____

2. PROJECT NAME _____

3. LOCATION OF TEST _____

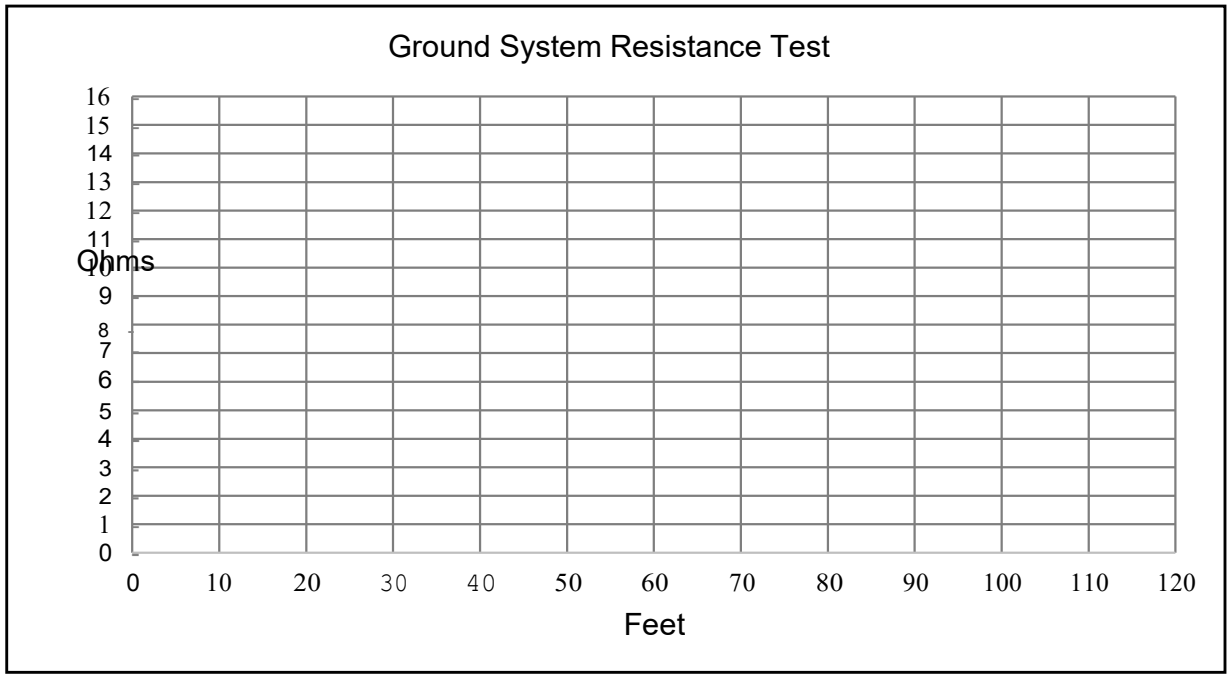
4. GROUND ROD TYPE _____

5. TEST METHOD _____
   INSTRUMENT TYPE _____

   SERIAL NO. _____

6. REQUIRED MAXIMUM RESISTANCE TO EARTH _____

7. MEASURED RESISTANCE TO EARTH
   GROUND ROD SYSTEM _____



TEST PERFORMED BY: _____
Signature

TEST WITNESSED BY: _____
Signature

PART 1-GENERAL

1.01 SUMMARY

A. Work Included:
   1. Conduit and equipment support members.
   2. Fastening hardware.

B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

1.03 SUBMITTALS

A. Submit shop drawings and product data in accordance with provisions of Section 01330- Submittals.

PART 2-PRODUCTS

2.01 MATERIAL

A. Support Members:
   1. 316 stainless steel in exterior locations.
   2. Hot-dipped, galvanized steel in all other areas.

B. Hardware:
   1. Stainless steel in exterior locations.
   2. Hot-dipped, galvanized steel in all other areas.

PART 3-EXECUTION

3.01 INSTALLATION

A. All supporting devices and support structures shall be constructed such that the structure adequately supports the load of the equipment installed on it including any wind and/or snow loads. Provide additional support members to those shown on the Drawings to adequately support load.

B. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors or support members. Do not use spring steel clips and clamps. Provide standoffs as specified in other technical sections.

C. Use toggle bolts or hollow wall fasteners in hollow masonry, and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion

anchors on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

D. The ends of all support members shall be ground smooth.

E. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

F. Do not use powder-actuated anchors.

G. Do not drill structural steel members.

H. Fabricate supports with welded end caps and all welds and surfaces ground smooth for neat appearance. Use hexagon head bolts with steel spring-lock washers under all nuts.

I. In wet locations, install free-standing electrical equipment on concrete pads. Anchor all equipment to adjacent walls with standoffs and caulk.

J. Install surface-mounted cabinets with a minimum of four anchors.

K. Do not use chain, wire rope, or perforated strap hangers.

L. All welds shall be continuous and ground smooth.

-END OF SECTION-

PART1-GENERAL

1.01 SUMMARY

A. Work Included:

1. Rigid aluminum conduit and fittings.
2. PVC externally and internally coated galvanized rigid metal conduit and fittings.
3. Polyvinyl chloride conduit and fittings.
4. Liquidtight flexible metal conduit and fittings.
5. Conduit seals and special fittings.

B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

A. ANSI C80.1- ElectricalRigid Steel Conduit (ERSC).

B. ANSI C80.5-Electrical Rigid Aluminum Conduit (ERAC).

C. ANSI/NEMA FB 1-Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.

D. NEMA RN 1-Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal.

1.03 QUALITY ASSURANCE

A. Manufacturers of Raceways: Firms regularly engaged in the manufacture of electrical raceways of the types and capacities required whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work like that for the project.

C. Code Compliance: Comply with National Electrical Code (NFPA 70) and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.

D. UL Labels: Provide electrical materials, which have been listed and labeled by Underwriters Laboratories.

E. Prior to shipment to the site, all conduit provided shall be new, unused material,

and shall not have been stored outdoors or exposed to weather.

F. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.04 SUBMITTALS

A. Submit shop drawings and product data in accordance with provisions of Section 01330- Submittals.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Provide color-coded thread protectors on the exposed threads of threaded rigid metal conduit.

B. Handle conduit carefully to prevent end damage and to avoid scoring the finish.

C. Store conduit inside and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, waterproof wrapping.

PART 2-PRODUCTS

2.01 RIGID METAL CONDUIT AND FITTINGS

A. Rigid Aluminum Conduit: ANSI C80.5 and UL6A. Heavy wall.

B. Conduit bodies for rigid aluminum conduit shall be as manufactured by Appleton, Form 85, or equal, and be constructed of pressure-cast, copper-free aluminum for sizes 2 inches and under, and sand-cast, copper-free aluminum for sizes over 2 inches. Conduit bodies shall have domed gasketed covers, and stainless-steel screws. Covers for conduit bodies must have bolts that thread into the conduit body. Snaptight and wedgenut covers are not allowed. CONTRACTOR shall select body style and size per application.

C. PVC-coated conduit and fittings shall be internally and externally hot dipped galvanized rigid metal conduit with hot dipped galvanized threads and PVC coating. PVC coating shall be UL listed with rigid metal conduit as the primary means of corrosion protection for the conduit, and PVC coating shall have an external 40 mil thickness with an internal 2 mil urethane coating. Acceptable manufacturers shall be Plasti-bond RedH2OT by Robroy Industries, Ocal-Blue by ABB (Thomas & Betts), or equal. All installers shall be field-certified from the factory for installation and shall provide proof of certification. PVC-coated conduit and fittings shall meet the following listings and manufacturing standards, without exception:

1. ANSI C80.1.
2. UL6.
3. NEMARN1.

D. Conduit bodies for PVC-coated rigid conduit shall be as manufactured by Plasti-bond RedH2OT by Robroy Industries, Ocal-Blue by ABB (Thomas & Betts), or equal, and have a 40 mil PVC exterior coating and 2 mil red urethane interior coating. Conduit bodies shall be Form 8 style or pulling elbow and include domed, gasketed covers and stainless-steel screws. Covers for conduit bodies must have bolts that thread into the conduit body. Snaptight and wedgenut covers are not allowed. CONTRACTOR shall select body style and size according to application.

E. Fittings and Conduit Bodies: ANSI/NEMA FB 1 and UL 514B; threaded-type material to match conduit. Split couplings are not allowed.

F. Supports: One-hole straps with conduit clamps and backspacers shall be used for surface-mounted conduit. Where standoffs are required, provide conduit clamps and supporting devices as specified in Section 06129-Supporting Devices.

2.02 POLYVINYL CHLORIDE CONDUIT (PVC) AND FITTINGS

A. Conduit: Heavy wall, rigid, Schedule 40, Schedule 80 where noted, UL listed for underground, encased, and aboveground applications. PVC conduit installed in exterior locations shall be UV resistant.

B. Conduit bodies for PVC conduit shall be as manufactured by Carlon, or equal, and be suitable for use with Schedule 40 or Schedule 80 PVC conduit. Conduit bodies shall have smooth hubs, textured lids, and foam-in-place gaskets. CONTRACTOR shall select body style and size per application.

C. Supports: Two-hole nonmetallic clamps shall be used for surface-mounted conduit. Where standoffs are required, provide pipe straps and supporting devices as specified in Section 06129-Supporting Devices. Support material shall match that of the conduit type being provided.

2.03 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Liquidtight Flexible Metal Conduit:

1. Conduit: Spiral-wound, electrogalvanized, single-strip steel with integral grounding conductor continuously enclosed within the entire length of the convolutions. The flexible PVC jacket shall be sunlight-resistant, flame-retardant, and resistant to damage from mild acids. Conduit shall be UL Listed. Conduit shall be Liquatite Type LA, or equal.

2. Fittings:

a. UL listed with thermoplastic elastomer sealing gasket.
b. Provide stainless-steel fittings outdoors, unless noted otherwise.

2.04 CONDUIT SEALS AND SPECIAL FITTINGS

A. Conduit Seals: Duct sealing compound, OZ Gedney Type DUX, or equal.

B. Expansion Fittings: Crouse Hinds or Robroy Type XJG (non-hazardous location), or equal, for rigid or PVC-coated rigid conduit. Carlon E945 Series, or equal for PVC conduit.

C. Expansion Deflection Fittings: O-Z type "DX," Crouse Hinds, type XO (PVC conduit only), or Appleton.

D. Ground Bushings: Crouse Hinds Model GLL, or equal.

E. Watertight Hubs: Diecast, insulated and gasketed, rated for wet or dry locations indoors or outdoors. Watertight hubs shall be Appleton HUBXXXDN, Crouse-Hinds Myers Hubs, or equal.

F. Conduit Plugs: Kwik N Sure pipe plug as manufactured by Cherne Industries, or equal. Plug shall include natural rubber O-ring with galvanized wing nut and hex nut.

PART 3-EXECUTION

3.01 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A. Size conduits for branch circuit conductors, control wires, and instrumentation cables to have not less than 25% spare capacity after installation; 3/4-inch minimum size. Minimum size for liquidtight flexible metal conduit is 1/2 inch.

B. Maintain at least 1 inch of separation between conduit sizes to 1 1/2 inches and 2 inches between conduits 1 1/2 inches or larger. Maintain 1 foot of separation between signal conduits (below 100 volts) and power conduits (100 volts and above).

C. All conduit shall be supported in accordance with the NEC and as specified herein. This shall apply to all conduit types, including liquid-tight flexible conduit.

D. Provide for the proper application, installation, and location of inserts, supports, and anchor bolts for a satisfactory raceway system. Where any

component of the raceway system is damaged, replace or provide new raceway system.

E. Run conduits concealed to avoid adverse conditions such as heat and moisture, to permit drainage, and to avoid all materials and equipment of other trades.

F. Conduits shall be attached to building surfaces and not suspended unless installed in a Unistrut-type conduit rack as specified herein. Individual conduits shall not be suspended. Clevis hangers are not allowed.

G. Independently support or attach the raceway system to structural parts of construction in accordance with good industry practice.

H. Conduit attached to building surfaces that may be damp or wet shall be spaced out to avoid rust and/or corrosion using fittings approved for the use. Use back straps on all conduit in damp and wet locations, or mount conduit with Unistrut straps, or equal. Watertight hubs shall be used in all damp and wet locations.

I. Conduits shall be securely fastened to building structure at intervals not exceeding 8 feet or closer, if necessary. Where hangers are necessary, 3/8-inch rod/eyelets/rings/or trapeze type in Unistrut channel and pipe clamps shall be used. Wire or perforated strap iron is not acceptable. PVC conduit shall be securely fastened to building structure at intervals not exceeding 3 feet.

3.02 GENERAL CONDUIT INSTALLATION REQUIREMENTS

A. Interior conduit shall be run concealed in walls, building cavities, chases, attic spaces, and buried below floor slabs. Exterior conduit shall be buried below grade and concealed in structure walls. Exposed conduit runs shall be avoided. Conduit may be run exposed only where it is impossible to conceal.

B. All conduit installed below grade shall be buried a minimum of 2 feet 0 inches.

C. PVC and PVC-coated, galvanized rigid steel conduit installed in earth (interior and exterior) shall be bedded in compacted sand with a minimum of 6-inch cover on all sides.

D. In all PVC conduit runs below grade 200 feet and longer, PVC coated rigid steel conduit shall be used for all 90-degree bends.

E. Ream conduit smooth at ends, cap upon installation, rigidly attach to structural parts of the building, and securely fasten to all outlet boxes, panel cabinets, junction boxes, pull boxes, splicing chambers, disconnect switches, and all other components of the raceway system.

F. Provide all empty raceways 2 1/2 inches and over with No. 10 galvanized fishwire, and nylon cord for conduits smaller than 2 1/2 inches. Empty raceways and fishwire/nylon cord shall be identified with permanent label, and label shall include conduit termination point. All empty conduits shall be threaded, capped and flush with finished floor or wall. Exposed conduits shall be threaded and capped.

G. Conduit seals shall be provided where conduits pass from the interior to exterior of the building and any conduit entering a wet location.

H. Liquidtight flexible conduit shall be installed in such a manner that liquids tend to run off the surfaces and not drain toward the fittings.

I. All runs of flexible conduit and flexible conduit couplings to equipment and devices shall be as short as practicable, of the same size as the conduit it extends, and with enough slack to reduce the effects of vibration to a minimum.

J. Provide conduit expansion-deflection fittings as specified herein in all conduit runs where movement perpendicular to axis of conduit may be encountered.

K. Conduits shall be pitched so that drainage is away from all structures.

L. Conduit bends for PVC conduit shall be made using a hot box, heat blanket, or glycol bender. Open flame or point heat sources of any type are not allowed.

M. The PVC-coated rigid conduit manufacturer's touch-up compound shall be used on all conduit interior and exterior bare steel exposed because of nicks, cuts, abrasions, thread cutting, and reaming; minimum six coats.

N. Where below-grade PVC conduit is connected to rigid metal conduit, the length of PVC conduit shall be a minimum of 10 feet. For short, below-grade conduit runs where required lengths of rigid metal conduit limit the length of PVC conduit to less than 10 feet, rigid metal conduit shall be used for the entire run.

O. Routing of conduits on exterior of buildings shall be reviewed with ENGINEER prior to installation.

3.03 CONDUIT PENETRATIONS AND TERMINATIONS

A. Where fittings are brought into an enclosure with a knockout, a gasket assembly consisting of an O-ring and retainer shall be installed on the

outside. Fittings shall be insulated throat type.

B. Conduit penetrations for control panels or enclosures containing electronic equipment shall utilize watertight hubs and, if entering the top of the enclosure, shall be located at the front of the enclosure and not over any electronic equipment (e.g., PLC, power supplies, etc.).

C. Conduit penetrations for all exterior enclosures (e.g., disconnects, junction boxes, control panels) shall utilize watertight hubs and enter the sides or bottom of the enclosure. Conduits shall not penetrate the top of the enclosure.

D. Provide conduit expansion fittings as specified herein in all conduit runs that cross a structural expansion joint and for conduits protruding from earth.

E. All conduits that protrude from poured concrete shall be PVC-coated rigid conduit. Conduit shall extend continuously (i.e., no joints) a minimum of 4 feet beyond the poured concrete (both sides).

F. Conduits passing through masonry, concrete, or similar construction shall be cast in place using PVC-coated rigid conduit extending completely through the construction.

G. Where above-grade conduits pass through cores in existing structures or through masonry walls, grout openings between conduit and walls or floors with sand cement mortar.

3.04 CONDUIT INSTALLATION SCHEDULE

A. The following schedule lists specific conduit types allowed in designated areas. Those areas not listed under a specific conduit type shall not have that type of conduit installed:

1. Rigid aluminum:

   a. All exposed interior locations.
   b. Interior locations requiring mechanical protection.
   c. Exterior locations (except in earth) and locations exposed to weather.

2. PVC-coated rigid steel:

   a. Conduits protruding from concrete.
   b. Interior and exterior locations requiring mechanical protection.
   c. Earth.
   d. Exterior locations and locations exposed to weather.
   e. Within 4 feet of building or structure footing, wall, or handhole.

3. PVC: Earth, except within 4 feet of a building or structure footing, wall, or handhole. PVC conduit under pavement or roadways shall be Schedule 80.
4. Liquidtight flexible metal conduit not over 3 feet in length for final connections to:

    a. Equipment in wet locations.
    b. Equipment with sliding bases or flexible positioning.
    c. Equipment with vibration isolation mounting.
    d. Equipment housing ferromagnetic cores or with integral moving components capable of generating noise or vibrations, including motors.

-END OF SECTION-

PART1-GENERAL

1.01 SUMMARY

A. Work Included:

1. Switch, outlet, and small junction boxes.

2. Pull and junction boxes.

B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern Work in this section.

1.02 REFERENCES

A. ANSI/NEMA OS 1-Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

B. ANSI/NEMA OS 2-Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.

C. NEMA 250-Enclosures for Electrical Equipment (1000 Volts Maximum).

1.03 QUALITY ASSURANCE

A. Manufacturers of switches, outlets, boxes, lamps, fuses, lugs, etc.: Firms regularly engaged in the manufacture of these products, of the types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation Work like that in this project.

C. Code Compliance: Comply with National Electrical Code (NFPA 70) and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.

D. UL Labels: Provide electrical cable, boxes, raceways, wire, connectors, outlets, switches, etc. that have been listed and labeled by Underwriters Laboratories.

E. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.04 SUBMITTALS

A. Submit shop drawings and product data in accordance with provisions of Section 01330-Submittals.

PART 2-PRODUCTS

2.01 SWITCH, OUTLET, AND SMALL JUNCTION BOXES

A. Cast Boxes: Aluminum or cast feraloy, deep-type, gasketed cover, threaded hubs, Eaton FD Series, or equal.

B. NEMA 4X Boxes: PVC or FRP, Carlon NS Series, or equal, with proper cover and gasket. 316 stainless steel, Calbrite FDC Series, or equal, where specified herein.

C. Covers for switch and outlet boxes used as junction boxes shall have covers that match box type.

2.02 PULLANO JUNCTION BOXES

A. NEMA 4X Boxes: PVC or FRP, Carlon HS Series, or equal with proper cover and gasket. 316 stainless steel with hinged cover, recessed quarter-turn latches, and gasket, Saginaw Control and Engineering Enviroline Series, or equal, where specified herein.

B. NEMA 12 Boxes: Painted steel with hinged cover, recessed quarter-turn latches, and gasket. Boxes shall be Hoffman Bulletin CW1, or equal.

C. Where terminal blocks or other devices are mounted in a pull or junction box, provide a 14-gauge steel back panel with a white enamel finish for mounting.

D. Boxes specified in this section are not allowed to have knockouts and are not allowed to be used as enclosures for control panels.

PART 3-EXECUTION

3.01 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as necessary for splices, taps, wire pulling, cable bending radii, equipment connections, and code compliance.

B. Electrical box locations shown on the drawings are approximate. Verify location and size of outlet boxes in all work areas prior to rough-in.

C. Where dedicated raceways are provided for different voltage systems or wiring, (e.g., power wiring), separate boxes shall also be provided unless acceptable to ENGINEER. Where acceptable to ENGINEER, combined boxes shall be physically divided to separate the wiring.

D. Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of access doors.

E. Locate and install to maintain headroom and to present a neat appearance.

F. All boxes attached to building surfaces that may be damp or wet shall be spaced to avoid rust and/or corrosion. All boxes in damp and wet locations shall be on 1/2-inch standoffs.

3.02 SWITCH, OUTLET, AND SMALL JUNCTION BOX INSTALLATION

A. Provide knockout closures for unused openings.

B. Support boxes independently of conduit.

C. Use multiple gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

D. Switch and outlet boxes provided for branch circuits and feeders shall not contain control wiring. Wiring for different voltage systems (e.g., 24 V, 120 V, 480 V) shall have dedicated pull and junction boxes for each voltage.

E. For weatherproof switches, devices, and exterior fixtures, use cast boxes with proper cover and gasket.

F. All interior exposed wall and ceiling outlet boxes shall be cast boxes, unless otherwise noted.

G. Knockout punches or saws shall be used for holes; boxes with prepunched holes are not acceptable.

H. Cast boxes with 3/4-inch hubs and aluminum fittings and enclosures may be used with all conduit types.

3.03 PULL AND JUNCTION BOX INSTALLATION

A. Support pulls and junction boxes independent of conduit.

B. Knockout punches or saws shall be used for holes; boxes with prepunched holes are not acceptable.

C. Refer to Section 06153-Electrical Identification for junction box labeling requirements.

D. All interior exposed junction and pull boxes shall be NEMA 12, unless noted otherwise.

E. All exterior junction and pull boxes shall be NEMA 4X stainless steel.

-END OF SECTION-

PART 1-GENERAL

1.01 SUMMARY

A. Work Included:

1. Nameplates.
2. Labeling tags.
3. Wire markers.

B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 SUBMITTALS

A. Submit shop drawings and product data in accordance with provisions of Section 01330- Submittals.

B. Provide schedule for nameplates and labeling tags with shop drawings Reference drawings for type used.

PART 2-PRODUCTS

2.01 NAMEPLATES

A. Type “A”:

1. Use:

a. SPD.
b. Cabinets, enclosures, pulls, and junction boxes.

2. Size: 2-inch by 3-inch.
3. Material: 2-layer laminated Micarta.
4. Background Color: Black.
5. Character Color: White.
6. Character Size: 1/2-inch.
7. Engraving: See one-line list for labels, or as requested by ENGINEER. Label shall include equipment number and description (i.e., SCAL-60-01, Fluoride Scale).
8. Mounting Location: Front exterior.

B. Type “B”:

1. Use: Standby power systems as in "A" above.
2. Size: 2-inch by 3 5/8 inch.

3. Material: 2-layer laminated Micarta.
4. Background Color: Red.
5. Character Color: White.
6. Character Size: 1/4-inch.
7. Engraving: See MCC schedule and one-line for labels, or as requested by ENGINEER.
8. Mounting Location: As requested by ENGINEER.

C. Type "C":

1. Use: Service entrance rated automatic transfer switches.
2. Size: 4-inch by 4-inch.
3. Material: 2-layer laminated Micarta.
4. Background Color: Black.
5. Character Color: White.
6. Character Size: 2 1/4-inch.
7. Engraving: Equipment label. Label shall include equipment number and description (i.e., LP-10-01, First Floor Power Panel).
8. Mounting Location: Equipment: Top wire way.

D. Type "D":

1. Use: Control stations, etc.
2. Size: 3/8-inch by 2-inch.
3. Material: 2-layer laminated Micarta.
4. Background Color: Black.
5. Character Color: White.
6. Character Size: 1/8-inch.
7. Engraving: Control station number and equipment description.
8. Mounting Location: Device front at top.

2.02 WIRE AND CABLE MARKERS

A. Wire and cable markers shall be permanently-attached, heat-shrink type labels.

1. Sleeve: Permanent, PVC, white, with legible machine-printed black markings.
2. Acceptable Manufacturers: Raychem Model D-SCE or ZH-SCE, Brady Model 3PS, or equal.
3. Grounding Conductor: Provide green wire marker; minimum 2 inches wide.

B. Wire or cable numbering preprinted on the conductor or cable insulation, flag-type labels, and individual wraparound numbers (such as Brady preprinted markers) are not acceptable. All wire markers shall be the same throughout the project.

PART 3-EXECUTION

3.01 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Affix nameplates with weatherproof, UV-resistant adhesive in outdoor locations and sticky back adhesive in indoor locations.

D. Prepare and install neatly-typed circuit directories and schedules in all panels, including, but not limited to, existing panels where Work is done under this Contract.

3.02 WIRE IDENTIFICATION

A. Provide wire markers on each conductor, including neutral and spare conductors, in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Neutral conductor labels shall include the associated branch circuit number. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring. Spare conductors shall have control wire number or shall indicate termination point of wire.

B. Conductors in pull boxes, control panels, cabinets, and panelboards shall be grouped as to circuits and arranged in a neat manner. All conductors of a feeder or branch circuit shall be grouped, bound together with nylon ties, and identified. Phase identification shall be consistent throughout the system. All wiring labels shall be able to be read without removing wire management (i.e., wiring trough covers, spiral windings, etc.) or twisting the wire/cable.

C. Where terminal blocks are factory provided with non-project-specific labels by equipment manufacturers in control panels, and similar equipment and are wired to terminal blocks in control panels with project-specific labels, the interconnecting wiring shall be labeled at both ends to match the project-specific terminal blocks in the control panel. Provide an additional label on the end of each wire that is connected to a terminal block with a non-project-specific label to indicate the associated terminal block.

D. Power Conductor Insulation Color Code:

1. 6 AWG and Larger: Provide general-purpose, flame-retardant, permanent tape at each termination and at accessible locations such as handholes, junction and pull boxes, panelboards, etc. Apply tape with at least six full, overlapping wraps; minimum 2 inches wide.

2. 8 AWG and Smaller: Provide conductors with color-coded insulation.

3. Colors:

System	Conductor	Color
All Systems	Equipment Grounding	Green
120/240 Volts Single-Phase, Three wire	Grounded Neutral One Hot Leg Other Hot Leg	White* Black Red
277/480 Volts Three-Phase, Four wire	Grounded Neutral Phase A Phase B Phase C	White* Brown Orange Yellow
Note: Phase A,B,C implies direction of positive phase rotation.		
*When installed as part of a 120-volt or 277-volt branch circuit, provide a color-coded stripe on the white neutral conductor insulation matching the branch circuit insulation.		

E. Circuit Identification:

1. Identify power, instrumentation, and control conductors at each termination and at accessible locations such as handholes, junction and pull boxes, panelboards, etc.
2. Conductors for panelboard circuits shall identify circuit matching the circuit directory designations, including the neutral conductor.
3. Control conductor identification shall match the associated terminal block label.
4. Circuits Not Listed in Circuit Directories:

   a. Assign circuit name based on unique device or equipment at load end of circuit.
   b. Where unique device or equipment names are not available or apparent, add a unique number or letter modifier to each otherwise identical circuit name.

3.03 JUNCTION BOX IDENTIFICATION

A. All junction boxes shall be labeled with permanent nameplates. Nameplates shall indicate circuit or load served, as well as the power source and highest voltage present on any conductor.

3.04 CONDUIT FITTINGS IDENTIFICATION

A. All conduit fittings that contain splices of any kind shall be labeled with permanent nameplates indicating "splice within." Nameplates shall be clearly visible at location installed. Nameplates shall be fastened to each conduit fitting

with heavy duty, UV-resistant, cold weather cable ties.

3.05 TERMINAL BLOCK IDENTIFICATION

A. Terminal blocks shall be labeled on both sides of each terminal block. Terminal block numbering shall match the numbers shown on the project-specific wiring diagrams.

B. Fused terminal blocks labels shall be located on top of the terminal blocks and include the fuse voltage and ampere rating.

3.06 COMPONENT IDENTIFICATION

A. All components (e.g., relays, timers, power supplies, transformers, etc.) within enclosures shall be identified with sticky-back adhesive, self-laminating, machine-printed marking labels. Labels shall be installed on the enclosure back panel and not on the device itself, wireway covers, or any other removable devices. Labels shall be included on the as-built drawings

3.07 LABELING FONT REQUIREMENTS

A. The font for all conductor, cable, and device labels shall be Arial with black characters on white background, and minimum font size 12.

B. The text for all conductor, cable, and device labels shall be machine printed. Handwritten labels are not acceptable.

END OF SECTION

PART 1-GENERAL

1.01 SUMMARY

A. Work Included:

1. Receptacles.
2. Cover plates.

B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

A. NEMA WO 1-General-Color Requirements for Wiring Devices.

B. NEMA WO 5-Specific-Purpose Wiring Devices.

C. Drawings-Bill of Materials.

1.03 QUALITY ASSURANCE

A. Manufacturers of outlets, etc.: Firms regularly engaged in the manufacture of these products, of the types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work like that in this project.

C. Code Compliance: Comply with National Electrical Code (NFPA 70) and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.

D. UL Labels: Provide electrical material, etc., which have been listed and labeled by Underwriters Laboratories.

E. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.04 SUBMITTALS

A. Submit shop drawings and product data in accordance with provisions of Section 01330-Submittals.

B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2-PRODUCTS

2.01 RECEPTACLES

A. Twenty ampere, 125-volt, NEMA 5-20R, Industrial specification grade, straight blade, 3-wire duplex grounded outlets, one of the following: Eaton 5362, Leviton 5362, Pass and Seymour 5362. Provide ivory color.

B. GFCI Receptacle: GFCI receptacles shall be UL 943 listed, Pass and Seymour 2097, Eaton TRSGF20 receptacle with integral ground fault current interrupter. Provide ivory color.

2.02 COVER PLATES

A. Every flush box shall be provided with standard 302 series stainless steel plates, blank, receptacle, switch, or cord as designated by outlet symbol. Surface boxes shall have plates to match Crouse-Hinds, Appleton, or equal, cast boxes.

B. While in use receptacle covers for exterior use shall be Leviton IUM1V-GY, or equal.

PART 3-EXECUTION

3.01 INSTALLATION

A. All receptacles shall be mounted vertically.

B. GFCI receptacles shall not be series wired.

C. Install convenience receptacles shown to be "above furniture" 36 inches above floor (bottom of box), grounding pole on bottom except as otherwise noted.

D. Install convenience receptacles 15 inches above floor (bottom of box), grounding pole on bottom except as otherwise noted.

E. Install specific-use receptacles above furniture, countertops, or at heights shown on the Drawings.

F. Convenience Receptacles: Specification grade self-grounding.

G. Install devices and cover plates flush and level.

H. Back wiring is not allowed for receptacles. Wires shall be terminated with the device screw terminal.

I. Individual labels shall be placed on the back of all switch faceplates and receptacle faceplates indicating the lighting panel and circuit from which the

switch or receptacle is fed. Labels shall be White background with Black lettering no smaller than 12-point font. Provide permanently attached self-adhesive type, machine fed, and self-laminating labels, or equal. All labels must be by the same manufacturer, same size, and same font. Handwritten labels are not acceptable.

END OF SECTION

PART 1 – GENERAL

1.1 Description

Contractor shall furnish all labor, materials, equipment, and incidentals required to construct and install, placing such into satisfactory operating condition, a complete INTRUDER-RESISTANT FENCE at location(s) as indicated on the drawings or specified in this or other binding documentation.

1.2 Quality Assurance

Fence material and installation: Manufacturer and installer shall be companies specializing in commercial quality chain link fencing with a minimum two years experience. Product installation shall be in accordance with ANSI/ASTM F567-84 – Installation of Chain-Link Fence.

PART 2 – PRODUCTS

2.1 Description

A. Materials

1. The fence shall be constructed of galvanized materials having a fabric height of 6'-0" and a three (3) strand barbed wire top angled outward at a 45 degree angle with a vertical height of 1'-0".

2. The fencing shall be constructed of materials specified herein:

   (a) Chain link fabric shall be 9 gauge steel wire, galvanized (hot dipped), with a 2 inch mesh, with a fabric width of 6'-0". Corner posts shall be 3 inches (O.D.) x 5.79 pounds/foot, galvanized, and set in concrete. Line posts shall be 1-7/8" (O.D.) x 2.72 pounds/foot, galvanized, set in concrete. Gate post(s) shall be 3 inches (O.D.) x 5.79 pounds/foot, galvanized, and set in concrete. Concrete shall be 5-sack mix, thoroughly tamped and surface trowelled to provide a slope for drainage away from the posts. Bracing shall be provided at all end, corner, and gate posts with 1-5/8" galvanized tubular braces. Gate: The gate unit shall be fabricated of 2 inch (O.D.) galvanized pipe with pressed steel or malleable iron corner ells, riveted or welded corners. If corners are welded, galvanizing shall be performed after fabrication. Internal bracing with 1-5/8" (O.D.) pipe and 3/8" adjustable truss rods shall be provided. Ball and socket bottom hinge made of malleable iron and 180 degree wraparound type top hinge to allow gate to swing 90 degrees or 180 degrees shall be provided. Padlocking device and semi-automatic catch to secure gate in open position shall be provided. Top rails to be tubular steel 1-5/8" (O.D.), 2.27 pounds/foot, and galvanized. Bottom tension wire to be 7 gauge, galvanized coil tension wire, fastened to chain

link fabric with 11 gauge galvanized hog rings on 24 inch centers. Fittings to be cast iron, wrought iron, or pressed steel fittings. Fabric bands shall fasten fabric to line posts, and shall be spaced approximately 14 inches apart. Tie wires attaching fabric to top rail shall be approximately 24 inches apart.

(b) Extension arms for line, end corner, and pull posts shall be fabricated of pressed steel or malleable iron base with pressed steel extensions. Installation shall be completed by riveting or welding. Barbed wire shall consist of three lines, each line consisting of 2 strands of 12-12/2 gauge galvanized steel wire with 2 or 4 point barbs, spaced on 5 inch centers. Total height of barbed wire extension to be 1'-0".

B. Standards: Fence fabric shall be zinc coated by the hot-dip galvanizing process after weaving to be sufficient to withstand six (6) one-minute dips of the Preece Test. All parts of the fence system, other than the fabric, shall be hot-dip galvanized after fabrication of the components. Coating shall be sufficient to withstand twelve (12) one-minute dips of the Preece Test.

C. Privacy Fence slats. Green pvc privacy screen slats, 6' tall to be inserted in between the fence fabric.

PART 3 – EXECUTION

3.1 Posts

A. Excavation for post holes may be completed with a power auger or post hole digger, and shall be in firm, undisturbed or compacted soil.

1. Posts are to be spaced a maximum distance of 8'-0" apart. Each post shall be 36 inches deep in concrete in a 12 inch minimum diameter hole using a 5 sack per cubic yard concrete mix.

2. Center, align and plumb posts in holes 2 inches above bottom of excavation. Exercise care at corner posts to preserve any property corner monuments in original locations.

3. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Unless otherwise indicate, extend concrete footings 2 inches above grade and trowel to a crown to shed water.

3.2 Rails, Bracing

1. Run top rail continuously through post caps. Provide expansion couplings as recommended by fencing manufacturer.

2. Provide center rails where indicated. Install in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.

3. Install braces so posts are plumb when diagonal rod is under proper tension.

4. Install bottom tension wires by stretching between two corner posts, angle posts, or gate posts at ends of each straight run of fence, and clamping to those posts. Tension wire shall be tied to each intermediate line post with not less than No. 9 gauge aluminum tie wires. Place bottom tension wire approximately 3 inches above finished grade.

3.3 Fabric

1. Leave approximately 2 inches between finish grade and bottom of fabric, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on outside of fence posts, and anchor to framework so that fabric remains in tension after pulling force is released.

2. Thread stretcher bars through or clamp to fabric 4 inches o.c., and secure to posts with metal bands spaced 15 inches o.c.

3.4 Barbed Wire

Pull wire taut and install securely to extension arms and end post or terminal arms in accordance with manufacturer's instructions.

3.5 Gate

Install gate plumb, level, and secure for pull opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 Tie Wires, Fasteners

A. Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.

B. Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.7 Privacy Screen Slats

Install green pvc slats vertically into fence fabric as directed by manufacturer.

END OF SECTION

PART 1 GENERAL

1.1 Description

Contractor shall furnish all labor, materials, equipment, and incidentals required to construct and install, placing such into satisfactory operating condition, a complete Standard barb wire fence (SBWF) at location(s) as indicated on the drawings or specified in this or other binding documentation.

SBWF shall consist of 5 strands of barb wire with the top wire 48 inches above the ground line. 3 and 4 strands of barb wire may be used for interior and exclusion fences.

1.2 Quality Assurance

Fence material and installation: Manufacturer and installer shall be companies specializing in commercial quality fencing with a minimum two years experience.

PART 2 PRODUCTS

2.1 Description

1. Materials

a. Wire.

Wire will consist of 2 twisted strands of 12.5 gauge steel wire with class 1 galvanizing or 2 twisted strands of 15.5 gauge high tensile wire with class 3 galvanizing. The barbs shall be 4 point on 5-inch centers.

b. Fasteners.

(1) Staples shall be of 9 gauge class 3 galvanized steel or heavier with a minimum length of 1¾ inches for softwoods and a minimum length of 1 inch for close-grained hardwoods.

(2) Manufacturer's clips or 14 gauge class 3 galvanized wire may be used to fasten wires to steel posts.

c. Posts.

(1) Wood.

All wooden posts and brace members (except red cedar, osage orange, or black locust) shall be treated with a minimum of 0.40 lbs/cubic foot of chromated copper arsenate (CCA) type A, B, or C or ammoniated copper quat (ACQ) preservative by a method to ensure that complete penetration of the sapwood is obtained or have a 20 year

warranty. All bark shall be removed from the red cedar, osage orange and black locust. At least half the diameter of red cedar shall be heartwood. Quality of treated wood shall provide sufficient strength and last for the expected life of the fence. (**NOTE: Do Not Cut or Notch Treated Post**)

All corner, end, pull, and gate brace assembly posts shall be wooden with a 6-7 inches diameter. Assembly posts shall be a minimum of 8 feet long for 5-6 inch diameter single H- brace assemblies. Bend assembly post shall have a 5-6 inch diameter and will be a minimum of 8 feet long.

Wooden line posts shall have a 4-5 inch diameter (4 inch for osage orange). Wood line posts shall be a minimum length of 8 feet.

(2) Plastic.

Plastic line posts shall be at least 4-5 inches in diameter, able to accept and hold staples,or insulated for electric fencing and be durable for the life of the fence. Plastic line posts shall be a minimum length of 7 feet.

(3) Steel.

Steel line posts shall have the standard "T" section, nominal dimensions of 1 3/8" x 1 3/8" x 1/8" with anchor plate. The post shall weigh at least 1.25 pounds per foot of length and be painted with a weather resistant paint. The posts shall be studded to aid in wire attachment. Steel line posts shall be a minimum length of 7 feet.

(4) Other.

Other materials may be used for line and assembly posts if they are of equal or greater strength and quality of above. They must be approved by the fence designer.

PART 3 EXECUTION

3.1 Post Installation and Spacing.

Live trees used for corner, bracing, and line posts shall have a diameter breast height (DBH) equal to or greater than those prescribed for normal wooden posts. Some alignment variation shall be allowed, but caution should be taken to minimize offsets and prevent excess fencing needs. Wire or insulators will not be fastened directly to trees. A board or boards will be placed on the tree to keep the wire from contacting the bark. Wire shall not be wrapped around the tree. A CCA treated 2" x 6", fiberglass strip, plastic strip, or an untreated red or white oak board with a minimum size of 1" x 4" must be securely fastened to the tree with at least three 40 d. pole barn nails. The board must be long enough to accommodate the wire. The fence will be fastened to the board with staples.

3.2 Corner, End, Pull, and Gate Brace Assemblies.

One of the following brace assemblies for all corners, ends, pulls, and gates shall be used:

A. The posts are to be set or driven to 3 feet below the ground line using an 8 foot post.

1. Deep soils and sandy soils shall have post driven 4 feet or deeper below the ground line, to secured the H-Brace with a minimum 9 foot post.

(Post should be 5 feet above ground. NOTE: Do Not Cut or Notch Treated Post.)

Brace assemblies are required at all corners, gates, pull, and ends.

The horizontal cross member shall be a 4-5 inch in diameter and a minimum of 8 feet in length installed with 10" and 4" galvanized pins (H-Brace Standard) placed 2 feet from top of post or 3 feet from top of the ground to the galvanized pins.The horizontal cross member shall be a 4-5 inch in diameter and a minimum of 8 feet in length. A tension wire composed of 2 complete loops of number 9 gauge smooth wire using a twist stick, or a inline stainer, or a double loop of 12 ½ gauge high tensile smooth wire with a inline striner shall be used. One end of the tension wire shall be at the height of the horizontal cross brace member galvanized pin and the other end of the tension wire shall be 1-2 inches above the ground line on the other post. Do not staple the tension wire. Used a staple assembly.

A corner assembly or a bend assembly shall be used when the horizontal alignment changes more than 15 degrees and a pull assembly when vertical alignment changes more than 15 degrees. A bend assembly will be used only when it will not affect the integrity of the fence.

Post spacing for a bend assembly can be determined by placing 3 stakes, each spaced 14 feet apart along the fence line. A string is then stretched between the first and third stake. A measurement is then taken from the second stake and the string. The spacing of the posts is determined as follows:

0 to 4 inches	14 feet
5 to 7 inches	12 feet
8 to 10 inches	10 feet
11 to 15 inches	8 feet
16 or more inches	6 feet

These bend assembly posts will be wood and set with a 6-inch lean from vertical to the outside of the curve and set or driven 36 inches deep.

Pull assemblies shall be used with the non-high tensile barb wire installed at intervals not to exceed 660 feet. Pull assemblies not needed for high tensile barb wire.

3.3 Line Post.

Wooden (Preferred) line posts shall be set or driven 34 inches below ground line at an 90 degree of the ground. If soil depth is less than 28 inches, use standard "T" steel posts. Post should be above the ground 5 feet for an 8 foot wooden post.

Steel line posts shall be set or driven 21inches below ground line. Post should be 5 feet above the ground for an 7 foot steel post.

Post spacing for line posts shall be a maximum of 16 feet.

If posts are not driven, the backfill around the post shall be thoroughly compacted with a hand tamping tool.

In areas where soil depth restricts the embedment depth, additional anchors or deadman applied against the direction of pull shall be used.

3.4 Wire Spacings and Fastenings.

The spacing of the barb wire for 5 strand fences shall be 12, 9, 9, 9, and 9 inches, starting at the ground line. The spacing of the 4 strand fence will be 12, 12, 12, and 12 inches, starting at the ground. The three wire spacing will be 15, 15, and 18 inches, starting at the ground.

The top wire shall be at least 2 inches below top of wooden post and 1 inch below the top of steel post.

The tension on the high tensile barb wire should be 200-250 lbs. on each wire. Tension will be applied with an in-line stretcher on each strand.

Staples shall be driven diagonally to the wood's grain and at a slight downward angle, (upward if pull is up) to avoid splitting the post and loosening of the staples. Space should be left between the inside crown of the staple and post to permit free movement of high tensile wire. Barbed staples shall be used for pressure treated posts.

Wires may be attached to steel posts by use of manufacturer's clips or by two turns of 14-gauge, class 3 galvanized wire. The staples, wires, and clips should allow free movement of the high tensile fence wire.

Wire shall be spliced by means of a Western Union splice or by suitable splice sleeves applied with a tool designed for the purpose. The Western Union splice shall have not less than 8 wraps at each end about the other. All wraps shall be tightly wound and closely spaced.

3.5 Grounding.

Non-electrical wire fences using wood posts shall be grounded at least every 1,000 feet. Ground rods should be driven not less than 4 feet into the ground. The rods shall be galvanized steel and a minimum of .0.50 inch in diameter. All line wires of the fence must be grounded. An alternate grounding material is the use of a steel line fence post every 100 feet.

END OF SECTION