

**SPECIFICATIONS**  
**FOR**  
**SANITARY SEWER IMPROVEMENTS**  
**OAKWOOD KNOLLS, CHAPEL HILL AND**  
**SKYVIEW/HIBROOK TREATMENT PLANTS**  
**BOROUGH OF OAKLAND**  
**BERGEN COUNTY, NEW JERSEY**

Linda H. Schwager, Mayor

COUNCIL MEMBERS

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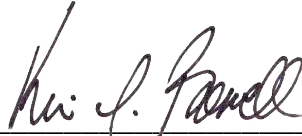
Lisa M. Duncan, Borough Clerk

Brian M. Chewcaskie, Esq., Borough Attorney

This project is funded by the  
Borough of Oakland.

BOSWELL ENGINEERING  
330 Phillips Avenue  
South Hackensack, NJ 07606  
N.J. Certificate of Authorization No.  
24GA27958000

OK-1653



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Kevin J. Boswell, P.E.  
Professional Engineer  
New Jersey License No. 32943  
Borough Engineer  
July 2020

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## DEFINITION OF TERMS

Owner	Borough of Oakland Bergen County, New Jersey
Engineer	Kevin J. Boswell Boswell Engineering 330 Phillips Avenue South Hackensack, N.J. 07606
Contractor	Party to whom the contract is awarded acting directly or through authorized representatives or employees.
Plans & Specifications	All engineering plans and specifications prepared by Boswell Engineering, and as directed herein, shall govern in the execution of the work.
Owner's Attorney	Brian M. Chewcaskie, Esq. Cleary, Jacobbe, Alfieri, Jacobs, LLC 169 Ramapo Valley Road, Upper Level Oakland, NJ 07436

**ADVERTISEMENT FOR BIDS  
BOROUGH OF OAKLAND  
BERGEN COUNTY, NEW JERSEY**

Sealed bids will be received by the Borough of Oakland, Municipal Plaza, Oakland, New Jersey 07436 in the County of Bergen and State of New Jersey on \_\_\_\_\_, 2019 at 11:00 a.m. prevailing time, and then publicly opened and read aloud for:

**SANITARY SEWER IMPROVEMENTS  
OAKWOOD KNOLLS, CHAPEL HILL AND SKYVIEW/HIBROOK TREATMENT PLANTS  
BOROUGH OF OAKLAND  
BERGEN COUNTY, NEW JERSEY**

The work to be performed under this contract includes the decommissioning of existing wastewater treatment plants Oakwood Knolls, Chapel Hill, and Skyview-Hibrook and installation of three (3) new pumping stations.

Principal items of work in the project include:

- Decommissioning of existing wastewater treatment plants
- Construction/Installation of pumping stations and their components
- Installation of force mains and appurtenances.
- Installation of control systems.

The work contemplated under this Contract shall be completed within 500 calendar days.

Copies of plans, specification, and contract documents will be on file for public inspection and may be obtained upon payment of \$154.00, said sum not refundable, at Boswell Engineering, 330 Phillips Avenue, South Hackensack, New Jersey 07606, between the hours of 9:00 a.m. and 4:00 p.m. prevailing time, Monday through Friday, excluding legal holidays.

Each bid must be made upon the prescribed forms, furnished with the Contract Drawings and Specifications, including the non-collusion affidavit and ownership statement compliance form and must be accompanied by a Consent of Surety and a certified check, cashier's check, or Bid Bond of not less than ten (10%) percent of the amount bid and, not to exceed \$20,000.00. Such checks and Bonds shall be made payable to the Owner and will be held as a Guarantee that in the event the Bid is accepted and a Contract awarded to the bidder, the Contract shall be duly executed and its performance properly secured. The successful bidder shall furnish and deliver to the Owner a performance and payment bond in the amount of 100 percent of the accepted bid amount as security for the faithful performance and payment of the Contract. Further, the successful bidder must furnish the policies or Certificates of Insurance required by the Contract. In default thereof, said checks and the amount represented thereby will be forfeited to the aforesaid Owner as liquidated damages. Bids must be accompanied, in the case of corporations not chartered in New Jersey, by proper certificate that such corporation is authorized to do business in the State of New Jersey.

Bidders are required to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 regarding equal employment opportunity, as amended. All corporations and partnerships must comply with Chapter 33, of the P.L. of 1977, regarding disclosure of partners and stockholders. Each bid must be enclosed in a sealed envelope bearing the name and address of the bidder, addressed to the Owner and labeled for the SANITARY SEWER IMPROVEMENTS OAKWOOD KNOLLS, CHAPEL HILL AND SKYVIEW/HIBROOK TREATMENT PLANTS.

The successful bidder will be required to comply with all provisions of prevailing wage rates as determined by the New Jersey Department of Labor.

All bids shall be irrevocable, not subject to withdrawal and shall stand available for a period of sixty (60) days.

The Owner reserves the right to reject any and all bids, to waive informalities or irregularities in the bids received and to accept the bid from the lowest responsible bidder.

BOROUGH OF OAKLAND

Richard S. Kunze, Borough Administrator

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## **INFORMATION FOR BIDDERS**

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## **INFORMATION FOR BIDDERS**

### **1. Contract Documents**

A copy of the Contract Documents will be supplied to prospective bidders upon payment of the amount that is specified in the advertisement, none of which is refundable, for each set, payable in cash or check, at Boswell Engineering, 330 Phillips Avenue, South Hackensack, New Jersey 07606.

The Owner, pursuant to N.J.S.A. 40A:11-25, may require from any person proposing to bid hereon a statement showing his financial ability and experience in performing public work before furnishing him with the Contract Documents and, if not satisfied with the sufficiency of the statement, may refuse to furnish the Contract Documents to him.

### **2. Proposal Form**

The proposal form is a complementary part of the Contract Documents and shall be used by the bidder in his submission. All blank spaces for unit prices, extended totals, summation, and lump sums must be completed in ink or typewritten. All erasures or other physical changes in the bid shall be signed or initialed by the bidder. Any omission in the Proposal shall be just cause for rejection.

### **3. Submission of Bid**

Bidders must use the proposal forms provided. The Proposal shall be enclosed in a sealed opaque envelope and the outside of the envelope shall bear the name and address of the bidder as well as designation of the project.

Bids will be received by the Owner at the time and place designated in the Advertisement.

### **4. Bid Bond**

Accompanying each bid shall be a certified check, cashier's check or bid bond, in an amount not less than ten percent (10%) of the amount of the bid but not more than \$20,000.00.

Such bid security shall be returned to all but the three lowest bidders within ten working days after the date of bid opening and the bid securities of the three lowest bidders will be returned within three (3) working days after the contract has been executed. If no Contract has been executed within sixty (60) days after the date of the bid opening, the Owner agrees to return the bid securities upon demand. No interest will be allowed upon any bid security.

### **5. Consent of Surety**

In addition to the bid security, each bidder must file with his bid a letter from a surety company which states, in the event said bidder is awarded the Contract, that the surety company will furnish a performance bond and payment bond in the amount of one hundred percent (100%) of the amount of the Contract.

6. Performance Bond

The successful bidder shall furnish and deliver to the Owner, along with the executed contract, a bond in the amount of one hundred percent (100%) of the contract price as security for the faithful performance of the contract, and guaranteeing 100 percent of the work performed. The performance bond must be executed by a responsible surety company acceptable to the Owner with a rating of "A" or better as determined by Best Rating System and authorized to transact business in the State of New Jersey. The performance bond shall be in accordance with N.J.S.A. 2A:44-143 to 147. This bond may be in the form of a single performance and payment bond in the total amount of one hundred percent (100%) of the amount of the contract price.

7. Payment Bond

The Contractor or Contractors to whom the Contract is awarded shall give a bond for one hundred percent (100%) of the full amount of the contract price in satisfactory legal form of a surety company or companies with a rating of "A" or better as determined by Best Rating System authorized to do business by and operating in accordance with the laws of the State of New Jersey and to be approved by the said Owner for the protection of all persons furnishing materials or labor for the construction of this contract to the Contractor or any subcontractors, said material and labor bond to be in the form required by Chapter 2A:44-143 to 147, N.J.S.A. and amendments thereto and supplements thereto, said bond not be returned and cancelled until all liability to any and all persons protected by the condition of said bond shall have been met by the Contractor or persons primarily liable for the payment thereof, or by the surety on said bond. This bond may be in the form of a single performance and payment bond in the total amount of one hundred percent (100%) of the amount of the contract price.

The surety company issuing the payment bond shall have the minimum surplus and capital stock or net cash assets required by N.J.S.A. 17:17-6 or N.J.S.A. 17:17-7, whichever is appropriate, at the time the invitation to bid is issued. Furthermore, the surety company, with respect to the issuance of the payment bond, must expressly comply with all of the provisions contained in N.J.S.A. 2A:44-143(b), with respect to the requirements concerning the holding of a current Certificate of Authority, issued by the United States Secretary of the Treasury pursuant to 31 U.S.C. Sec. 9305, that is valid in the State of New Jersey as listed annually in the United States Treasury Circular 570.

Moreover, with respect to the issuance of the payment bond, the surety company must submit the statutorily required Surety Disclosure Statement and Certification, required by N.J.S.A. 2A:44-143(d.), a copy of which document is included in these specifications, and furthermore, must meet all of the requirements of the Commissioner of Insurance of the State of New Jersey with respect to issuance of payment bonds for construction projects involving public funds.

8. Errors in Bid

In the event there is a discrepancy between the unit prices and the extended totals, the unit prices shall prevail. In case there is an error in the summation of the extended totals, the extended totals shall govern and the computed summation by the Engineer shall be accepted as the amount bid.



In the event there is a discrepancy between the item unit bid prices written in numbers and the item unit bid prices written in words, the item unit bid prices written in words shall govern.

9. Estimated Quantities

The quantities as listed in the proposal are approximate only, and are given as a basis for the comparison of bids. The Owner reserves the right to increase or decrease any item to any amount.

Any such change in quantity shall not be regarded as sufficient grounds to renegotiate the unit price bid for that item unless such item is increased or reduced by more than twenty-five percent (25%).

10. Condition of Job Site

Each bidder shall make a careful investigation of the job site and inform himself fully of the conditions relating to the construction and labor under which the work will be performed. Failure to do so will not relieve the successful bidder of his obligation to perform the work as set forth in the Contract Documents.

Bidders are hereby notified that it will be their responsibility to obtain information which they may require as to subsurface conditions and the location of underground utilities.

Each bidder by submission of his bid represents that he has apprised himself of all conditions, and the kind, quality, and quantity of work to be performed.

11. Addenda and Interpretations

No interpretations of the meaning of the Contract Documents will be made orally by the Engineer to any prospective bidder.

Notice of revisions or addenda to advertisement or bid documents relating to bids shall be no later than seven (7) days, Saturdays, Sundays and holidays excepted, prior to the date for acceptance of bids be published in a legal newspaper and be made available by notification in writing by certified mail to any person who has submitted a bid or who received a bid package.

12. Failure to Enter Into Contract

Should the successful bidder fail to execute and deliver the Contract, Certificate of Insurance, Payment and Performance Bonds within ten working days after the receipt of written notification by the Owner that the Contract is ready for execution, the bidder forfeits to the Owner as liquidated damages the security deposited with his bid.

13. Rejection of Bids

The Owner reserves the right to reject any or all bids and to waive any informality if deemed in the best interests of the Owner.

14. Utilities

Bidders are hereby notified that it will be the Contractor's responsibility to notify respective utility companies of any damages caused by the Contractor to their lines and see that the same will be repaired immediately at no cost to the Owner.

15. Work Scheduling

Prior to beginning of construction, the Contractor is required to submit in writing work schedules, which shall have the approval of the Engineer. The Contractor is also required to submit in writing prior to beginning of construction the methods of construction to be used in performance of this project.

16. The Bids

On a bid for any contract, the Owner reserves the right to hold a hearing to determine who is the most qualified bidder based on experience, ability to perform the work, financial ability, and work previously performed by the bidder in the particular area for which he has bid. All bidders agree that the decision of the Owner shall be final and not appealable unless such decision is made in bad faith. The Owner reserves the right to determine between two (2) tie bidders who shall receive the contract by drawing lots. In the event that the Owner makes such a decision, the names of each of the tie bidders shall be placed in a suitable receptacle and deposited in a closed container which shall be vigorously shook and a representative of the Owner or the Engineer shall draw the name of the successful bidder from the receptacle. All contractors, by submitting a bid, agree to the foregoing terms in determining a tie between two (2) bidders.

17. Discrimination, Affirmative Action Program and Equal Employment Opportunity (EEO)

Bidders are required to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27, and with all regulations promulgated thereunder. The Contractor also agrees to submit a copy of the Monthly Project Work Form AA-202 once a month thereafter for the duration of the contract to the Division of Public Contract's Equal Employment Opportunity, compliance of the Department of Treasury of the State of New Jersey and to the Owner's compliance officer.

18. Beneficial Ownership In Bidder

Pursuant to Chapter 33, P.L. 1977, all bidders shall set forth, in an appropriate statement, the names and addresses of all stockholders in the corporation, partners in a partnership or other persons in a business entity who have a ten (10%) percent or more interest or any individual who has a ten (10%) percent or more interest in the business entity which may bid on the aforesaid contract.

19. Payment of Wages

Bidders on this contract will be required to pay the prevailing wage rates for the locality in which the project is to be performed. The prevailing wage rate shall be determined by the Secretary of Labor in accordance with the Davis/Bacon Act, as amended, or the New Jersey Prevailing Wage Law of 1963, Chapter 150 (N.J.S.A. 34:11 - 56.25 et. seq.), whichever rates are higher.

The Contractor shall pay the minimum rates determined by the United States Secretary of Labor and the New Jersey Department of Labor. If the minimum wage rate prescribed for any craft by the United States Secretary of Labor is not the same as the minimum wage rate prescribed for that craft by the New Jersey Department of Labor, the higher rate shall be the rate paid.

The state wage rates in effect at the time of award are made a part of this contract, pursuant to Chapter 150, Laws of 1963 (N.J.S.A. 34:11-56.25 et. seq.).

In the event it is found that any employee of the Contractor or any subcontractor covered by the contract, has been paid a rate of wages less than the minimum wage required to be paid by the contract, the Owner may terminate the Contractor's or subcontractor's right to proceed with the work, or such part of the work, as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The Contractor and his sureties shall be liable to the local government for any excess costs occasioned thereby.

20. Requirements Before Contract

The Owner requires the submission of the Performance Bond and Payment Bond, Certificate of Insurance, Affirmative Action Affidavit, and Initial Project Workforce Report (Form AA-201) before contracts are issued.

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## **GENERAL CONDITIONS OF THE CONTRACT**

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## **GENERAL CONDITIONS OF THE CONTRACT**

### **ART. 1 DEFINITIONS**

Certain terms are used from time to time in the Contract Documents and shall be construed as follows:

Contract Documents - consist of the Advertisement, Information for Bidders, Proposal, Agreement, General Specifications, Supplemental Specifications, Plans, and Addenda, if any. These form the Contracts.

Owner - shall mean the specific body as indicated in the Agreement.

Engineer - shall mean the individual or his agent so designated by the Owner.

Contractor - shall mean the successful bidder who is the party of the second part of the Agreement. For convenience throughout the Contract Documents, the Contractor shall be referred to as an individual.

Subcontractor - shall mean those having a direct contract with the Contractor to furnish materials worked to a special design according to the Contract Documents of this work.

Work - shall mean all labor, materials, supplies, tools and equipment, insurance, bonds, and other facilities necessary to complete the Contract.

Surety - shall mean the corporate body which is bound with and for the Contractor and which engages to be responsible for his payment of all debts pertaining to and for his acceptable performance of the work for which he has contracted.

Drawings - shall mean all sketches, blueprints, plans, and reproductions of drawings pertaining to the construction of the structures and appurtenances.

Specifications - shall mean the directions, provisions and requirements, contained herein, together with all written agreements made to the method and manner of performing the work or the quantities and qualities of materials to be furnished under the Contract.

Extra work - shall mean any work required by the Owner, which in the judgment of the Engineer, involves changes in or additions to that work required by the Contract Documents.

Written Notice - shall mean notice which has been duly served when delivered to or at last known business address of the person, firm or corporation for whom intended or when enclosed in a prepaid postage wrapper or envelope addressed to such person, firm, or corporation at the last known business address and deposited in a United States mail box. All notices sent by mail shall be certified, and the time of receipt shall be used for the determination of any waiting period for action to be taken as called for in the Contract Documents.

## **ART. 2 INTENT OF CONTRACT DOCUMENTS**

The Contract Documents are complementary, and what is required or called for by any one of them shall be as binding as if mentioned by all. The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper execution of the work in a good and workmanlike manner. In the performance of the work, the Contractor shall also bear all costs of insurance; obtain and pay for any necessary permits; royalties; conform to all federal, state, county, and municipal legislation pertinent to this project; and protect the work during construction. The Contractor shall also provide to the Owner any and all equipment warranties which are standard and transferable.

## **ART. 3 ORDER OF COMPLETION**

The Contractor shall submit a schedule which will show the order in which the proposed work will be performed and the dates when each part will be started and completed. The order of work shall be approved by the Engineer.

## **ART. 4 OWNERSHIP OF DRAWINGS**

All furnished Drawings, with the exception of the Contract set, are the property of the Engineer, and shall be returned to him at the completion of work.

## **ART. 5 CONTRACTOR'S UNDERSTANDING**

It is understood and agreed that the Contractor has satisfied himself as to the nature and location of the work; the character, quality and quantity of the necessary material; the character of equipment and facilities needed to perform the work; the general and local surface and subsurface conditions; all federal, state, county and municipal ordinances which may affect the work to be performed under this Contract.

## **ART. 6 CONTRACTOR'S RESPONSIBILITY**

The Contractor shall be responsible for all parts of the work, temporary and permanent, until the project is accepted by the Owner. The Contractor shall also bear all losses resulting from any unforeseen difficulties which may be encountered; or delays of work resulting from the breaking, leaking or relocation of any underground utilities; or from delays required for any related or adjoining contract and shall save the Owner harmless from all claims of any kind arising from the performance of this Contract.

The Contractor shall be responsible for any and all damage caused by or due to flooding during construction, which damages either personal and/or real property, and it will be his responsibility to take adequate steps during the course of construction to prevent such damage.

The Contractor is solely responsible for compliance with all applicable safety regulations regarding safety and confined space entry including, but not limited to, those of the Occupational Safety and Health Administration (OSHA), National Safety Council, State of New Jersey, Department of Labor and Industry, etc.

## **ART. 7 OWNER'S RESPONSIBILITY**

The Owner shall be responsible for the ownership of lands, easements, or slope rights upon which the proposed work is to be constructed. The Owner shall not be responsible for lands used for storage of the Contractor's equipment. If the Contractor desires temporary use of other land during construction, he will secure written permission from the owner and shall file a duplicate copy of such permission with the Owner.

## **ART. 8 SUBCONTRACTORS**

The Contractor, prior to engaging any subcontractor, shall furnish the Engineer, in writing, with the name and address of the subcontractor; and the nature and extent of the work to be performed. A list of five completed similar projects by the subcontractor and the name, address and phone number of the Engineer in-charge shall also be furnished. The Contractor shall not award any subcontract until the proposed subcontractor has been approved by the Engineer and evidence has been presented to the Owner that the employees of the subcontractor are protected by compensation insurance. The Contractor shall require the Subcontractors to comply with any and all rules, regulations, laws, statutes and contract requirements set forth herein that apply to the Contractor.

The Contractor agrees that he is fully responsible to the Owner for acts or omissions of his subcontractor and of persons either directly or indirectly employed by them.

The Owner reserves the right to require the Contractor to construct, with his own employees, not less than forty percent of the total value of the Contract; such percentage to be calculated on the basis of the original bid proposal.

Nothing contained in the Contract Documents, shall create any contractual relation between any subcontractor and the Owner.

## **ART. 9 SUPERINTENDENTS**

The Contractor shall keep on the work site at all times during its progress, a competent superintendent who shall be satisfactory to the Engineer. The superintendent shall not be changed except with the consent of the Engineer, unless the superintendent ceases to be in the Contractor's employ. The superintendent shall represent and have full authority to act for the Contractor. Any directions so given shall be confirmed in writing by the Engineer upon written request of the Contractor.

The Contractor shall also furnish to the Owner the telephone numbers of his superintendent and assistants for any emergency arising outside the normal work day schedule as a result of the Contract. If such an emergency does arise, and the Owner cannot contact the Contractor or his agents, or the Contractor or his agent does not arrive on the job site within two hours of such notification, the Owner reserves the right to correct the situation. Any costs incurred by the Owner shall be reported, in writing, to the Contractor for immediate payment. No additional estimates for work under this Contract shall be paid to the Contractor until the Owner is in receipt of payment for such emergency work.



## **ART. 10 PROTECTION OF WORK AND PROPERTY**

The Contractor shall continuously maintain adequate protection of all his work, the Owner's property and operations, existing utility facilities, and adjacent property from injury or loss arising in connection with this Contract. He shall be responsible for such damage, loss or injury except if caused by agents or employees of the Owner.

In the event of emergency affecting the safety of life or of the work or of adjoining property, the Contractor shall act to prevent such threatened loss of property without authorization by the Owner, and he shall act, without appeal, if instructed by the Owner. Any compensation due to the Contractor by reason of such action shall be determined by agreement prior to the submittal of the next monthly estimate.

In the event of a discharge of sewage to surface or ground, the Contractor shall be responsible for following all applicable Federal, State and local rules and regulations relative to reporting and clean-up operations.

The Contractor shall provide clear video tapes taken before and after construction of those areas where contemplated construction activities are in close proximity to the private and other properties within the easements duly existing or obtained.

The cost of taking, developing and furnishing copies of these video tapes shall be borne by the Contractor.

The before construction video tapes must be submitted to the Engineer for his review prior to commencement of the actual construction work.

## **ART. 11 INSPECTION OF WORK**

The Owner shall have the right to inspect all materials and work performed during any phase of construction and the Contractor shall provide all reasonable facilities for the safe and convenient means of such inspection. The Contractor shall notify the Engineer of any work requiring inspection 72 hours prior to commencing work. Unless otherwise authorized, work shall be done only in the presence of the Engineer or an authorized representative. Any work done without proper inspection will be subject to rejections and not approved for payment. Inspection of the work shall not relieve the Contractor of the obligation to fulfill all conditions of the Contract.

No work shall be closed or covered until it has been duly inspected and approved. Should un-approved work be covered, the Contractor shall, if requested by the Engineer, uncover all work for inspection. The cost of uncovering the work and replacement shall be borne by the Contractor.

The cost of inspection shall be borne by the Owner during the normal work week. The wages and overhead for inspection services on Saturdays, Sundays, legal holidays, or on week days outside the hours of 8:00 A.M. to 4:30 P.M. inclusive shall be borne by the Contractor.

## **ART. 12 CHANGES IN THE WORK**

The Owner may order extra work or make changes by altering, adding or deducting from the work without invalidating the Contract. All such work shall be executed under

the conditions of the original Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

In giving instructions, no extra work or change shall be made unless said order is written, except in an emergency endangering life and property. (See ART. 10) Prior to the execution of any written change order the value of such extra work shall be determined in writing in one of the following ways.

(A) By estimate or acceptance in a lump sum.

(B) By unit prices named in the Contract or subsequently agreed upon.

(C) By cost and percentage or by cost and a fixed fee.

It is understood that the Owner reserves the right to have any extra work done by any person, persons, or corporation other than the Contractor if an agreement upon the prices to be paid for such extra work cannot be promptly reached between the Owner and the Contractor. The Contractor agrees to make no claim for damages or for any privileges or rights other than that provided in the Contract by reason of such work by others.

Any extra work done by the Contractor shall be included in the monthly estimates.

#### **ART. 13 TIME OF COMPLETION**

The work contemplated under this Contract shall be completed within 500 calendar days. The Contractor shall commence the work not later than 20 calendar days after the execution of the Contract. The completion time shall include, but not be limited to, the time necessary to prepare shop drawings, to order, process, and deliver all equipment and materials, to obtain necessary permits and approvals, to perform the proper installation contemplated under this contract and all else necessary and incidental in connection with the performance of this Contract.

If the Contractor fails to complete the work within the specified time plus extensions, the Contractor shall be responsible to the Owner as liquidated damages for the sum of \$1,500.00 per day (Saturdays, Sundays, and legal holidays excepted) for every day thereafter until the completion and acceptance of work. Such liquidated damages shall not be considered as a penalty. The Owner shall deduct and retain out of any money due or to become due hereunder the amount of the liquidated damages.

#### **ART. 14 MONTHLY ESTIMATES**

Upon receipt of an invoice from the Contractor with supporting documentation as required, the Engineer shall prepare a monthly estimate for partial payment to the Contractor not later than the third day of each month. No later than the last day of the month, the Owner will attempt to make partial payment to the Contractor on the basis of the Engineer's estimate. All such payments shall be considered tentative only, subject to correction in any subsequent estimate, and need not be based on accurate measurement. These payments are to be made purely to allow the Contractor to meet his current bills and for no other purpose. The Owner will retain ten percent of the amount of each partial payment for contracts up to \$100,000 and two percent for contracts in excess of \$100,000, until substantial completion.

In the preparation of the monthly estimates, no allowance will be made for materials until said materials have been incorporated in the work.

## **ART. 15 WITHHOLDING OF PAYMENT**

The Owner may withhold payment for the following:

- (A) Defective work not corrected.
- (B) Claims filed or responsible evidence indicating probability of filing claims.
- (C) Failure of the Contractor to make proper payments to subcontractor or for material or labor.
- (D) Unpaid damages by the Contractor to subcontractors, the Owner or any other agency or person.
- (E) Failure of the Contractor to submit certified payroll records.

## **ART. 16 FINAL ESTIMATE AND FINAL PAYMENT**

Upon completion of all work, except maintenance, the Engineer shall file with the Owner a final estimate stating, from actual measurements or observation, the entire amount of work performed and compensation earned by the Contractor. Final payment will not be released until the maintenance bond or cash is submitted and approved by the Owner and the Contractor agrees to the final estimate and affixes his signature thereto. The Owner reserves the right to disregard claims for compensation submitted by the Contractor after the date of the final estimate. The date of final acceptance of the work shall be the date when the final payment is ordered paid by the Owner.

The acceptance of the final payment by the Contractor shall be and operate as a release for all things done or furnished in connection with this work and for every act of the Owner. This payment shall not operate to release the Contractor or his Sureties from any obligation under this Contract.

## **ART. 17 MAINTENANCE**

Before final payment is made, the Contractor shall furnish a Surety Corporation Maintenance Bond to the Owner in a sum equal to 15 percent of the final contract amount and such Bond shall remain in full force and effect for a period of two years from the date of acceptance of the work. The Bond shall provide that the Contractor guarantees to replace, during the two year period, any defective material or damage of the work to the satisfaction of the Engineer without cost to the Owner.

If during the two year period, any work should be found to be defective, the Owner shall order, in writing, the repair of such work. The repairs shall be undertaken within twenty four hours of the written notice and work shall be continuous, during regular working hours, until the replacement or repair is completed. If the Contractor fails to perform or fails to continue to perform the necessary repair the Owner may cause such work to be corrected and the cost thereof shall be paid by the Contractor or his Surety before the Bond will be released.

The Contractor is not obligated to repair any work that he may prove, to the satisfaction of the Engineer, has resulted from abuse of the work by parties other than the Contractor.

If the Owner puts to use any portion of the work prior to the final payment, the maintenance period for such portion of the work shall still be considered from the date of acceptance.

#### **ART. 18 DEFECTIVE WORK**

The Contractor, without compensation, shall promptly remove from the site, all materials condemned by the Engineer, and shall promptly replace and re-execute any work found to be defective by the Engineer prior to the final payment. The Contractor shall not be relieved of his obligation to remove unsuitable materials or correct defective work even though such work and materials have been previously inspected or estimated for monthly payment.

If the Contractor shall fail or neglect to replace any defective work or to discard condemned materials within ten working days after written notice, the Owner may cause such defective work to be replaced or the condemned materials to be discarded, and acceptable materials provided, and the expense thereof shall be deducted from the amount to be paid to the Contractor. An itemized list of expenses incurred by the Owner shall be submitted to the Contractor with the next monthly payment.

The Contractor is responsible to correct all defective work regardless of whether payment has been made and/or accepted by the Engineer.

#### **ART. 19 CLAIMS FOR EXTRA COST**

If the Contractor claims that any instructions, be they drawings or otherwise, involve extra cost under this Contract, he shall give written notification to the Engineer within forty-eight hours after the receipt of such instructions. In any event, before proceeding to execute the work, the Contractor shall meet with the Engineer to afford the opportunity to modify the design or construction procedure, to establish the validity and the value of the claim as provided in ART. 12, Changes in the Work.

If the Contractor claims compensation for any alleged damages sustained by reason of acts of the Owner, or its agents, the Contractor shall immediately notify the Engineer so that a proper appraisal can be made. Within five days thereafter, the Contractor shall submit to the Engineer a written statement as to the nature of the damage and an itemized statement of the amount claimed for such damage. No such claims shall be valid or entitled to payment unless as hereinbefore specified.

Work under this contract shall not be terminated or delayed during any discussions or negotiations related to claims for extra cost.

#### **ART. 20 LINE AND GRADE**

Unless otherwise stated in the specifications, the Contractor shall stake out such lines and grades as necessary in order to perform the work. The Contractor shall transfer the line and grade far enough in advance of the immediate work area to detect any errors or omissions that may exist. It shall remain the Contractor's responsibility to detect and report such errors or omissions to the Engineer immediately.

## **ART. 21 PUBLIC UTILITIES**

Special utility provisions as well as a list of all corporations, companies, agencies or municipalities owning or controlling the utilities in the vicinity of the project site is given in Appendix B.

The Contractor shall contact in writing, all agencies which may have utilities located in the area of work prior to commencement of construction and a copy of such notification shall be forwarded to the Engineer. A meeting of all utility company officials with the Contractor and Engineer shall be arranged by the Engineer to eliminate any possible misunderstandings or confusion during construction.

Upon completion of the work, the Contractor shall obtain a written statement from the various utility companies stating that all manholes or valve boxes within any newly paved area under this contract are free of any foreign matter and can be readily opened.

## **ART. 22 CHATTEL MORTGAGES**

No materials, equipment, or supplies for the work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest is retained by the seller. The Contractor warrants that he has clear title to all materials and supplies used by him in the work.

## **ART. 23 INSURANCES**

The Contractor shall maintain during the life of the contract, insurance policies of the type and with the minimum limits indicated below and in a form satisfactory to the Owner. The Contractor shall provide a certified copy of the policies and/or certificates of insurance satisfactory to the Owner prior to commencement of work.

A) Policy and Limit Guidelines as follows:

- 1) Workers Compensation insurance in accordance with laws of the State of New Jersey and other states where work is being performed. The Contractor shall also have and maintain Employers Liability Insurance as well as USL&H and Jones Act coverage where applicable.
- 2) Commercial General Liability insurance coverage, written on an occurrence basis, and must not be altered by any endorsements limiting coverage. Limits of liability shall not be less than the following:

\$2,000,000	General Aggregate per location/per job
\$2,000,000	Products/Completed Operations
\$1,000,000	Personal Injury and Advertising Injury Limit
\$1,000,000	Each Occurrence Combined Single Limit for Bodily Injury and Property Damage

The coverage shall include:

- a) Premises/Operations
- b) Independent Contractors

- c) Contractual liability covering liability assumed under the indemnification provision contained in this Agreement and deleting any third-party beneficiary exclusion.
  - d) Broad form property damage liability including completed operations.
  - e) Coverage for liability arising from explosion, collapse and underground damage, if blasting or excavation is to be done.
  - f) Personal injury coverage, including coverage for liability arising from false arrest, malicious prosecution, willful detention, libel, slander, defamation of character, invasion of privacy and wrongful egress or entry.
  - g) Products and completed operations for a period of two (2) years from substantial completion.
  - h) Limited Pollution Cleanup at a limit of \$100,000 for construction projects over \$500,000.
  - i) Environmental Liability at a limit of \$1,000,000.
- 3) Comprehensive Automobile Liability insurance covering the use of all owned, non-owned, hired or leased automobiles with limits of liability not less than \$1,000,000 combined single limit for bodily injury and property damage. Coverage should include uninsured and underinsured motorist at limits no less than the minimum statutory limits.
  - 4) Owners Protective Liability policy (OCP) with minimum limits of \$1 million. The policy "Named Insured" would be the municipality as Owner. The policy would also show the Contractor as "Designated Contractor". This policy will protect the Named Insured (the Owner) for the negligent acts of the Designated Contractor (Contractor).
  - 5) Umbrella Liability insurance policy written on an occurrence basis with a minimum combined single limit of "see below" as "Follow Form" excess of the Contractor's Employer's Liability, Commercial General Liability and Comprehensive Automobile Liability insurance policies required herein. Coverage to include on site limited pollution. The OCP policy as required in Item #4 should be an underlying policy.

<b><u>Project Cost</u></b>	<b><u>Umbrella Limit</u></b>
\$50,000 And Below	\$1,000,000
Over \$50,000 to \$500,000	\$3,000,000
Over \$500,000 to \$1,000,000	\$5,000,000
Over \$1,000,000	\$10,000,000

B) Policy and Limit Guidelines as follows:

- 1) Certified copies of all insurance policies provided above or certificates thereof satisfactory to the Owner shall be furnished forthwith. Each such policy or certificate shall contain a provision that it is not subject to change or cancellation unless 30 days prior written via certified mail/return receipt shall have been given to the Owner by the

Contractor's Insurer. These must be received 30 days prior to commencement of work.

- 2) The Contractor agrees that it will defend, indemnify and save harmless the Owner, its officers, agents, employees and engineer from and all liability, suits, actions, and demands and all damages, costs or fees on account of injuries to persons or property, including accidental death, arising out of or in connection with the work, or by reason of the operations under this agreement.
- 3) All insurance purchased and maintained by the Contractor shall designate the Owner, their officers, officials, agents, employees, Engineers, consultants as additional insureds.
- 4) Except as modified by the Owner in writing, the insurance requirements herein shall also apply to Subcontractors and to the Sub-Subcontractors and the Contractor will be responsible for supervision of the filing of certified copies of the insurance policies and/or insurance certificates prior to any Subcontractor commencing work on the project.
- 5) The Owner shall maintain Property insurance upon the entire work at the site. The insurance shall insure against the perils as provided by its general insurance carrier and its excess insurer.
- 6) The Owner and Contractor waive all rights against (1) each other and the Subcontractors, Sub-Subcontractors agents and employees each of the other, and (2) the architect and separate Contractors, if any, and their Subcontractors, Sub-Subcontractors, agents and employees for damages caused by fire or other perils to the extent covered by insurance obtained pursuant to Paragraph 5 or any other property insurance applicable to the work except such rights as they may have to the proceeds or such insurance held by the Owner. The Owner or the Contractor, as appropriate, shall require the architect, separate Contractors, Subcontractors, and Sub-Subcontractors by appropriate agreements, written where legal required for validity, similar waivers, each in favor of all parties enumerated in the Subparagraph 6.
- 7) All insurance coverage evidenced by the Contractor in accordance with this contract shall be from A.M. Best's rated A-X or better Insurance Company licensed to do business in the State of New Jersey.
- 8) All proof of insurance submitted to the municipality shall clearly set forth all exclusions and deductible clauses. The Owner will allow certain deductible clauses which are not considered excessive, overly broad, or harmful to the interest of the Owner. Standard exclusions will be allowed of any additional exclusions. This will be at the discretion of the Owner. Regardless of the allowance of exclusions or deductions by the Owner, the Contractor shall be responsible for the deductible limit of this policy and all exclusions consistent with the risks he assumes under this contract and as imposed by law.

In the event that the Contractor provides evidence of insurance in the form of certificates of insurance, valid for a period of time less than the period during which the Contractor is required by the terms of this

contract to maintain insurance, said certificates are acceptable, but the Contractor shall be obligated to renew its insurance policies as necessary and to provide new certificates of insurance so that the Owner is continuously in possession of evidence of the Contractor's insurance in accordance with the foregoing provisions.

In the event the Contractor fails or refuses to renew its insurance policy, or the policy is cancelled, terminated or modified so that the insurances do not meet the requirements of this subsection, the Owner may refuse to make payment of any further moneys due under this contract or refuse to make payment of moneys due or coming due under other contracts between the Contractor's insurance for the periods and amounts referred to above. Alternately, the Owner may default the Contractor and direct the surety to complete the project. During any period when the required insurance is not in effect, the Owner may suspend performance of the contract. If the contract is so suspended, additional compensation or extension of contract time is not due on account thereof.

#### **ART. 24 WORK BY OTHERS**

The Owner reserves the right to do any work which may connect with, become part of or be adjacent to the work embraced in this contract, at any time, by contract or otherwise.

The Contractor shall not interfere in any way with such other Contractor or person or persons which the Owner may employ and shall suspend such part, or all of his work, or shall prosecute the same in a manner, as may be ordered, to afford all reasonable facilities for doing such other work. Where the Contractor cannot agree as to who has precedence in any location, the decision shall rest with the Engineer, whose determination shall be final and conclusive. Any time lost, due to the work by others, shall not be just cause for additional compensation by the Contractor.

#### **ART. 25 RIGHT OF OWNER TO DECLARE CONTRACTOR IN DEFAULT**

The Owner has the right to declare the Contractor in default under the following circumstances:

- (A) If the Contractor fails to begin the work within the required time.
- (B) If the work to be done under this Contract is abandoned.
- (C) If the Contractor is adjudged bankrupt or makes an assignment for the benefit of creditors.
- (D) If the Contractor fails to or refuses to regard laws, ordinances, regulations, and such orders as given by the Owner or Engineer with respect to the work.
- (E) If the Contractor, after notice from the Engineer, refuses or fails to supply enough properly skilled workmen or proper materials or equipment.
- (F) If the Contractor violates any of the provisions of this Contract or shall not perform the same in good faith.
- (G) If the Contractor refuses or fails to prosecute the work or any part thereof with such diligence as will insure the work's completion within the specified period (or any duly authorized extension) or fails to complete the work within the prescribed period.



- (H) If the Contractor fails to make prompt payment to person supplying labor or materials for the work.
- (I) If the Contractor assigns or sublets the work otherwise than as specified.
- (J) If the Engineer is of the opinion, and certifies in writing, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the Contractor is not complying with the orders of the Engineer, or that sufficient workmen, materials, plant, tools, supplies, safety standards, or other means of carrying on the work are not provided to carry out all the requirements of the Contract.
- (K) Failure of the Contractor or Subcontractor to pay required wage rates.

The Owner shall serve written notice to the Contractor ordering the Contractor not to begin, or not to resume, or to discontinue all work under this Contract for any of the above stated reasons.

The Owner may then enter upon and take possession of the work, or any part thereof, and by purchase of necessary materials and equipment, by and/or direct employment of labor complete the work; or the Owner may cause the work to be completed by other persons by contract without advertising; or the Owner may re-advertise and re-let the uncompleted portions of the work and all expenses or financial loss to the Owner by reason of any of the above methods for completing the unfinished work shall be deducted out of monies then due, or to become due to Contractor under this Contract.

In case such expense shall exceed the amount which would have been payable under this contract if the same had been completed by the Contractor, the Contractor or his sureties shall pay the amount of such excess to the Owner.

Should such expense be less than the amount payable under this Contract, had the same been completed by the Contractor, he shall receive the difference after deducting the amount retained as herein before or hereinafter specified.

All the work undertaken by the Owner, by contract or otherwise, shall be certified by the Engineer as to the amount of work done, the cost and amount of excess cost, if any. Such certification shall be binding and conclusive upon the Contractor, his sureties, successors, assigns or liens.

In case this Contract, or any alterations or modifications thereof be thus terminated, the decision of the Owner shall be conclusive, and said Contractor shall not be allowed to claim or receive any compensation or damages for not being allowed to proceed with the work.

## **ART. 26 REMOVAL OF EQUIPMENT**

In case of termination of work, from any cause whatever, prior to completion, the Contractor shall promptly remove any part or all of his equipment and supplies from the work. If such removal is not completed within five working days after written notification by the Owner, the Owner shall have the right to remove such equipment and supplies at the expense of the Contractor.

## **ART. 27 CONTRACTOR'S RIGHT TO TERMINATE WORK**

If the work shall be stopped by order of the court or any other public authority for a period of three months without act or fault of the Contractor or of any of his agents, servants, employees, or subcontractors, the Contractor may, upon ten days notice to the Owner, discontinue performance of the work and/or terminate the Contract, in which event the liability of the Owner to the Contractor shall be determined as provided hereinbefore except that the Contractor shall not be obliged to pay to the Owner an excess of the expense of completing the work over the unpaid balance of the compensation to be paid the Contractor.

## **ART. 28 SUSPENSION OF WORK**

The Owner, on account of public necessity, adverse weather conditions, or other reasons, may order all or any part of the work suspended, and thereupon, the Contractor shall neatly pile up all materials, provide and maintain walks and crossings and take other means to properly protect the work. In case of stoppage of work, the time allowed for the completion of the work shall be extended in an amount equal to that lost by the Contractor in such manner, but the Contractor shall be entitled to no claims for damages. Under no circumstances shall the materials be used which have been affected by the weather.

## **ART. 29 POWERS OF THE ENGINEER**

The Engineer or its designee shall make all necessary explanations as to the meaning and intent of the Contract Documents, shall give all orders and directions contemplated under the Contract. The Engineer or its designee shall determine in all cases the quantity, quality, and acceptability of the several kinds of work and materials and shall determine all questions in relation to the work and construction thereof.

In case there is any inconsistency or ambiguity in the Contract Documents brought to his attention by the Contractor, the Engineer shall base his decision upon the premise that the more stringent interpretation was made by the Contractor in the submission of his bid. The Engineer shall decide any difference or conflicts which may arise between the Contractor and other contractors of the Owner in regard to their work.

Should the Contractor take exception to any determination made by the Engineer relating to this Contract, the Contractor shall within ten calendar days after receiving notification of such decision, file with the Owner a written notice appeal together with a full statement of facts as he believes them to be true. A copy of said notice and statement of facts shall be furnished to the Engineer.

## **ART. 30 DISPUTES**

In accordance with N.J.S.A. 40A:11-50 (PL 1997 c371) no disputes, as defined in the said statute shall be to a Court for adjudication unless the dispute has first been submitted to non-binding mediation. This provision shall not apply to disputes concerning the bid solicitation or award process, or to the formation or subcontracts to be entered into pursuant to PL 1971 c198 (C40A:11-1 et seq.) nor shall this provision prevent the contracting unit from seeking injunctive or declaratory relief in Court at anytime.

## **ART. 31 UNAUTHORIZED WORK**

Work done without lines and grade being given, work done beyond the lines and grades shown on the drawings or as given, or any extra work done without a written authorization will be considered unauthorized. Such work will be at the expense of the Contractor and will not be paid for by the Owner. Work so done, may be ordered removed and/or replaced by the Engineer at the Contractor's expense.

## **ART. 32 MAINTENANCE OF TRAFFIC**

The Contractor shall provide for and maintain local vehicular traffic during construction operations wherever feasible. At no time shall he close off any street by barricading or other methods without the prior consent of the Owner. If and when it becomes necessary to close the street to the normal flow of traffic, the Contractor shall notify the Police Department, Fire Department and the Engineer, and shall at all times provide ingress and egress for emergency services as provided by the aforesaid departments.

All traffic control measures must conform with the latest edition of the Manual of Uniform Traffic Control Devices.

Detour routes, if approved by the Engineer, must be adequately and fully marked by the Contractor for the entire length of the detour.

## **ART. 33 EROSION AND SEDIMENTATION CONTROL**

The Contractor shall schedule and conduct the work exercising such precautions as necessary to prevent and/or reasonably minimize the pollution or contamination of stream and other waters with sediment or other harmful materials. Wherever construction exposes work which is subject to erosion, the extent of such exposures in advance of subsequent construction shall be subject to the approval of the Engineer. Erosion control features or other work to be completed within such areas shall follow as soon after exposure as practicable.

Construction of drainage facilities as well as performance of other contract work which will contribute to the control of siltation shall be carried out in conjunction with earthwork operations, including borrow pit operations, or as soon thereafter as is practicable.

During construction, the Contractor shall shape the top of earthwork so as to effect the drainage of rainwater and to prevent the flow of runoff over the slopes except at locations selected or approved by the Engineer. If and where the Engineer so directs, temporary slope drains shall be constructed to carry the runoff.

The erosion control measures described herein shall be continued until the grass on seeded slopes is sufficiently established to be an effective erosion deterrent.

Unless otherwise approved in writing by the Engineer, construction operations in rivers, streams and impoundments should be restricted to those areas where channel changes are shown on the plans and to those areas which must be entered for the construction of temporary or permanent structures. Rivers, streams and impoundments shall be promptly cleared of all falsework, piling, debris, or other obstructions placed therein or caused by the construction operations.

Excavation from the roadway, channel changes, cofferdams, etc., shall not be deposited in or so near to rivers, streams or impoundments so that it will be washed away by high water or runoff.

Each 5,000 square feet of cut face of earth excavation and/or fill for roadway slopes will be treated to establish a temporary vegetative cover as described in the "Standards for Soil Erosion and Sedimentation Control in New Jersey" immediately after the completion of excavation and/or embankment operations in the same area. All work must also be in accordance with the local Soil Conservation District. The Contractor shall notify the District in writing at least 48 hours in advance of any land disturbance activity.

Unless otherwise stated in the technical specifications, no separate payment will be made to the Contractor for soil erosion and sedimentation control measures and the cost for soil erosion and sediment control measures will be included in the bid price of various items in the Proposal.

#### **ART. 34 FINAL CLEAN UP**

Before final acceptance of the work, the Contractor shall remove all equipment, temporary work, unused and useless materials, rubbish; shall leave the ground and adjacent property in a neat and satisfactory condition; shall remove all obstructions from waterways caused by his operations; and shall clean all new and existing storm water drains within and adjacent to the work which have been obstructed by the Contractor.

#### **ART. 35 LIENS**

The Contractor agrees that he will furnish the Owner with satisfactory evidence that all persons who have done work or furnished materials under this agreement and are entitled to a lien, therefore, have been fully paid off and are no longer entitled to such lien. The Owner may withhold payment in the event claims are filed or it has reasonable evidence indicating the probability of claims being filed.

#### **ART. 36 COMPLIANCE WITH LABOR STATUTES AND RULES**

The Contractor agrees to comply with all the laws of the State of New Jersey regarding labor and compensation with all labor statutes, rules, regulations, and ordinances applicable and having the force of the law. The Contractor in matters of non-discrimination agrees that:

- (A) In the hiring of persons for the performance of work under this Contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this Contract, no Contractor, nor any person acting on behalf of such Contractor or subcontractor, shall, by reason or race, creed, color, national origin, or ancestry, discriminate against any person who is qualified and available to perform the work to which the employment relates.
- (B) No Contractor, subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employees engaged in the performance of work under this Contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such Contract on account of race, creed, color, national origin, or ancestry.

- (C) There may be deducted from the amount payable to the Contractor by the contracting public agency, under this Contract, a penalty of \$50.00 for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provision of the Contract.
- (D) This Contract may be cancelled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the Contract occurring after notice of the Contractor from the contracting public agency of any prior violation of the section of the Contract.
- (E) The Contractor agrees to comply with all State statutes, rules and regulations dealing with minimum wage rates and failure to do so shall subject the Contractor to forfeiture of the contract or other penalties imposed by law.
- (F) Contractors are responsible for subcontractor compliance.
- (G) The Contractor shall instruct his personnel to follow all safety regulations of the Occupational Safety and Health Administration (OSHA) and officials of the State of New Jersey Department of Labor and Industry. The Contractor is forewarned that the regulatory agencies could impose a work stoppage if their representatives inspect the Contract work and discover that safety precautions mandated by the agencies have been violated.
- (H) In the case of projects with contracts exceeding \$50,000 that are part of the project, the Contractor shall have an Affirmative Action Plan. The form AA-201B and/or others as it may be required by the Affirmative Action Office shall be completed by the Contractor and furnished to the Owner and the Affirmative Action Office no later than three (3) days after the Contractor signs the Contract.

## **ART. 37 AMERICAN GOODS AND PRODUCTS**

The Contractor shall comply with any and all "Buy American" requirements of Federal and State law, including N.J.S.A. 40A:11-18 which provides that only manufactured products of the United States, wherever available, be used.

## **ART. 38 EQUIPMENT**

All microprocessor based equipment on this project shall be date-sensitive, date-compliant and Year 2000 compliant.

## **ART. 39 COMMUNITY DEVELOPMENT REQUIREMENTS**

### **BERGEN COUNTY COMMUNITY DEVELOPMENT PROGRAM**

#### **POLICY MEMORANDUM 95-02**

### **Standard Federal Contract Provisions**

There are nine (9) standard contract provisions that sub-grantees must include in all or in certain types of contracts and specifications. Five (5) of the provisions address and implement socio-economics policies, contained statutes or executive orders. The remaining four provisions address procurement issues. These provisions must be provided to your architect or engineer and attorney to be included in specifications and construction contracts. Specifications along with a copy of your bid advertisement,

must be submitted to the Division of Community Development prior to undertaking the procurement process for all projects funded whole or in part by CDBG funds.

If you are not clear on these matters you should request guidance from the Division of Community Development.

The five (5) socio-economic provisions are as follows:

Executive Order 11246, "Equal Employment Opportunity", which sets forth non-discrimination requirements for federally financed construction as amended by Executive Order 11275 and as supplemented in Department of Labor regulations (41 CFR Part 60). To comply, a construction contractor with contracts exceeding \$10,000 must have an affirmative action plan that does not discriminate on the basis of race, color, religion, creed, sex, national origin and age.

Copeland "Anti-Kickback" Act (18 U.S.C. 874), as supplemented by Department of Labor regulations (29 CFR Part 3), this Act makes it a criminal offense for any person to induce, by any manner whatsoever, any person employed in the construction, completion or repair of any public building or work financed in whole or in part by loans or grants from the Community Block Grant Program, to relinquish any compensation to which he is entitled under his contract of employment. The Copeland Act applies to both contractors and subcontractors.

Davis-Bacon Act (40 U.S.C. S276(a)-276(a)7 as supplemented by Department of Labor regulations (29 CFR Parts), Contractors on construction projects which exceed \$2,000 must pay laborers and mechanics the HIGHER of the New Jersey Prevailing Wages Rates as promulgated by the NJ Commissioner of Labor or the Federal Prevailing Wage rates as promulgated by the U.S. Secretary of Labor. Under this Act employers must pay wages at least once a week. See also Policy Memorandum 95-01 "Prevailing Wage Requirements" for details.

Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330), as supplemented by Department of Labor regulations (29 CFR Part 5). Contractors on construction projects and certain other types of projects must pay an overtime rate of one and one half times the basic hourly rate. (Eight hours a day, 40 hours a week basis). Contractors must provide safe and healthy work surroundings and conditions. This act also provides for payment of liquidated damages where violations occur.

Clean Air Act of 1970 – To comply, contractors must not create significant air pollution at their plants or business sites.

The following four (4) mandated provisions are related to procurement:

Remedies. Sub-grantees must include in all specifications and contracts the means to remedy breaches and violations of a contract and penalize or sanction remedies depending on what is being purchased. All contracts should have provisions requiring contractors to correct deficiencies. If sub-grantee actions were not the cause of the substandard performance, contractors should pay for the costs associated with contract violations and breaches. (Refer to Articles 13, 15 and 18).

Termination. Local Government sub-grantees entering into contracts over \$10,000 are required to reserve the right to terminate for cause and convenience. A provision for termination must describe the way in which terminations will be carried out and the

basis for settlement. The provisions also must differentiate between terminations for default and terminations for convenience. (Refer to Articles 25 and 27).

Non-profits must include suitable termination provisions in contracts in excess of \$25,000. (Small Purchase Threshold).

Patents and Copyrights. Sub-grantees are required to notify contractors of their rights to inventions and other materials generated under contracts.

Access to Records. Sub-grantees must include a clause that establishes the right of federal agencies and grantor government sub-divisions to have access to contractor records that pertain to grant supported contracts. Grantor agencies, the Comptroller General of the United States or any authorized representative must be able to examine pertinent documents when conducting audits or other forms of examinations.

COMMUNITY DEVELOPMENT CONTACT PERSON: EDWARD DOLSHUN 201-646-2559.

#### Statutory/Regulatory Reference

24 CFR85.36 (g)(3)(i)

Patents and Copyrights. Upon proper written notification to the Engineer and Owner, the General Contractor and/or Subcontractor have the right to seek and obtain patents or copyrights for inventions and other materials generated by them while under contract.

Access and Records. Federal agencies and the County of Bergen shall have the right to access any contractor's records that pertain to this contract. The Owner and the Comptroller General of the United States or any authorized representative must be able to examine pertinent documents when conducting audits or other forms of examinations.

#### **ART. 40 PUBLIC WORKS CONTRACTOR REGISTRATION ACT**

The Contractor shall comply with the requirements of the Public Works Contractor and Registration Act for the State of New Jersey known as the P.L. 1999.c238 (NJSA 34:11-56.48). In accordance with the requirements of this Act, the Contractor shall submit with the bid a copy of its Public Works Contractor Registration Certificate as well as a copy of the certificates for its named subcontractors.

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## **SCOPE OF WORK**

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**SCOPE OF WORK  
PUMPING STATIONS OAKLAND KNOLLS, CHAPEL HILL  
AND SKYVIEW-HIBROOK  
BOROUGH OF OAKLAND  
BERGEN COUNTY, NEW JERSEY**

The work to be performed under this contract includes the decommissioning of existing wastewater treatment plants Oakwood Knolls, Chapel Hill, and Skyview-Hibrook and installation of three (3) new pumping stations.

Principal items of work in the project include:

- Decommissioning of existing wastewater treatment plants
- Construction/Installation of pumping stations and their components
- Installation of force mains and appurtenances
- Installation of control systems.

The work contemplated under this Contract shall be completed within 500 calendar days.

Unless otherwise specifically noted, all work is to be in compliance with the New Jersey Department of Transportation, Standard Specifications for Road and Bridge Construction 2007 U.S. Customary English Units, as amended.

All work is to be inspected, by a representative of the Engineer. Quantity tickets will be collected by a representative of the Engineer, at the time of delivery of the specific load only. No tickets will be accepted, for any quantities of materials at any other time. Volume items will be measured within the prescribed pay limits indicated on the Contract Drawings.

Milled material, if directed, shall be designated for recycling and transported to an approved recycling center. Tonnage of milled material shall be certified to the Owner and the Owner's recycling coordinator.

The Contractor shall be responsible for the construction stakeout/layout. **The construction stakeout/layout shall be performed by a qualified New Jersey licensed professional land surveyor.**

The Contractor is hereby alerted of the escrow deposit required for the payment of police traffic directors in accordance with these specifications.

The Contractor shall remove and replace all signs, including street names signs, as determined by the RE in the field. Use mixed case lettering for street name signs in accordance with the current edition of the Manual on Uniform Traffic Control (MUTCD) and the Standard Construction Details located in the Appendices of these Specifications. Provide shop drawings of all signs for review and approval prior to ordering. All street name signs shall be extruded aluminum and in accordance with Subsection 911.01 of the Specifications and paid for under the item "Regulatory and Warning Sign."

The Contractor shall construct all sidewalks, handicap ramps and pedestrian facilities within the public right-of-way or easements in full compliance with the "Proposed Accessibility Guidelines for Pedestrian Facilities in the Public "Right-of-Way" located at <http://www.access-board.gov/prowac/nprm.htm> as published in the Federal Register on July 26, 2011 and the

Manual on Uniform Traffic Control Devices (MUTCD). Workmanship and materials shall be in conformance with the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction as amended and supplemented by County and/or Municipal requirements. The Contractor is notified that the improperly constructed ramps and facilities, as determined by the Municipality and/or County, will require replacement with compliant ramps and facilities at the sole cost and expense of the Contractor.

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## **AGREEMENT**

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**SANITARY SEWER IMPROVEMENTS  
OAKWOOD KNOLLS, CHAPEL HILL AND SKYVIEW/HIBROOK TREATMENT PLANTS  
AGREEMENT**

This Agreement made on the \_\_\_\_\_ day of \_\_\_\_\_ by and between the Borough of Oakland in the County of Bergen, in the State of New Jersey, party of the first part, hereinafter called the Owner and \_\_\_\_\_ party of the second part, hereinafter called the Contractor.

Witnesseth: That the Contractor, for and in consideration of the sum or sums hereinafter mentioned to be paid, as hereinafter expressed by the Owner, does hereby covenant, promise and agree, and for the Contractor's heirs, personal representative, successors, and assigns does promise and agree, to and with the Owner as follows:

1. That the Contractor will agree to furnish and deliver all materials to do and perform all the work and labor required in and about said project as indicated in the accompanying proposal, all in accordance with the Contract Documents, specifications, and affirmative action requirements which are annexed hereto and deemed to a part of this Agreement and further, that the Contractor will perform said work as and then ordered by the engineer and prosecute the same diligently to conclusion and complete the same within the time specified in the General Conditions of the Contract. The Contractor will commence the work not later than 20 calendar days after the execution of the contract.
2. And it is further agreed by and between the parties hereto, that if the Contractor shall omit, fail, neglect or refuse to commence, prosecute or to complete said work as aforesaid, or in case further time be granted for the commencement and completion of said work, and the said Contractor shall omit, fail, neglect or refuse to commence, prosecute or complete said work within the time granted, or if the Contractor shall cease operations under this Contract at any time, for the space of ten (10) calendar days without the approval of the Engineer, that then, in any such event, the Governing Body of the Owner, or the Engineer in its behalf, shall have the full privilege, authority and power, if the Governing Body shall so elect, to cause the said work to be done and completed without interference, opposition, or hindrance of or by the Contractor; provided, the Governing Body shall give to the Contractor or its sureties notice in writing of the intention to do so, by mailing such notice in an envelope, with postage prepaid, addressed to the Contractor, under, in and by this Contract, shall cease and be void, and the Contractor shall receive no further benefit, pay or remuneration thereunder; and the Contractor and/or its sureties shall be liable for any and all sums of money which the Owner shall or may pay or expend for fully completing and maintaining said work, over and above the amount which the Contractor would have been entitled to receive, had the Contractor completed and maintained the work under the Contract according to its terms and conditions, and all loss or damage may result to the Owner by reason of the omission, failure, or refusal of said Contractor to commence, prosecute and maintain said work as aforesaid.
3. And it is further agreed by and between the parties hereto, that whenever damages are imposed by the terms of this Contract for failure, neglect or default of the Contractor in the performance of this contract, this amount thereof when incurred by the Owner, may be deducted and withheld from any money to become due upon this Contract, and when so deducted and withheld shall be deemed and taken as payment by the Contractor to that extent.
4. And it is further agreed by and between the parties hereto, that the time is of the essence of this contract, and that if the contract work is not fully completed within the

time limit for its completion in accordance with ART. 13 of the General Conditions of the Contract, the Contractor shall pay to the Owner for each day, Saturdays, Sundays and Holidays excepted and such time as the prosecution of the work is stopped by written direction of the Governing Body or its authorized agent that shall or may elapse after the time so limited for its completion, until its final and full completion and acceptance by the Owner the sum of \$1,500.00 per day, Saturdays, Sundays and Holidays excepted, as liquidated damages.

5. The Contractor agrees to carry adequate policy or policies of insurance in accordance with ART. 23 of the General Conditions of the Contract, as will indemnify him and the Owner and the Engineer from any liability imposed by law as a result of any act or omission of the Contractor, his agents, servants or employees from the time of the commencement of the work hereunder; such policy or policies of insurance shall be subject to inspection by the properly authorized agent, servant or employee of the Owner.
6. The Contractor further agrees that prior to the payment to him by the Owner of the Contract Sum hereinafter set forth, the Contractor will furnish to the properly authorized agent, servant or employee of the Owner satisfactory evidence of the payment by the Contractor of all obligations incurred by the Contractor, resulting from the order or purchase of materials by the Contractor, charges for labor or obligations upon any subcontractor or contract which the Contractor may list.

The Contractor agrees to indemnify and save harmless the Owner from any claims, demands, actions, or causes of action which may be presented to or asserted against the Owner as a result of any act or omission by the Contractor in the performance of the work hereunder, or in violation by the Contractor of any duty imposed upon the Contractor by law.

It is hereby mutually agreed that the Owner is to pay and the Contractor is to receive as full compensation for furnishing all materials and labor in building, constructing and testing, and in all respects completing the work herein described and appurtenances thereto in the manner and under the conditions herein specified, the various unit prices stipulated in the Proposal hereto annexed.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement this day and year as first above written.

BOROUGH OF OAKLAND

By\_\_\_\_\_

(SEAL)

ATTEST:

By\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Contractor

ATTEST/WITNESS:

By\_\_\_\_\_

By\_\_\_\_\_

Bond No \_\_\_\_\_

**PERFORMANCE/LABOR MATERIAL BOND**

KNOW ALL MEN BY THESE PRESENTS THAT we, the undersigned as Principal, and the \_\_\_\_\_, a corporation organized and existing under the laws of the State of New Jersey and duly authorized to do business in the State of \_\_\_\_\_, as Surety, are held and firmly bound unto \_\_\_\_\_ as Obligee in the penal sum \_\_\_\_\_ (\$ \_\_\_\_\_) for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the above-named Principal did on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, enter into a contract with \_\_\_\_\_ which contract is made part of this bond the same as though set forth herein:

NOW, if the said \_\_\_\_\_ shall well and faithfully do and perform the things agreed by them to be done and performed according to the terms of said Contract, and shall pay all lawful claims of beneficiaries as defined by N.J.S.A. 2A:44-143 for labor performed or materials, provisions, provender or other supplies or teams, fuel, oils, implements, or machinery furnished, used or consumed in the carrying forward, performing or completing of said Contract, we agreeing and assenting that this undertaking shall be for the benefit of any beneficiary as defined in N.J.S.A. 2A:44-143 having a just claim, as well as for the Obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated;

The said Surety hereby stipulates and agrees that no modifications, omissions or additions in or to the terms of the said Contract; or in or to the plans or specifications therefore, shall in any way affect the obligation of said Surety on its bond.

This bond is given in compliance with the requirement of the statutes of the State of New Jersey in respect to bonds or contracts on public works. Revised Statutes of the State of New Jersey, N.J.S.A. 2A:44-143 to 2A:44-147, both inclusive, and liability hereunder is limited as in said statutes provided.

SIGNED, SEALED AND DATED this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_\_

Witness: \_\_\_\_\_  
(If Individual)

\_\_\_\_\_  
(Principal)

Attest: \_\_\_\_\_  
(If Corporation)

\_\_\_\_\_

Attest: \_\_\_\_\_

By \_\_\_\_\_

Official Use Only

**STATE OF NEW JERSEY**  
**DIVISION OF CONTRACT COMPLIANCE**  
**EQUAL EMPLOYMENT OPPORTUNITY IN PUBLIC CONTRACTS**

Assignment

Code

FORM AA-201

Revised 10/03

**INITIAL PROJECT WORKFORCE REPORT CONSTRUCTION**

READ INSTRUCTIONS ON THE BACK CAREFULLY BEFORE THE COMPLETION AND DISTRIBUTION OF THIS FORM.  
 PLEASE TYPE OR PRINT IN BLACK OR BLUE INK.

1. FID NUMBER	2. CONTRACTOR ID NUMBER	5. NAME AND ADDRESS OF PUBLIC AGENCY AWARDED CONTRACT	
3. NAME AND ADDRESS OF PRIME CONTRACTOR		CONTRACT NUMBER      DATE OF AWARD      DOLLAR AMOUNT OF AWARD	
(Name)			
(Street Address)			
(City)      (State)      (Zip Code)		6. NAME AND ADDRESS OF PROJECT	7. PROJECT NUMBER
4. IS THIS COMPANY MINORITY OWNED [ ] OR WOMAN OWNED [ ]		COUNTY	8. IS THIS PROJECT COVERED BY A PROJECT LABOR AGREEMENT (PLA)? <input type="checkbox"/> YES <input type="checkbox"/> NO

9. TRADE OR CRAFT	PROJECTED TOTAL EMPLOYEES				PROJECTED MINORITY EMPLOYEES				PROJECTED PHASE - IN DATE	PROJECTED COMPLETION DATE
	MALE		FEMALE		MALE		FEMALE			
	J	AP	J	AP	J	AP	J	AP		
1. ASBESTOS WORKER										
2. BRICKLAYER OR MASON										
3. CARPENTER										
4. ELECTRICIAN										
5. GLAZIER										
6. HVAC MECHANIC										
7. IRONWORKER										
8. OPERATING ENGINEER										
9. PAINTER										
10. PLUMBER										
11. ROOFER										
12. SHEET METAL WORKER										
13. SPRINKLER FITTER										
14. STEAMFITTER										
15. SURVEYOR										
16. TILER										
17. TRUCK DRIVER										
18. LABORER										
19. OTHER										
20. OTHER										

I hereby certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements are willfully false, I am subject to punishment.

\_\_\_\_\_  
 (Signature)

10. (Please Print Your Name) \_\_\_\_\_ (Title) \_\_\_\_\_

(Area Code)      (Telephone Number)      (Ext.)      (Date)

**INITIAL PROJECT WORKFORCE REPORT CONSTRUCTION**

NEW JERSEY FACILITY

STATE OF NEW JERSEY  
Division of Contract Compliance & Equal Employment Opportunity  
**EMPLOYEE INFORMATION REPORT**

**IMPORTANT-** READ INSTRUCTIONS ON BACK OF FORM CAREFULLY BEFORE COMPLETING FORM. TYPE OR PRINT IN SHARP BALLPOINT PEN. FAILURE TO PROPERLY COMPLETE THE ENTIRE FORM MAY DELAY ISSUANCE OF YOUR CERTIFICATE. DO NOT SUBMIT EEO-1 REPORT FOR SECTION B, ITEM 11.

**SECTION A – COMPANY IDENTIFICATION**

1. FID. NO. OR SOCIAL SECURITY	2. TYPE OF BUSINESS <input type="checkbox"/> 1. MFG <input type="checkbox"/> 2. SERVICE <input type="checkbox"/> 3. WHOLESALE <input type="checkbox"/> 4. RETAIL <input type="checkbox"/> 5. OTHER	3. TOTAL NO. EMPLOYEES IN THE ENTIRE COMPANY
4. COMPANY NAME		
5. STREET	CITY	COUNTY    STATE    ZIP CODE
6. NAME OF PARENT OR AFFILIATED COMPANY (IF NONE, SO INDICATE)		CITY    STATE    ZIP CODE
7. CHECK ONE: IS THE COMPANY: <input type="checkbox"/> SINGLE-ESTABLISHMENT EMPLOYER <input type="checkbox"/> MULTI-ESTABLISHMENT EMPLOYER		
8. IF MULTI-ESTABLISHMENT EMPLOYER, STATE THE NUMBER OF ESTABLISHMENTS IN NJ		
9. TOTAL NUMBER OF EMPLOYEES AT ESTABLISHMENT WHICH HAS BEEN AWARDED THE CONTRACT		
10. PUBLIC AGENCY AWARDED CONTRACT	CITY	COUNTY    STATE    ZIP CODE
Official Use Only	DATE RECEIVED	INAUG. DATE    ASSIGNED CERTIFICATION NUMBER

**SECTION B – EMPLOYMENT DATA**

11. Report all permanent, temporary and part-time employees ON YOUR OWN PAYROLL. Enter the appropriate figures on all lines and in all columns. Where there are no employees in a particular category, enter a zero. Include ALL employees, not just those in minority/non-minority categories, in columns 1, 2, & 3. **DO NOT SUBMIT AN EEO-1 REPORT.**

JOB CATEGORIES	ALL EMPLOYEES			PERMANENT MINORITY/NON-MINORITY EMPLOYEE BREAKDOWN									
	COL. 1 TOTAL (Cols. 2 & 3)	COL. 2 MALE	COL. 3 FEMALE	***** MALE *****					***** FEMALE *****				
				BLACK	HISPANIC	AMER. INDIAN	ASIAN	NON MIN.	BLACK	HISPANIC	AMER. INDIAN	ASIAN	NON MIN.
Officials/ Managers													
Professionals													
Technicians													
Sales Workers													
Office & Clerical													
Craftworkers (Skilled)													
Operatives (Semi-skilled)													
Laborers (Unskilled)													
Service Workers													
TOTAL													
Total employment From previous Report (if any)													
Temporary & Part-Time Employees													
The data below shall NOT be included in the figures for the appropriate categories above.													

12. HOW WAS INFORMATION AS TO RACE OR ETHNIC GROUP IN SECTION B OBTAINED? <input type="checkbox"/> 1. Visual Survey <input type="checkbox"/> 2. Employment Record <input type="checkbox"/> 3. Other (Specify)	14. IS THIS THE FIRST Employee Information Report Submitted?  1. YES <input type="checkbox"/> 2. NO <input type="checkbox"/>	15. IF NO, DATE LAST REPORT SUBMITTED  MO.    DAY    YEAR
13. DATES OF PAYROLL PERIOD USED From:    To:		

**SECTION C – SIGNATURE AND IDENTIFICATION**

16. NAME OF PERSON COMPLETING FORM (Print or Type)	SIGNATURE	TITLE	DATE MO.    DAY    YEAR
17. ADDRESS NO. & STREET	CITY	COUNTY    STATE    ZIP CODE	PHONE (AREA CODE, NO., EXTENSION)

WHITE – DIV. OF CONTRACT COMPLIANCE; CANARY – DIV. OF CONTRACT COMPLIANCE DP;  
PINK – PUBLIC AGENCY; GOLD – VENDOR



**State Of New Jersey**  
*Division Of Contract Compliance And  
 Equal Employment Opportunity In Public Contracts*

**MONTHLY PROJECT WORKFORCE REPORT - CONSTRUCTION****READ INSTRUCTIONS ON BACK CAREFULLY BEFORE COMPLETING****THIS FORM. PLEASE TYPE OR PRINT IN BLACK OR BLUE INK.**

1. Name and address of Prime Contractor	2. Contractor ID Number	3. F ID or SS Number	
(NAME)		4. Reporting Period	
(ADDRESS)		5. Public Agency Awarding Contract	Date of Award
(CITY) (STATE) (ZIP CODE)		6. Name and Location of Project County	7. Project ID Number

			CLASSI- FICATION (SEE REVERSE)	11. NUMBER OF EMPLOYEES						12. TOTAL	13. WORK HOURS		14. % OF WORK HRS		15. CUM. WORK HRS			16. CUM. % OF W/H		
8. CONTRACTOR NAME (LIST PRIME CONTRACTOR WITH SUBS FOLLOWING)	9. PERCENT OF WORK COMPLETED	10. TRADE OR CRAFT		A.	B.	C.	D.	E.	F.	NO. OF MIN. EMP.	TOTAL WORK HOURS	A.	B.	A.	B.	TOTAL WORK HOURS	A.	B.	A.	B.
				TOTAL	BLACK	HISPANIC	AMERICAN INDIAN	ASIAN	FEMALES			MIN. W/H	FEMALE W/H	% OF MIN. W/H	% OF FEMALE W/H		MIN. HOURS	FEMALE HOURS	% OF MIN. W/H	% OF FEM. W/H
			J																	
			AP																	
			J																	
			AP																	
			J																	
			AP																	
			J																	
			AP																	
			J																	
			AP																	

17. COMPLETED BY (PRINT OR TYPE)

(NAME)	(SIGNATURE)	(TITLE)
(AREA CODE)	(TELEPHONE NUMBER)	(EXT.) (DATE)

DIVISION OF CONTRACT COMPLIANCE / EEO OFFICE

**MONTHLY PROJECT WORKFORCE REPORT - CONSTRUCTION**

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## **PROPOSAL FORMS**

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## BID DOCUMENT SUBMISSION CHECKLIST

All forms/certifications must be completed in full and initialed by the prospective bidder indicating inclusion of completed form with the bid documents. Failure to include any of the following will be a basis for disqualification of the bid.

**Initial**

Bid Document Submission Checklist ..... \_\_\_\_\_

Bid Proposal Form ..... \_\_\_\_\_

Schedule of Prices ..... \_\_\_\_\_

Consent of Surety ..... \_\_\_\_\_

Acknowledgement of Receipt of Addenda ..... \_\_\_\_\_

Affirmative Action Compliance Notice ..... \_\_\_\_\_

Acknowledgement of Mandatory Equal Employment Opportunity Language and  
Mandatory Americans With Disabilities Act of 1990 ..... \_\_\_\_\_

Stockholder Disclosure Certification ..... \_\_\_\_\_

Business Registration Certificates ..... \_\_\_\_\_

Request for Prevailing Wage Determination ..... \_\_\_\_\_

Public Works Contractor Registration (including named Sub-Contractors)  
(Copy of Public Works Contractor Registration Certificates) ..... \_\_\_\_\_

Non-Collusion Affidavit ..... \_\_\_\_\_

Equipment Certification ..... \_\_\_\_\_

Bidder's Affidavit ..... \_\_\_\_\_

Bid Bond ..... \_\_\_\_\_

Bidder's Safety Acknowledgement ..... \_\_\_\_\_

Bidder's Qualification Form ..... \_\_\_\_\_

Plant and Equipment Questionnaire (4 pages) ..... \_\_\_\_\_

Iran Disclosure Form (P.L. 2012, Chapter 25) ..... \_\_\_\_\_

Naming of Subcontractors Form ..... \_\_\_\_\_

## BID PROPOSAL FORM

TO: Borough of Oakland

FOR: SANITARY SEWER IMPROVEMENTS OAKWOOD KNOLLS, CHAPEL HILL AND  
SKYVIEW/HIBROOK TREATMENT PLANTS

The undersigned hereby declares that the only person or persons interested in the Proposal as principal or principals, is or are named below, and that no other person than herein below named has any interest in the Proposal. This Proposal is made without any connection with any other person or persons making a Proposal for the same purpose. The Proposal is in all respects fair and without collusion or fraud and that no officer or employee of the Owner is, shall be, or will become directly or indirectly, interested as a contracting party, partner, stockholder, surety or otherwise in the performance of the contract, or in the supplies, work, or business to which it relates.

It is further declared that the site of the work and the Contract Documents have been examined and it is also agreed that the work will be carried out and completed, if this Proposal is accepted, as specified and the undersigned will provide all the Superintendents, Labor, Material, Tools and Equipment, and all else necessary therefore, and incidental thereto for the items in the Proposal, complete in place, at the price per unit of measure for each scheduled item of work stated in the Schedule of Prices following.

It is understood that the quantities stated in this Schedule of Prices for the various items are estimates only and the Owner reserves the right to increase or decrease the items specified in the Contract Documents. It is further understood that the total price stated by the undersigned in the Schedule of Prices is based on the estimated quantities and it will control in the awarding of the Contract, and that payments will be made for the actual measurements of the authorized work as constructed in accordance with the unit price stated hereafter in the Schedule of Prices.

Accompanying this Proposal is a Consent of Surety and a certified check, cashier's check, or bid bond for a minimum of ten (10%) percent of the amount bid but not greater than \$20,000 payable to the Owner, which is agreed by the undersigned to be forfeited as liquidated damages, and not as a penalty, if the Contract is awarded to the undersigned, and the undersigned shall fail to execute the Contract for the work within the stipulated time. Otherwise, the bid security shall be returned to the undersigned as specified in the Contract Documents.

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Federal I.D.# or Social Security #

\_\_\_\_\_  
Address

\_\_\_\_\_  
Signature of Authorized Agent

\_\_\_\_\_  
Type of Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Telephone Number

\_\_\_\_\_  
Date

\_\_\_\_\_  
Fax Number

\_\_\_\_\_  
E-mail Address

**SCHEDULE OF PRICES  
SANITARY SEWER IMPROVEMENTS  
OAKWOOD KNOLLS, CHAPEL HILL AND SKYVIEW/HIBROOK TREATMENT PLANTS  
BOROUGH OF OAKLAND  
BERGEN COUNTY, NEW JERSEY**

ITEM NO.	ESTIMATED QUANTITY	DESCRIPTION AND UNIT PRICES	UNIT PRICE	COMPUTED TOTALS
1.	L.S.	Mobilization		
		<u>Dollars</u>		
		<u>Cents</u>	Lump Sum	\$_____
2.	500 C.Y.	Test Holes		
		<u>Dollars</u>		
		<u>Cents</u>	\$_____	\$_____
3.	3,500 C.Y.	Rock Excavation		
		<u>Dollars</u>		
		<u>Cents</u>	\$_____	\$_____
4.	10,000 C.Y.	Select Fill		
		<u>Dollars</u>		
		<u>Cents</u>	\$_____	\$_____
5.	3,555 L.F.	8 Inch PVC Sewer Pipe		
		<u>Dollars</u>		
		<u>Cents</u>	\$_____	\$_____
6.	2,928 L.F.	2 Inch PVC Force Main		
		<u>Dollars</u>		
		<u>Cents</u>	\$_____	\$_____
7.	16,748 L.F.	3 Inch PVC Force Main		
		<u>Dollars</u>		
		<u>Cents</u>	\$_____	\$_____
8.	L.S.	Stream Crossing Station 29+95 to Station 30+35		
		<u>Dollars</u>		
		<u>Cents</u>	Lump Sum	\$_____
9A.	L.S.	Jacking Station 15+05 to Station 15+85		
		<u>Dollars</u>		
		<u>Cents</u>	Lump Sum	\$_____

9B.	L.S.	Jacking Station 83+96 to Station 84+16 _____ Dollars _____ Cents	Lump Sum	\$_____
9C.	L.S.	Jacking Station 111+25 to Station 111+55 _____ Dollars _____ Cents	Lump Sum	\$_____
10.	19 Unit	Sanitary Manhole _____ Dollars _____ Cents	\$_____	\$_____
11.	4 Unit	Sanitary Drop Manhole _____ Dollars _____ Cents	\$_____	\$_____
12.	1 Unit	Sanitary Doghouse Manhole _____ Dollars _____ Cents	\$_____	\$_____
13.	5 Unit	Modify Existing Manhole _____ Dollars _____ Cents	\$_____	\$_____
14.	4 Unit	Air Release Manhole _____ Dollars _____ Cents	\$_____	\$_____
15.	1 Unit	Air Release Chamber _____ Dollars _____ Cents	\$_____	\$_____
16.	6 Unit	4 Inch Blow Off Assembly _____ Dollars _____ Cents	\$_____	\$_____
17.	2 Unit	Meter Chamber _____ Dollars _____ Cents	\$_____	\$_____
18A.	L.S.	Chapel Hill Packaged Pumping Station _____ Dollars _____ Cents	Lump Sum	\$_____

18B.	L.S.	Oakwood Knolls Packaged Pumping Station			
			<u>Dollars</u>		
			<u>Cents</u>	Lump Sum	\$_____
18C.	L.S.	Lakeside Boulevard Packaged Pumping Station			
			<u>Dollars</u>		
			<u>Cents</u>	Lump Sum	\$_____
19A.	L.S.	Chapel Hill Natural Gas Generator			
			<u>Dollars</u>		
			<u>Cents</u>	Lump Sum	\$_____
19B.	L.S.	Oakwood Knolls Natural Gas Generator			
			<u>Dollars</u>		
			<u>Cents</u>	Lump Sum	\$_____
19C.	L.S.	Lakeside Boulevard Natural Gas Generator			
			<u>Dollars</u>		
			<u>Cents</u>	Lump Sum	\$_____
20A.	L.S.	Decommissioning of Oakwood Knolls WWTP			
			<u>Dollars</u>		
			<u>Cents</u>	Lump Sum	\$_____
20B.	L.S.	Decommissioning of Skyview/Hibrook WWTP			
			<u>Dollars</u>		
			<u>Cents</u>	Lump Sum	\$_____
20C.	L.S.	Decommissioning of Chapel Hill WWTP			
			<u>Dollars</u>		
			<u>Cents</u>	Lump Sum	\$_____
20D.	L.S.	Decommissioning of Hibrook Pumping Station			
			<u>Dollars</u>		
			<u>Cents</u>	Lump Sum	\$_____
20E.	L.S.	Decommissioning of Skyview Pumping Station			
			<u>Dollars</u>		
			<u>Cents</u>	Lump Sum	\$_____

21.	L.S.	Maintenance and Protection of Traffic _____ Dollars _____ Cents	Lump Sum	\$ _____
22.	Allowance	Maintenance and Protection of Traffic _____ Dollars _____ Cents	Allowance	\$ <u>90,000.00</u>
23.	Allowance	Allowance for Unforeseen Contingencies _____ Dollars _____ Cents	Allowance	\$ <u>50,000.00</u>
24.	Allowance	SCADA Allowance _____ Dollars _____ Cents	Allowance	\$ <u>30,000.00</u>

TOTAL ITEMS 1 - 24 IN WORDS AND FIGURES

\_\_\_\_\_ Dollars      \$ \_\_\_\_\_



## CONSENT OF SURETY

A performance bond will be required from the successful contractor on this project, and consequently, all bidders shall submit, with their bid, a consent of surety in substantially the following form:

To: Borough of Oakland  
(Owner)

Re: \_\_\_\_\_  
(Contractor)

SANITARY SEWER IMPROVEMENTS OAKWOOD KNOLLS, CHAPEL HILL AND  
SKYVIEW/HIBROOK TREATMENT PLANTS  
(Project Description)

This is to certify that the \_\_\_\_\_  
(Surety Company)

will provide to Borough of Oakland a performance  
bond in (Owner)  
the full amount of awarded contract, which shall meet any and all requirements under  
N.J.S.A. 2A:44-143 through N.J.S.A. 2A:44-147, in the event that said contractor is awarded  
a contract for the above project.

\_\_\_\_\_  
(CONTRACTOR)

\_\_\_\_\_  
(Authorized Agent of Surety Company)

Date: \_\_\_\_\_

**CONSENT OF SURETY MUST BE SIGNED AND SEALED BY AN AUTHORIZED AGENT  
OR REPRESENTATIVE OF A SURETY COMPANY AND NOT BY THE INDIVIDUAL OR  
COMPANY REPRESENTATIVE SUBMITTING THE BID.**

## ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA

### BOROUGH OF OAKLAND

#### SANITARY SEWER IMPROVEMENTS

#### OAKWOOD KNOLLS, CHAPEL HILL AND SKYVIEW/HIBROOK TREATMENT PLANTS

Pursuant to N.J.S.A. 40A:11-23.1a., the undersigned bidder hereby acknowledges receipt of the following notices, revisions, or addenda to the bid advertisement, specifications or bid documents. By indicating date of receipt, bidder acknowledges the submitted bid takes into account the provisions of the notice, revision or addendum. Note that the local unit's record of notice to bidders shall take precedence and that failure to include provisions of changes in a bid proposal may be subject for rejection of the bid. If no addendum was received, please initial in the "NONE RECEIVED" space below.

Local Unit Reference Number or Title of Addendum/Revision	How Received (mail, fax, pick- up, etc.)	Date Received

**Acknowledge by bidder:**

**NONE RECEIVED:** \_\_\_\_\_

Name of Bidder: \_\_\_\_\_

By Authorized Representative: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name and Title: \_\_\_\_\_

Date: \_\_\_\_\_

**AFFIRMATIVE ACTION COMPLIANCE NOTICE**  
**N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 et seq.**  
**GOODS AND SERVICES CONTRACTS**  
**(INCLUDING PROFESSIONAL SERVICES)**

This form is a summary of the successful Bidder's requirement to comply with the requirements of N.J.S.A. 10:5-31 and N.J.A.C. 17:27-1 et seq.

The successful Bidder shall submit to the public agency, after notification of award but prior to execution of this contract, one of the following three documents as forms of evidence:

(a) A photocopy of a valid letter that the bidder is operating under an existing Federally approved or sanctioned affirmative action program (good for one year from the date of the letter);

OR

(b) A photocopy of a Certificate of Employee Information Report approval, issued in accordance with N.J.A.C. 17:27-4;

OR

(c) A photocopy of an Employee Information Report (Form AA302) provided by the Division and distributed to the public agency to be completed by the bidder in accordance with N.J.A.C. 17:27-4.

The successful bidder may obtain the Affirmative Action Employee Information Report (AA302) from the contracting unit during normal business hours.

The successful bidder(s) must submit the copies of the AA302 Report to the Division of Contract Compliance and Equal Employment Opportunity in Public Contracts (Division). The Public Agency copy is submitted to the public agency, and the bidder copy is retained by the bidder.

The undersigned bidder certifies that he/she is aware of the commitment to comply with the requirements of N.J.S.A. 10:5-31 and N.J.A.C. 17:27.1 et seq. and agrees to furnish the required forms of evidence.

The undersigned bidder further understands that his/her bid shall be rejected as non-responsive if said bidder fails to comply with the requirements of N.J.S.A. 10:5-31 and N.J.A.C. 17:27-1 et seq.

The undersigned agrees to comply with all laws relating to Affirmative Action, whether state, local or federal, for the entire period of the contract.

COMPANY: \_\_\_\_\_ SIGNATURE: \_\_\_\_\_  
PRINT NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_  
DATE: \_\_\_\_\_

**ACKNOWLEDGEMENT OF MANDATORY EQUAL EMPLOYMENT OPPORTUNITY  
LANGUAGE AND MANDATORY AMERICANS WITH DISABILITIES ACT OF 1990**

I Hereby Certify That \_\_\_\_\_  
Name of Bidder

Has Submitted a Bid For \_\_\_\_\_  
Project Name

On This \_\_\_\_\_ Day of \_\_\_\_\_, 20 \_\_\_\_\_, And

In Compliance with Public Law 1975, Chapter 127 (NJAC 17:27), As

Described in Exhibit A and B within these bid specifications.

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_  
Title

Subscribed and Sworn Before Me

On \_\_\_\_\_, 20 \_\_\_\_\_.

\_\_\_\_\_  
Notary Public

(Please note: The Bidder must fill in and execute this page and submit it as part of the sealed bid.)

## **Exhibit A**

### ***(Known as Exhibit B in Goods and Services Bid Specifications: A Guide for New Jersey Local Public Agencies – Section C)***

#### **MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE**

**N.J.S.A. 10:5-31 ET SEQ., N.J.A.C. 17:27**

#### **CONSTRUCTION CONTRACTS**

During the performance of this contract, the Contractor agrees as follows:

The Contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the Contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, up-grading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The Contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The Contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the Contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The Contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to **N.J.S.A. 10:5-31 et seq.**, as amended and supplemented from time to time and the Americans with Disabilities Act.

When hiring or scheduling workers in each construction trade, the Contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by **N.J.S.A. 17:27-7.2**; provided, however, that the Division may, in its discretion, exempt a Contractor or subcontractor from compliance with the good faith procedures prescribed by the following

provisions, A, B and C, as long as the Division is satisfied that the Contractor or subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Division, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with **N.J.S.A. 17:27-7.2**. The Contractor or subcontractor agrees that a good faith effort shall include compliance with the following procedures:

- (A) If the Contractor or subcontractor has a referral agreement or arrangement with a union for a construction trade, the Contractor or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the Contractor or subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to **N.J.S.A. 10:531** et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the Contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the Contractor or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the Contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the Contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the Contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.
- (B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the Contractor does not have a referral agreement or arrangement with a union for a construction trade, the Contractor or subcontractor agrees to take the following actions:
  - (1) To notify the public agency compliance officer, the Division, and minority and women referral organizations listed by the Division pursuant to **N.J.A.C. 17:27-5.3**, of its workforce needs, and request referral of minority and women workers;
  - (2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;
  - (3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the Contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade;

(4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the Contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;

(5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and non-discrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;

(6) To adhere to the following procedure when minority and women workers apply or are referred to the Contractor or subcontractor:

(i) The contractor or subcontractor shall interview the referred minority or women worker.

(ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the Contractor or subcontractor shall in good faith determine the qualifications of such individuals. The Contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a Contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Division. If necessary, the Contractor or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.

(iii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Division, the Contractor or subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.

(iv) If, for any reason, said Contractor or subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the Contractor or subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Division.

(7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Division and submitted promptly to the Division upon request.

- (C) The Contractor or subcontractor agrees that nothing contained in (B) above shall preclude the Contractor or subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the Contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the Contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the Contractor or subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the Contractor shall submit to the public agency compliance officer and the Division an initial project workforce report (Form AA 201) electronically provided to the public agency by the Division, through its website, for distribution to and completion by the Contractor, in accordance with **N.J.A.C. 17:27-7**. The Contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Division and to the public agency compliance officer.

The Contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-the-job programs for outreach and training of minorities and women.

- (D) The Contractor and its subcontractors shall furnish such reports or other documents to the Division of Public Contracts Equal Employment Opportunity Compliance as may be requested by the Division from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Division of Public Contracts Equal Employment Opportunity Compliance for conducting a compliance investigation pursuant to **Subchapter 10 of the Administrative Code (NJAC 17:27)**.



## **Exhibit B**

### ***(Known as Appendix A in Goods and Services Bid Specifications: A Guide for New Jersey Local Public Agencies – Section C)***

#### **AMERICANS WITH DISABILITIES ACT OF 1990 Equal Opportunity for Individuals with Disability**

The contractor and the Borough of Oakland, (hereafter "owner") do hereby agree that the provisions of Title 11 of the Americans With Disabilities Act of 1990 (the "Act") (42 U.S.C. S121 01 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs, and activities provided or made available by public entities, and the rules and regulations promulgated pursuant there unto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the owner pursuant to this contract, the contractor agrees that the performance shall be in strict compliance with the Act. In the event that the contractor, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the contractor shall defend the owner in any action or administrative proceeding commenced pursuant to this Act. The contractor shall indemnify, protect, and save harmless the owner, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages, of whatever kind or nature arising out of or claimed to arise out of the alleged violation. The contractor shall, at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the owner's grievance procedure, the contractor agrees to abide by any decision of the owner which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the owner, or if the owner incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the contractor shall satisfy and discharge the same at its own expense.

The owner shall, as soon as practicable after a claim has been made against it, give written notice thereof to the contractor along with full and complete particulars of the claim. If any action or administrative proceeding is brought against the owner or any of its agents, servants, and employees, the *owner shall* expeditiously forward or have forwarded to the contractor every demand, complaint, notice, summons, pleading, or other process received by the owner or its representatives.

It is expressly agreed and understood that any approval by the owner of the services provided by the contractor pursuant to this contract will not relieve the contractor of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the owner pursuant to this paragraph.

It is further agreed and understood that the owner assumes no obligation to indemnify or save harmless the contractor, its agents, servants, employees and subcontractors for any claim which may arise out of their performance of this Agreement. Furthermore, the contractor expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the contractor's obligations assumed in this Agreement, nor shall they be construed to relieve the contractor from any liability, nor preclude the owner from taking any other actions available to it under any other provisions of the Agreement or otherwise at law.

## STOCKHOLDER DISCLOSURE CERTIFICATION

NEW JERSEY PUBLIC LAW 1977, CHAPTER 33 REQUIRES EACH CORPORATION OR PARTNERSHIP SUBMITTING A BID TO ANY GOVERNMENTAL AGENCY TO ACCOMPANY THAT BID WITH A STATEMENT OF OWNERSHIP LISTING THE NAME AND ADDRESS AND PERCENTAGE OWNERSHIP OF EACH INDIVIDUAL OWNING TEN PERCENT (10%) OR MORE OF THE CORPORATION OR PARTNERSHIP. THIS FORM OR AN APPROPRIATE LISTING ON THE BIDDERS LETTERHEAD CONTAINING SIMILAR INFORMATION, MUST BE INCLUDED IN THE BIDDERS PROPOSAL WHEN THE BID IS ORIGINALLY SUBMITTED.

### OWNERSHIP STATEMENT – PER PL 1977 CHAPTER 33

\_\_\_\_\_  
(NAME OF CORPORATION OR PARTNERSHIP) PRINT

\_\_\_\_\_  
(ADDRESS OF RECORD) PRINT

<u>NAME</u>	<u>ADDRESS</u>	<u>PERCENT OWNED</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

IF ONE OR MORE SUCH STOCKHOLDER OR PARTNER IS ITSELF A CORPORATION OR IS A PARTNERSHIP, THE STOCKHOLDERS HOLDING TEN PERCENT (10%) OR MORE OF THAT CORPORATION'S STOCK OR THE INDIVIDUAL PARTNERS OWNING TEN PERCENT (10%) OR GREATER INTEREST IN THAT PARTNERSHIP MUST BE LISTED ON A SUPPLEMENTAL SHEET ON THE BIDDER'S LETTERHEAD.

THE FULL NAMES AND RESIDENCES OF ALL PERSONS INTERESTED IN THIS BID AS PRINCIPALS ARE AS FOLLOWS:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CONTRACTOR'S LEGAL STATUS: \_\_\_\_\_

(CORPORATION LIMITED LIABILITY CORPORATION, SUBCHAPTERS COOPERATIVE, PARTNERSHIP, LIMITED LIABILITY PARTNERSHIP, JOINT VENTURE, OR INDIVIDUAL OPERATING UNDER A TRADENAME.)

I CERTIFY THAT THE FOREGOING INFORMATION IS CORRECT.

SUBSCRIBED AND SWORN TO  
BEFORE ME THIS \_\_\_\_\_ DAY  
OF \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
NOTARY PUBLIC OF  
MY COMMISSION EXPIRES \_\_\_\_\_, 20\_\_\_\_

## **BUSINESS REGISTRATION CERTIFICATE**

A contractor shall provide proof of its own business registration and proofs of business registration for any named subcontractors. The proof shall be in the form of a copy of the organization's "Business Registration Certificate" issued by the Division of Revenue. The proof of business registration shall be provided prior to the time the bid or proposal is awarded or authorized by the contracting agency.

The contractor shall provide written notice to its subcontractors and suppliers of the responsibility to submit proof of business registration to the contractor. The requirement of proof of business registration extends down through all levels (tiers) of the project.

Before final payment on the contract is made by the contracting agency, the contractor shall submit an accurate list and the proof of business registration of each subcontractor or supplier used in the fulfillment of the contract, or shall attest that no subcontractors were used.

For the term of the contract, the contractor and each of its affiliates and a subcontractor and each of its affiliates [N.J.S.A. 52:32-44(g)(3)] shall collect and remit to the Director, New Jersey Division of Taxation, the use tax due pursuant to the Sales and Use Tax Act on all sales of tangible personal property delivered into this State, regardless of whether the tangible personal property is intended for a contract with a contracting agency.

A business organization that fails to provide a copy of a business registration as required pursuant to Section 1 of P.L. 2001, c.134 (C.52:32-44 et al.) or Subsection e. or f. of Section 92 of P.L. 1977, c.110 (C.5:12-92), or that provides false business registration information under the requirements of either of those sections, shall be liable for a penalty of \$25.00 for each day of violation, not to exceed \$50,000 for each business registration copy not properly provided under a contract with a contracting agency.

## REQUEST FOR PREVAILING WAGE DETERMINATION

I, the undersigned, being the duly authorized and acting legal representative of the Bidder, do hereby certify as follows:

There shall be paid each laborer or mechanic of the successful Bidder or subcontractor engaged in work on the project under this bid in the trade or occupation required in these specifications, not less than the hourly wage rate established by the State Commissioner of Labor & Industry under N.J.S. 34:15-25 regulation pertaining to prevailing wage rates.

The Owner will not consider any claims for additional compensation made by the Bidder because of payment by the Bidder of any wage rate in excess of the applicable rate contained in this contract. All disputes in regard to the payment of wages in excess of minimum wages shall be adjusted by the Bidder.

\_\_\_\_\_  
WITNESS OR ATTESTED BY

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
DATE

\_\_\_\_\_  
NAME OF ORGANIZATION

\_\_\_\_\_  
PRINT NAME AND TITLE OF  
PERSON SIGNING

(Must be signed and submitted with Bid Proposal)

## **PUBLIC WORKS CONTRACTOR REGISTRATION**

The Public Works Contractor Registration Act (PWCRA) requires that all contractors, including named subcontractors, to register with the Department of Labor prior to submitting price proposals or engaging on certain public works contracts that exceed the prevailing wage threshold. The prevailing wage threshold is \$15,444 for municipalities and \$2,000 for all non-municipal entities, such as boards of education, authorities, fire districts, counties, etc. The municipality reserves the right to maintain the application of prevailing wage rates for projects under the threshold.

Under the law a *contractor* is a “person, partnership, association, joint stock company, trust, corporation, or other legal business entity or successor thereof who enters into a contract” which is subject to the provisions of the New Jersey Prevailing Wage Act [N.J.S.A. 34:11-56.25 et seq.]. It applies to contractors based in New Jersey or in another state.

The PWCRA defines “public works projects” as contracts for “public works” as defined in the Prevailing Wage Act [N.J.S.A. 34:11-56.26(5)]. The term means:

- “Construction, reconstruction, demolition, alteration, or repair work, or maintenance work, including painting and decorating, done under contract and paid for in whole or in part out of the funds of a public body, except work performed under a rehabilitation program.
- “Public work” shall also mean construction, reconstruction, demolition, alteration, or repair work, done on any property or premises, whether or not the work is paid for from public funds,...
- “Maintenance work” means the repair of existing facilities when the size, type or extent of such facilities is not hereby changed or increased. While “maintenance” includes painting and decorating and is covered under the law, it does not include work such as routine landscape maintenance or janitorial services.

## NON - COLLUSION AFFIDAVIT

State of New Jersey:

County of \_\_\_\_\_

ss:

I, \_\_\_\_\_ residing in

(name of affiant)

\_\_\_\_\_ in the County of \_\_\_\_\_ and the State of \_\_\_\_\_ of  
(name of municipality)

full age, being duly sworn according to the law on my oath depose and say that:

I am \_\_\_\_\_ of the firm of \_\_\_\_\_  
(title or position) (name of firm)

the bidder making this Proposal for the bid entitled SANITARY SEWER IMPROVEMENTS  
OAKWOOD KNOLLS, CHAPEL HILL AND SKYVIEW/HIBROOK TREATMENT PLANTS, and  
that I executed the

(title of bid proposal)

said proposal with full authority to do so that said bidder has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named project; and that all statements contained in said proposal and in this affidavit are true and correct, and made with full knowledge that the Borough of Oakland relies upon the truth of the statements contained in said

(name of contracting unit)

Proposal and in the statements contained in this affidavit in awarding the contract for said project.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee except bona fide employees or bond fide established commercial or selling agencies maintained by \_\_\_\_\_.

Subscribed and sworn to

\_\_\_\_\_  
Signature of Affiant

before me this day

\_\_\_\_\_, 20\_\_\_\_

\_\_\_\_\_  
(Type or print name of affiant under signature)

\_\_\_\_\_  
Notary Public of

My commission expires \_\_\_\_\_

(Seal)

## **EQUIPMENT CERTIFICATION**

The undersigned Bidder hereby certifies as follows:

The bidder owns or controls all the necessary equipment required to accomplish the work described in the specifications.

Name of Bidder: \_\_\_\_\_

By: \_\_\_\_\_  
(Signature)

Name of above: \_\_\_\_\_  
(Print)

Title: \_\_\_\_\_

Date: \_\_\_\_\_

## BIDDER'S AFFIDAVIT

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

\_\_\_\_\_ being duly sworn, deposes and says that he  
resides at \_\_\_\_\_

and that he is the \_\_\_\_\_  
(Give Title)  
of \_\_\_\_\_  
(Name of Organization)

who signed the above Proposal of Bid, that he was duly authorized to sign, that the Bid is the true offer of the Bidder, that the seal attached is the seal of the Bidder and that all declarations and statements contained in the Bid are true to the best of his knowledge and belief.

He further deposes that he has submitted herewith a list of names and addresses of all stockholders and/or partners owning a 10 percent or greater interest in compliance with P.L. 1977, Chapter 33, effective March 8, 1977.

\_\_\_\_\_  
Affiant

Subscribed and Sworn before me  
this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
(Notary Public) (Seal)

\_\_\_\_\_  
(Commission expiration date)



## BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,

\_\_\_\_\_ as Principal, and \_\_\_\_\_ as Surety, are hereby held and firmly bound unto the Borough of Oakland in the penal sum of not less than ten percent of the bid amount to a maximum of \$20,000.00 for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_

The condition of the above obligation is such that whereas the Principal has submitted to the Borough of \_\_\_\_\_ a certain Bid, attached hereto, and made a part of hereof, to enter into a contract in writing for \_\_\_\_\_

---

NOW THEREFORE,

- A) If said Bid shall be rejected, or, in the alternate,
- B) if said Bid shall be accepted and the Principal shall execute and deliver a contract in the form of contract to be prepared by the Borough Attorney (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said Contract, and shall in all other respects perform the agreement created by the acceptance of the said Bid,

Then, this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood that all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Principal may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and Surety have set their hands and seals, and such of them as are corporations having their corporate seals to be hereto affixed and these presents to be signed by their proper corporate officers, the day and year first set forth above.

Principal: \_\_\_\_\_ (L.S.)

Surety: \_\_\_\_\_

By: \_\_\_\_\_

### **BIDDER'S SAFETY ACKNOWLEDGMENT**

The undersigned hereby states that as a principal of the firm submitting this proposal, he or she is fully aware that all safety regulations of the Occupational Safety and Health Administration (OSHA) and the requirements of the State of New Jersey Department of Labor and Industry shall be adhered to on this project and that he or she shall instruct his or her personnel to follow these regulations. These regulations include, but not limited to, the regulations concerning Trench Excavation, Competent Persons and Confined Space Regulations.

If it is observed by an official representative of the municipality that these safety regulations are not being followed and there exists a potential serious safety deficiency that could result in accident, I acknowledge that this municipal representative may stop the project until the safety deficiency is corrected without any claim for additional compensation by this firm.

\_\_\_\_\_  
WITNESS OR ATTESTED BY

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
DATE

\_\_\_\_\_  
NAME OF ORGANIZATION

\_\_\_\_\_  
PRINT NAME AND TITLE OF  
PERSON SIGNING

(Must be signed and submitted with Bid Proposal)

## **BIDDER'S QUALIFICATION FORM**

(This form is part of the Proposal)

On the form provided, indicate at least five (5) jobs performed within the last three (3) years of a similar nature and contract amount:

1. Name of Job: \_\_\_\_\_  
Major Construction Items: \_\_\_\_\_  
\_\_\_\_\_

Engineer Name, Address, & Telephone Number: \_\_\_\_\_  
\_\_\_\_\_

2. Name of Job: \_\_\_\_\_  
Major Construction Items: \_\_\_\_\_  
\_\_\_\_\_

Engineer Name, Address, & Telephone Number: \_\_\_\_\_  
\_\_\_\_\_

3. Name of Job: \_\_\_\_\_  
Major Construction Items: \_\_\_\_\_  
\_\_\_\_\_

Engineer Name, Address, & Telephone Number: \_\_\_\_\_  
\_\_\_\_\_

4. Name of Job: \_\_\_\_\_  
Major Construction Items: \_\_\_\_\_  
\_\_\_\_\_

Engineer Name, Address, & Telephone Number: \_\_\_\_\_  
\_\_\_\_\_

5. Name of Job: \_\_\_\_\_  
Major Construction Items: \_\_\_\_\_  
\_\_\_\_\_

Engineer Name, Address, & Telephone Number: \_\_\_\_\_  
\_\_\_\_\_

## PLANT AND EQUIPMENT QUESTIONNAIRE

Submitted to \_\_\_\_\_  
By \_\_\_\_\_  
Principal Office \_\_\_\_\_

A Corporation  
A Co-partnership  
An Individual

The signatory of this questionnaire guarantees the truth and accuracy of all statements and of all answers to interrogatories hereinafter made.

1. In what manner have you inspected the proposed work? Explain in detail.

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2. Explain your plan or layout for performing the proposed work.

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3. The work, if awarded to you, will have the personal supervision of whom?

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4. Do you intend to do the proposed work with your own forces? \_\_\_\_\_

**STATUS OF CONTRACTS ON HAND**

5. Give full information about all of your contracts, whether private or government contracts, whether prime or sub-contracts; whether in progress or awarded but not yet begun; or where you are low bidder pending formal award of contract.

Owner	Location	Description	Adjusted Contract Amount	Amount Completed and Billed	Additional Earned Since Last Estimate	Balance To Be Completed	Estimated Date of Completion
<b>Totals</b>							

6. What equipment do you own that is available for and intended to be used on the proposed project?

**TABLE 1**

Quantity	Item	Description, Size Capacity, Etc.	Condition	Years of Service	Present Location

7. What equipment do you intend to purchase or lease for use on the proposed work, should the contract be awarded to you?

**TABLE 2**

Quantity	Item	Description, Size Capacity, Etc.	Approximate Purchase	Cost Lease

8. Have you made contracts or received firm offers for all materials within prices used in preparing your proposal? Do not give name of dealers or manufacturers.

\_\_\_\_\_Yes

\_\_\_\_\_No

The Undersigned hereby declare(s) that the items of equipment in Table 1 are owned by \_\_\_\_\_, and are available for and intended to be used on the Project, if \_\_\_\_\_ is awarded the Contract, and that (he) (she) (they) propose(s) to purchase or lease for the Project the additional items of equipment stated in Table 2.

If awarded the Contract, the Undersigned will furnish certificates from the owners of leased equipment to the effect that, in case of default of contract, as set forth in Article 25 the Governing Body has the right to take over the leased equipment for use in completing the work.

Dated at \_\_\_\_\_ this \_\_\_\_\_  
day of \_\_\_\_\_, 20 \_\_\_\_\_.

\_\_\_\_\_  
Name of Organization

By \_\_\_\_\_

\_\_\_\_\_  
Title or Person Signing

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

\_\_\_\_\_, Being duly sworn, deposes and says that he  
is \_\_\_\_\_ of the above \_\_\_\_\_

Name of Organization

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Sworn to before me this \_\_\_\_\_  
day of \_\_\_\_\_, 20 \_\_\_\_\_

My Commission Expires \_\_\_\_\_

\_\_\_\_\_  
Notary Public

**STATE OF NEW JERSEY – DIVISION OF PURCHASE AND PROPERTY**  
**Borough of Oakland**  
**DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN**

**Bid Name:** \_\_\_\_\_

**Bid Due Date:** \_\_\_\_\_

**Bidder:** \_\_\_\_\_

**PART 1: CERTIFICATION**  
**BIDDERS MUST COMPLETE PART 1 BY CHECKING EITHER BOX.**

Pursuant to Public Law 2012, c. 25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete the certification below to attest, under penalty of perjury, that NEITHER the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of the Treasury Chapter 25 list as a person or entity engaging in investment activities in Iran. The Chapter 25 list is found on the Division's website at <http://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf>. Bidders **must** review this list prior to completing the below certification. If the New Jersey Director of the Division of Purchase and Property finds a person or entity to be in violation of law, he/she shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.

**PLEASE CHECK THE APPROPRIATE BOX:**

- ☐ **I certify, pursuant to Public Law 2012, c. 25, that neither the bidder listed above nor any of the bidder's parents, subsidiaries, or affiliates is listed on the N.J. Department of the Treasury's list of entities determined to be engaged in prohibited activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List"). I further certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. I will skip Part 2 and sign and complete the Certification below: OR**
- ☐ **I am unable to certify as above because the bidder and/or one of more of its parents, subsidiaries, or affiliates is listed on the Department's Chapter 25 list. I will provide a detailed, accurate and precise description of the activities in Part 2 below and sign and complete the Certification below. Failure to provide such will result in the proposal being rendered as non-responsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.**

**PART 2: PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN**

You must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran outlined above by completing the boxes below.

**PLEASE PROVIDE THOROUGH ANSWERS TO EACH QUESTION. IF YOU NEED ADDITIONAL ROOM, ADD ADDITIONAL PAGES.**

Name _____	Relationship to Bidder/Offeror _____
Description of Activities _____	
Duration of Engagement _____	Anticipated Cessation Date _____
Bidder/Offeror Contact Name _____	

Certification: I, being duly sworn upon my oath, hereby represent and state that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I attest that I am authorized to execute this certification on behalf of the above-referenced person or entity. I acknowledge that the State of New Jersey and the Borough of Oakland are relying on the information contained herein and thereby acknowledge that I am under a continuing obligation from the date of this certification through the completion of any contracts with the State of New Jersey and the Borough of Oakland to notify the State of New Jersey and the Borough of Oakland in writing of any changes to the answers of information contained herein. I acknowledge that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I recognize that I am subject to criminal prosecution under the law and that it will also constitute a material breach of my agreement(s) with the State of New Jersey and/or the Borough of Oakland and that the State and/or the Borough of Oakland at its option may declare any contract(s) resulting from this certification void and unenforceable.

**Full Name (Print):** \_\_\_\_\_ **Signature:** \_\_\_\_\_

**Title:** \_\_\_\_\_ **Date:** \_\_\_\_\_





## State of New Jersey

DEPARTMENT OF THE TREASURY  
DIVISION OF PURCHASE AND PROPERTY  
OFFICE OF THE DIRECTOR

33 WEST STATE STREET

P. O. BOX 039

TRENTON, NEW JERSEY 08625-0039

<https://www.njstart.gov>

Telephone (609) 292-4886 / Facsimile (609) 984-2575

PHILIP D. MURPHY  
*Governor*

ELIZABETH MAHER MUOIO  
*State Treasurer*

SHEILA Y. OLIVER  
*Lt. Governor*

MAURICE A. GRIFFIN  
*Acting Director*

**The following list represents entities determined, based on credible information available to the public, to be engaged in prohibited activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25"):**

1.	Amona
2.	Bank Markazi Iran (Central Bank of Iran)
3.	Bank Mellat
4.	Bank Melli Iran
5.	Bank Saderat PLC
6.	Bank Sepah
7.	Bank Tejarat
8.	Belaz
9.	Belneftekhim (Belorusneft)
10.	China International United Petroleum & Chemicals Co., Ltd. (Unipet)
11.	China National Offshore Oil Corporation (CNOOC)
12.	China National Petroleum Corporation (CNPC)
13.	China National United Oil Corporation (ChinaOil)
14.	China Petroleum & Chemical Corporation (Sinopec)
15.	China Precision Machinery Import-Export Corp. (CPMIEC)
16.	Grimley Smith Associates

17.	Indian Oil Corporation
18.	Kingdream PLC
19.	Naftiran Intertrade Company (NICO)
20.	National Iranian Tanker Company (NITC)
21.	Oil and Natural Gas Corporation (ONGC)
22.	Oil India Limited
23.	Persia International Bank
24.	Petroleos de Venezuela (PDVSA Petróleo, SA)
25.	PetroChina Company, Ltd.
26.	Sameh Afzar Tajak Co. (SATCO)
27.	Shandong Fin Cnc Machine Company, Ltd.
28.	Sinohydro Co., Ltd.
29.	SKS Ventures
30.	Som Petrol AS
31.	Zhuhai Zhenrong Company

**List Date: January 31, 2019**

## NAMING OF SUBCONTRACTORS FORM

ALL CONTRACTORS MUST COMPLETE THE FOLLOWING:

N.J.S.A. 40A:11-16 requires that where all the work and materials required to complete the construction project are to be included in a single overall contract, bidders that propose using subcontractors for any of the four specialized "sub-prime" categories (i.e. Plumbing and gas fitting and all kindred work; Steam and hot water heating, ventilating apparatus, steam power plants and kindred work (HVAC); Electrical work; and Structural steel and ornamental iron work) must submit a certificate with their bids listing each subcontractor named in the bid for that category.

If \_\_\_\_\_ is successfully awarded this  
(Name of Firm)  
project, I, \_\_\_\_\_,  
(Authorized Representative)  
of the City of \_\_\_\_\_, in the County of \_\_\_\_\_ and State  
of \_\_\_\_\_, certify pursuant to N.J.S.A. 40A:11-16 that I shall utilize the  
following subcontractors if this Bid is successfully awarded to my firm.

<u>NAME OF SUBCONTRACTOR</u>	<u>SCOPE OF WORK</u>

(Use additional sheet of paper if more space required)

\_\_\_\_\_  
Signature of Bidder

\_\_\_\_\_  
Name and Title (Print or Type)

SWORN TO AND SUBSCRIBED  
BEFORE ME THIS \_\_\_\_ DAY  
OF \_\_\_\_\_ 20\_\_.

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## **SUPPLEMENTARY TECHNICAL SPECIFICATIONS**

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**Edition 2011**

**SUPPLEMENTARY SPECIFICATIONS  
FOR STATE AID PROJECTS**

**FOR**

**SANITARY SEWER IMPROVEMENTS  
OAKWOOD KNOLLS, CHAPEL HILL AND SKYVIEW/HIBROOK TREATMENT PLANTS**

**IN THE BOROUGH OF OAKLAND**

**COUNTY OF BERGEN**

**AUTHORIZATION OF CONTRACT**

The contract for this project is authorized by the provisions of local public contracts law, NJSA 40A: 11-1 et seq.

**SPECIFICATIONS TO BE USED**

The 2007 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation and as amended herein, shall govern the construction of this project.

**WAGE RATES**

The contractor shall pay the minimum wage rates determined by the New Jersey Department of Labor.

State wage rates may be obtained from the New Jersey Department of Labor (Telephone: 609-292-2259) or by accessing the Department of Labor's web site at [http://lwd.dol.state.nj.us/labor/wagehour/wagehour\\_index.html](http://lwd.dol.state.nj.us/labor/wagehour/wagehour_index.html). The State wage rates in effect at the time of award will be made a part of this Contract, pursuant to Chapter 150, Laws of 1963 (NJSA 34:11-56.25, *et seq.*).

In the event it is found that any employee of the contractor or any subcontractor covered by the contract, has been paid a rate of wages less than the minimum wage required to be paid by the contract, the contracting agency may terminate the contractor's or subcontractor's right to proceed with the work, or such part of the work, as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The contractor and his sureties shall be liable to the contracting agency for any excess costs occasioned thereby.

## **GENERAL**

All awards shall be made subject to the approval of the New Jersey Department of Transportation. No construction shall start before approval of said award by the New Jersey Department of Transportation. Prior to the start of construction the contractor must submit a Material Questionnaire (SA-11) listing all sources of materials. Any materials used on the project from a non-approved New Jersey Department of Transportation source will be considered non-participating. The contractor is also notified that the District Office, Division of Local Aid and Economic Development must be notified of the construction commencement date at least three (3) calendar days prior to the start of construction.

Award of contract and subletting will not be permitted to, materials will not be permitted from, and use of equipment will not be permitted that is owned and/or operated by, firms and individuals included in the report of suspensions, debarments and disqualifications of firms and individuals as maintained by the Department of the Treasury, General Services Administration, CN-039, Trenton NJ 08625 (609-292-5400).

Payment for a pay item in the proposal includes all the compensation that will be made for the work of that item as described in the contract documents unless the "Measurement and Payment" section provides that certain work essential to that item will be paid for under another pay item.

Whenever any section, subsection, subpart or subheading is amended by such terms as changed to, deleted or added it is construed to mean that it amends that section, subsection, subpart or subheading of the 2007 Standard Specifications unless otherwise noted.

Whenever reference to page number is made, it is construed to refer to the 2007 Standard Specifications unless otherwise noted.

Henceforth in this supplementary specification whenever reference to the State, Department, ME, RE or Inspector is made, it is construed to mean the particular municipality or county executing this contract.

Whenever reference to Title 27 is made, it is construed to mean Title 40.

PART ONE – GENERAL

1.1 LOCATION OF WORK

The location of this work is in the Borough of Oakland, Bergen County, New Jersey.

1.2 WORK INCLUDED

- 1.2.1 General: Under this Contract, the Contractor shall, furnish, install, test and place into satisfactory operating condition all general construction work items required to complete the design and intent of the Contract Drawings and Specifications for the unit price and lump sum bid for this Contract.

In general, the principal items of work under this Contract include, but are not necessarily limited to, the following:

- (1) Site preparation, within the boundaries shown on the Contract Drawings as specified herein.
- (2) Decommissioning, demolition, removal or abandonment of three (3) existing treatment plants, two (2) existing pumping stations, and appurtenances as indicated on the Contract Drawings and specified within. All valves, equipment, pumps and fittings to be returned to the Borough.
- (3) Installation of three (3) new packaged Pumping Stations, as indicated on the Contract Drawings including but not limited to submersible pumps, valves, piping, concrete pads, controls, natural gas generators, automatic transfer switches (ATS) and electrical work.
- (4) Installation of approximately:
  - 3,555 L.F. of 8-inch PVC Sewer Pipe
  - 2,930 L.F. of 2-inch PVC Force Main
  - 16,785 L.F. of 3-inch PVC Force Mainwhich shall include excavation, backfilling, compacting, jacking, surface restoration, pipe fittings, casing pipes and any other related appurtenances as specified herein or as shown on the Contract Drawings.
- (5) Concrete work such as the installation of encasement, thrust blocks and other embedded items.
- (6) Temporary support of all existing utilities, including storm, gas, water, sanitary and electric.

- (7) Provide all temporary services including power, lighting, heating, security and potable water.
- (8) Maintain continuous operation of the existing sanitary sewer systems without any disruption in operation and service, including temporary bypass pumping.
- (9) Provide photographs, videos of construction site and surrounding area before construction commences.
- (10) Exploration of test pits, as required to ascertain the more exact location of utilities and other structures and any foundations for same, which might interfere with construction. The excavation of test pits shall be one of the first items of work.
- (11) Maintenance and Protection of traffic.
- (12) Schedule and coordinate the work with the Owner and other Contractors.
- (13) Daily clean-up of site, including removal of rubbish, and sweeping area, including dust control.
- (14) Soil erosion and sediment control.
- (15) Utility Mark Out.
- (16) All other work required for a complete and satisfactory operating installation.

## 1.2 QUALITY ASSURANCE

- 1.3.1 The entire Contract work shall be completed in strict accordance with all applicable Federal, State and local regulations and ordinances and the best standards of practice.

## 1.3 PERMITS AND CERTIFICATION

- 1.4.1 General: The Contractor shall pay all costs and fees, as outlined in Articles of the General Conditions of the Contract and obtain all necessary permits and Certificates of approval and submit them to the Engineer before final acceptance of the work.

PART TWO – PRODUCTS - Not applicable.

PART THREE – EXECUTION - Not applicable.

**END OF SECTION**

PART ONE – GENERAL

1.1 DESCRIPTION OF CASH ALLOWANCE

The Contractor shall include in the Proposal a cash allowance described herein and in the Proposal

1.2 ALLOWANCE FOR POLICE TRAFFIC DIRECTORS

1.2.1 General: The work shall include the stipulated amount, as indicated in the Proposal as an allowance for police traffic directors.

1.2.2 Submittal Requirements: The Contractor shall provide all invoices for Police Traffic Directors to the Engineer for his review and approval. The Contractor shall not be reimbursed under the allowance for any work, which he has not demonstrated to be part of the work authorized by the Engineer.

1.3 ALLOWANCE FOR UNFORESEEN CONDITIONS

1.3.1 General: The work shall include the portion of the stipulated amount, as indicated in the Proposal as an allowance for conditions specified and as directed and approved by the Engineer.

1.3.2 Submittal Requirements: The Contractor shall provide all invoices from labor, subcontractors, and material to the Engineer for his review and approval. The Contractor shall not be reimbursed under the allowance for any work which he has not demonstrated is part of the work authorized by the Engineer.

The Contractor shall not proceed with the work associated with the cash allowance until all costs associated with the work have been authorized in writing by the Engineer.

1.4 SCADA ALLOWANCE

1.4.1 General: The work shall include the stipulated amount, as indicated in the Proposal as an allowance for the integration of the SCADA system.

PART TWO - PRODUCTS - Not applicable.

PART THREE - EXECUTION - Not applicable.

**END OF SECTION**



PART ONE – GENERAL

1.1 CONSTRUCTION SCHEDULE

Construction schedule shall be in accordance with the requirements of the General Conditions of the Contract and Section 01340, SUBMITTALS.

1.2 ESTIMATES

The Contractor shall submit to the Engineer a breakdown statement of the lump sum bid items in accordance with the requirements of the General Conditions of the Contract.

1.3 MEASUREMENT AND PAYMENT

The unit price and lump sum price bid under this Contract shall include all costs of furnishing, installing, testing, and placing into satisfactory service all works as shown on the Contract Drawings and specified herein, complete with all appurtenances and accessories, as shown or required.

1.4 DESCRIPTION OF WORK

1.4.1 Mobilization (Item 1)

Payment for mobilization shall be made in accordance with the New Jersey Department of Transportation Standard Specifications for Road and Bridges Construction dated 2007, section 154.

1.4.2 Test Holes (Item 2)

Measurement for Test Holes shall be made at the unit price bid per cubic yard excavated.

The unit price bid shall include all labor, equipment and materials required or necessary to perform excavation, sawcutting, backfill, compaction dense graded aggregate and asphalt pavement as directed by the Engineer.

Should there be any utility interference with the proposed work, the Contractor shall submit a recommendation to the Engineer for realignment of the proposed pipe installation or relocating the existing utility.

Test holes shall conform to the requirements of Section 02221, EXCAVATION, BACKFILLING AND COMPACTING.

1.4.3 Rock Excavation (Item 3)

Measurement for rock excavation shall be made in cubic yards for the actual number of cubic yards removed as contained within the planes defined by the existing rock surfaces and the payment lines shown or ordered by the Engineer.

Payment for rock excavation shall be made at the unit price bid per cubic yard in the Proposal, which price and payment shall be full compensation for excavation of rock, removal of rock from the site, disposal and all other miscellaneous work required.

Rock excavation shall conform to the requirements of Section 02221, EXCAVATION, BACKFILLING AND COMPACTING, including explosives and safeguards as shown or ordered.

1.4.4 Select Fill (Item 4)

Measurement for select fill shall be made in cubic yards for the actual number of cubic yards in place and to such widths, depths and lengths as shown on the Contract Drawings or as directed by the Engineer.

Payment for select fill shall be made at the unit price bid per cubic yard in the proposal, which price and payment shall be full compensation for all costs of material, equipment and labor required to import select fill and dispose of unsuitable trench material as determined by the Engineer.

Installation and compaction of select fill shall be included in the unit price bid for this item.

Placement of select fill shall conform to the requirements of Section 02221, EXCAVATION, BACKFILLING AND COMPACTING.

Select fill shall be used as additional material as required and to replace unsuitable material as determined by the Engineer.

The Contractor's attention is called to the fact that select fill material may be used separately or in combination, in place of unsuitable materials for backfilling trenches where so ordered by the Engineer. Any combination of materials to be used as backfill shall not entitle the Contractor to additional compensation. No penalty shall be incurred for additions or deletions of material based on actual field conditions.

1.4.5 PVC Sewer Pipe (Item 5)

Payment shall be made at the unit price bid per linear foot of PVC sewer pipe as measured in place over the horizontal centerline of the installed pipe.

Item 5     8 Inch PVC Sewer Pipe

Sewers shall conform to the requirements of Section 15076, PIPE AND PIPE FITTINGS. Deductions in length shall be made for fittings based on the "laid length" for the fitting as shown in the applicable ANSI publications for said fittings. No additions in length shall be made due to jointing.

The unit prices bid shall include all costs for labor, materials, and equipment required to furnish, install, and test the pipe as shown on the Contract Drawings and specified herein.

Payment under this item shall also include excavation, removal and disposal of the existing pipe, backfill, soil disposal, dewatering, sheeting, magnetic location tape, geotextile material, compaction, clearing, bypass pumping, sawcutting, dense graded aggregate, surface restoration, pavement, concrete anchors and any other items necessary to install in place the sanitary sewer piping in working, satisfactory condition.

All excavation shall conform to the requirements of Section 02221, EXCAVATION, BACKFILLING AND COMPACTING. All foundation material shall conform to the requirements of Section 02200, SELECT FILL AND FOUNDATION MATERIAL.

Cutting, capping and the abandonment of existing sewer piping shall be included in the unit prices bid under this item, and shall conform to the requirements of Section 02030, ENVIRONMENTAL PROTECTION.

The unit price bid for this item shall include all costs incurred for additional excavation for supporting structures required for the protection of new and existing piping at all utility crossings, slope stabilization and trench protection whether by means of a trench box or sheeting, as approved by the Engineer.

Temporary support of all existing utilities, shall be included in the unit price bid under this item which shall include coordination of work with each specific utility company, temporary support of the utility in conflict, temporary shut-off, bypass or relocation (as determined by the utility company) and any other work required to provide adequate protection of the existing utility during all phases of construction to the satisfaction of the specific utility company.

The unit price bid for these items shall include all costs incurred for temporary sheeting and bracing of trench work, and if necessary, soil consolidation, subaqueous construction in trench, or any other work required to safeguard working conditions, structure and traffic. The unit price bid for these items shall include all costs incurred for sheeting left in place for the Contractor's construction purposes to protect structures and utilities.

The unit price bid for these items shall include all costs incurred for pumping and draining the site of work, including well points, if necessary and conditions are suitable, and pumps of adequate capacity.

Disposal of all unsuitable excavated material shall be included in the unit price bid under this item.

The Contractor shall be responsible for backfilling the trench at the end of each working day. The Contractor shall install quarry process stone and provide a reasonably smooth way of passage for all vehicles. The Contractor shall install temporary asphalt at a minimum of one (1) time per week as directed by the Engineer. Payment for temporary asphalt shall be included in the unit price bid for this item.

The unit price bid for these items shall also include preparation of the designated area for final paving which includes removing and disposing of temporary asphalt material, excavation to specified depth, rough grading, proof rolling and installation of final asphalt pavement as shown on the Contract Drawings.

Pavement shall conform to the requirements of Section 02500, SURFACE RESTORATION. Pavement damaged or removed by the Contractor beyond the limits specified shall be replaced by the Contractor in accordance with these Specifications at the Contractor's own expense. All pavement shall be installed with straight line edges and running either parallel or perpendicular to the road center line.

The unit price bid for these items shall include the cost of furnishing and placing additional bituminous base course and concrete pavement which may be necessary where settlement or "bird bathing" occurs.

Utility lines (storm, sanitary, gas, oil, water, electric, etc.), concrete sidewalks, curbing, concrete stairs, retaining walls, stone walls, footings, reinforced concrete transition slab, landscaping, driveways, etc., if damaged, shall be repaired or replaced, as directed by the Engineer, at no additional cost to the Owner.

The cost for the coordination and/or relocation of the various utilities that interfere with the construction of this project or modification to the proposed alignment shall be included in the unit price bid for this item.

1.4.6 PVC Force Main (Item 6, Item 7)

Payment shall be made at the unit price bid per linear foot of PVC force main as measured in place over the horizontal centerline of the installed pipe.

Item 6	2 Inch PVC Force Main
Item 7	3 Inch PVC Force Main

Sanitary force mains shall conform to the requirements of Section 15076, PIPE AND PIPE FITTINGS. Deductions in length shall be made for fittings based on the "laid length" for the fitting as shown in the applicable ANSI publications for said fittings. No additions in length shall be made due to jointing.

The unit prices bid shall include all costs for labor, materials, and equipment required to furnish, install, and test the pipe as shown on the Contract Drawings and specified herein.

Payment under this item shall also include excavation, removal and disposal of the existing pipe, insulation, backfill, soil disposal, dewatering, sheeting, magnetic location tape, geotextile material, compaction, clearing, bypass pumping, sawcutting, dense graded aggregate, surface restoration, pavement, concrete anchors and any other items necessary to install in place the sanitary sewer piping in working, satisfactory condition.

All excavation shall conform to the requirements of Section 02221, EXCAVATION, BACKFILLING AND COMPACTING. All foundation material shall conform to the requirements of Section 02200, SELECT FILL AND FOUNDATION MATERIAL.

Cutting, capping and the abandonment of existing sewer piping shall be included in the unit prices bid under this item, and shall conform to the requirements of Section 02030, ENVIRONMENTAL PROTECTION.

The unit price bid for this item shall include all costs incurred for additional excavation for supporting structures required for the protection of new and existing piping at all utility crossings, slope stabilization and trench protection whether by means of a trench box or sheeting, as approved by the Engineer.

Temporary support of all existing utilities, shall be included in the unit price bid under this item which shall include coordination of work with each specific utility company, temporary support of the utility in conflict, temporary shut-off, bypass or relocation (as determined by the utility company) and any other work required to provide adequate protection of the existing utility during all phases of construction to the satisfaction of the specific utility company.

The unit price bid for these items shall include all costs incurred for temporary sheeting and bracing of trench work, and if necessary, soil consolidation, subaqueous construction in trench, or any other work required to safeguard working conditions, structure and traffic. The unit price bid for these items shall include all costs incurred for sheeting left in place for the Contractor's construction purposes to protect structures and utilities.

The unit price bid for these items shall include all costs incurred for pumping and draining the site of work, including well points, if necessary and conditions are suitable, and pumps of adequate capacity.

Disposal of all unsuitable excavated material shall be included in the unit price bid under these items.

The Contractor shall be responsible for backfilling the trench at the end of each working day. The Contractor shall install quarry process stone and provide a reasonably smooth way of passage for all vehicles. The Contractor shall install temporary asphalt at a minimum of one (1) time per week as directed by the Engineer. Payment for temporary asphalt shall be included in the unit price bid for these items.

The unit price bid for these items shall also include preparation of the designated area for final paving which includes removing and disposing of temporary asphalt material, excavation to specified depth, rough grading, proof rolling and installation of final asphalt pavement as shown on the Contract Drawings.

Pavement shall conform to the requirements of Section 02500, SURFACE RESTORATION. Pavement damaged or removed by the Contractor beyond the limits specified shall be replaced by the Contractor in accordance with these Specifications at the Contractor's own expense. All pavement shall be installed with straight line edges and running either parallel or perpendicular to the road center line.

The unit price bid for these items shall include the cost of furnishing and placing additional bituminous base course and concrete pavement which may be necessary where settlement or "bird bathing" occurs.

Utility lines (storm, sanitary, gas, oil, water, electric, etc.), concrete sidewalks, curbing, concrete stairs, retaining walls, stone walls, footings, reinforced concrete transition slab, landscaping, driveways, etc., if damaged, shall be repaired or replaced, as directed by the Engineer, at no additional cost to the Owner.

The cost for the coordination and/or relocation of the various utilities that interfere with the construction of this project or modification to the proposed alignment shall be included in the unit price bid for these items.

#### 1.4.7 Stream Crossing (Item 8)

Payment for stream crossing shall be made for each lump sum price bid in the Proposal, which price and payment shall be full compensation for providing all labor, material, equipment and all other incidentals necessary to perform all required work as shown on the Contract Drawings and/or directed by the Engineer, as follows:

Item 8            Stream Crossing Station 29+95 to Station 30+35

Casing pipe shall conform to the requirements of Section 15064, PIPE AND PIPE FITTINGS.

Insulation and insulating pipe spacers shall be used in the carrier pipe and paid for under the lump sum price bid for this item.

1.4.8 Jacking (Item 9A, Item 9B and 9C)

Payment for Jacking shall be made for each lump sum price bid in the Proposal, which price and payment shall be full compensation for providing all labor, material, equipment and all other incidentals necessary to perform all required work as shown on the Contract Drawings and/or directed by the Engineer, as follows:

Item 9A	Jacking Station 15+05 to Station 15+85
Item 9B	Jacking Station 83+96 to Station 84+16
Item 9C	Jacking Station 111+25 to Station 111+55

Casing pipe shall conform to the requirements of Section 15064, PIPE AND PIPE FITTINGS.

All excavation and Jacking shall conform to the requirements of Section 02221, EXCAVATION, BACKFILLING AND COMPACTING.

Item 9C shall include all costs for dual jacking pipes for each force main as shown on the Contract Drawings and directed by the Engineer.

Areas where pipe cover is less than 4 feet from bottom of stream or grade, insulation and insulating pipe spacers shall be used in the carrier pipe and paid for under the lump sum price bid for these Items.

The Contractor shall construct pipelines crossing under the tracks of the Railroad Companies and other locations, complete with appurtenances including complying with all the requirements of the Railroad Companies, excavation of test pits, furnishing, installing, jacking and receiving pits, testing casing pipe and carrier pipe under the railroad and other locations within the limits shown.

The lump sum price bid for these items shall include all costs required by New York, Susquehanna and Western Railway Corporation when working in railroad right of way and other locations, including track monitoring. The Contractor shall secure all required permits for flagman, supervisor and expenses related to jacking underneath the railway.

Sheeting for the jacking pits shall be left in place unless directed otherwise, and will be paid for under the lump sum price bid for these Items.

1.4.9 Manhole (Item 10, Item 11, Item 12, Item 13)

Measurement for Sanitary Manhole shall be made in units for the actual number of units installed. Payment shall include all costs for labor, material and equipment required to install new manholes at locations as shown in the Contract Drawings and directed by the Engineer.

Item 10	Sanitary Manhole
Item 11	Sanitary Drop Manhole
Item 12	Sanitary Doghouse Manhole
Item 13	Modify Existing Sanitary Manhole

The unit price bid for these items shall also include the cost of excavation of all existing material, removal and disposal of any existing manholes, compaction, backfilling, foundation material, dense graded aggregate, asphalt pavement, manhole castings, and materials for benching, painting and cleaning. Removal and disposal of existing manholes shall conform to the requirements of Section 02050, DEMOLITION.

Manholes shall conform to the requirements of Section 02601, PRECAST MANHOLES AND CHAMBERS.

All excavation, backfill and backfill material, and compaction shall conform to the requirements of Section 02221, EXCAVATION, BACKFILLING AND COMPACTING.

1.4.10 Air Release Manhole (Item 14, Item 15)

Measurement for air release manholes and chambers shall be made in units for the actual number of units installed. Payment shall include all costs for labor, material and equipment required to install new air release manholes and chambers at locations as shown in the Contract Drawings and directed by the Engineer.

Item 14	Air Release Manhole
Item 15	Air Release Chamber

The unit price bid for this item shall include piping and air release assembly.

The unit price bid for this item shall also include the cost of excavation of all existing material, removal and disposal of any existing manholes, compaction, backfilling, foundation material, dense graded aggregate, asphalt pavement, manhole castings, and materials for benching, painting and cleaning. Removal



and disposal of existing manholes shall conform to the requirements of Section 02050, DEMOLITION.

Manholes shall conform to the requirements of Section 02601, PRECAST MANHOLES AND CHAMBERS, and Section 15100, VALVES.

All excavation, backfill and backfill material, and compaction shall conform to the requirements of Section 02221, EXCAVATION, BACKFILLING AND COMPACTING.

1.4.11 4 Inch Blow off Assembly (Item 16)

Measurement for blow off assemblies shall be made in units for the actual number of units installed. Payment shall include all costs for labor, material and equipment required to install blow off assemblies at locations as shown in the Contract Drawings and directed by the Engineer.

The unit price bid for this item shall include piping, valves and valve boxes. Blow off assemblies shall conform to the requirements of Section 15100, VALVES.

The unit price bid for this item shall also include the cost of excavation of all existing material, compaction, backfilling, foundation material, dense graded aggregate, asphalt pavement.

All excavation, backfill and backfill material, and compaction shall conform to the requirements of Section 02221, EXCAVATION, BACKFILLING AND COMPACTING.

1.4.12 Meter Chamber (Item 17)

Measurement for meter chambers shall be made in units for the actual number of units installed. Payment shall include all costs for labor, material and equipment required to install new meter chambers at locations as shown in the Contract Drawings and directed by the Engineer.

The unit price bid for this item shall include any piping and the electromagnetic flow meter.

The unit price bid for this item shall also include the cost of excavation of all existing material, compaction, backfilling, foundation material, dense graded aggregate, asphalt pavement, painting and cleaning. Removal and disposal of any existing material shall conform to the requirements of Section 02050, DEMOLITION.

Electromagnetic flow meters shall conform to Section 15100, VALVES.

All excavation, backfill and backfill material, and compaction shall conform to the requirements of Section 02221, EXCAVATION, BACKFILLING AND COMPACTING.

1.4.13 Packaged Pump Station (Item 18A, Item 18B, Item 18C)

The lump sum price shall include full compensation for providing all labor, materials, equipment and incidentals required to place into satisfactory service all work shown as shown on the Contract Drawings and Specifications.

Item 18A	Chapel Hill Pumping Station
Item 18B	Oakwood Knolls Pumping Station
Item 18C	Lakeside Boulevard Pumping Station

The unit price bid for these items shall include, but not limited to submersible pumps, valves, piping, concrete pads, controls, electrical work, and fencing.

The lump sum price shall include the cost required to perform all electrical work and wiring required for the pumping station to be fully operational.

All electrical work is to be done by a licensed Electrician and according to the National Electric Code.

Fencing shall be in accordance with Section 02445, CHAIN LINK FENCE.

All work shall conform to the requirements of Section 11210A, PACKAGED PUMP STATION CHAPEL HILL, Section 11210B, PACKAGED PUMP STATION LAKESIDE BOULEVARD, Section 11210C, PACKAGED PUMP STATION OAKWOOD KNOLLS.

All excavation, backfill and compaction shall conform to the requirements of Section 02221, EXCAVATION, BACKFILLING AND COMPACTING.

1.4.14 Natural Gas Generator (Item 19A, Item 19B, Item 19C)

The lump sum price shall include all costs of furnishing, installing, testing, and placing into satisfactory operation natural gas generators at each new pumping station, as illustrated on the Contract Drawings and specified herein.

Item 19A	Chapel Hill Natural Gas Generator
Item 19B	Oakwood Knolls Natural Gas Generator
Item 19C	Lakeside Boulevard Natural Gas Generator

Payment shall include the following work, including but not limited to, installation of generator, automatic transfer switches (ATS), any structural, mechanical and electrical work, controls and instrumentation and any site work required to place the generators into service.

All electrical work is to be done by a licensed Electrician and according to the National Electric Code.

Natural gas generators shall be in accordance with Section 16210, NATURAL GAS GENERATORS.

1.4.15 Decommissioning of Existing Wastewater Treatment Plants & Pumping Stations (Item 20A – Item 20E)

The lump sum price shall include full compensation for demolition and decommissioning of the existing wastewater treatment plants, including demolition, removal or abandonment of existing items and appurtenances as indicated on the Contract Drawings for the following items:

Item 20A	Decommissioning of Oakwood Knolls WWTP
Item 20B	Decommissioning of Skyview/Hibrook WWTP
Item 20C	Decommissioning of Chapel Hill WWTP
Item 20D	Decommissioning of Hibrook Pumping Station
Item 20E	Decommissioning of Skyview Pumping Station

All work shall conform to the requirements of Section 02050, DECOMMISSIONING AND DEMOLITION.

1.4.16 Maintenance and Protection of Traffic (Item 21)

Payment for Maintenance and Protection of Traffic shall be made for the lump sum price bid in the Proposal, which price and payment shall be full compensation for providing all labor, materials and equipment required to perform all required work by the Contractor as shown in the Contract Drawings, or as directed by the Engineer.

Maintenance and Protection of Traffic shall conform to the Requirements of Section 01500, TEMPORARY FACILITIES AND CONTROLS.

Payment for Maintenance and Protection of Traffic shall not include payment for Police Traffic Directors. Payment for Police Traffic Directors shall be made under its respective bid item.

The Contractor shall secure all required permits for which payment shall be included under this item. Payment for this item shall be made on a prorated basis over the duration of the project. Separate payment shall not be made for relocating traffic control devices, as required or directed.

1.4.17 Allowance for Police Traffic Directors (Item 22)

The Police Traffic Directors will be required for the construction activity taking place in the Borough of Oakland. The Police Traffic Directors shall be off-duty Police Officers from the Borough of Oakland. The Borough is to be contacted by the Contractor in order to obtain the services of Police Traffic Directors.

The allowance price under this Item shall include all costs for the Police Traffic Directors including labor, materials, equipment and services required for the work authorized in writing by the Engineer.

All work shall conform to the requirements of Section 01020, CASH ALLOWANCE, Section 01500, TEMPORARY FACILITIES AND CONTROLS.

Payment shall be made only for the portion total allowance in the Proposal, which price and payment shall be full compensation for all services, labor, material and equipment required to perform the scope of work, as defined by the Engineer.

**1.4.18 Allowance for Unforeseen Contingencies (Item 23)**

The allowance price under this Item shall include all costs for the unforeseen conditions, as designated by the Engineer, including labor, materials, equipment and services required for the work authorized, in writing, by the Engineer.

All work shall conform to the requirements of Section 01020, CASH ALLOWANCE.

Payment shall be made only for the portion total cash allowance in the Proposal which price and payment shall be full compensation for all services, labor, material and equipment required to perform the scope of work, as defined by the Engineer, including:

- That portion of the stipulated cash allowance for the unforeseen contingencies; and
- 
- All costs demonstrated by the Contractor in support of the unforeseen contingencies within the scope of work defined by the Engineer.

**1.4.19 SCADA Allowance (Item 24)**

The allowance price under this item shall include all services necessary to integrate proposed devices and equipment with proposed SCADA system.

**PART TWO - PRODUCTS** - Not applicable

**PART THREE - EXECUTION** - Not applicable

**END OF SECTION**

PART ONE - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

This section specifies the general methods and requirements of submissions applicable to the following work-related submittals: Shop Drawings and Product Data.

1.2 SHOP DRAWINGS, PROJECT DATA

1.2.1 Shop Drawings

- (1) Shop Drawings as specified in individual work sections include, but are not necessarily limited to, data such as fabrication and drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the Work.
- (2) All Shop Drawings submitted by subcontractors for approval shall be sent directly to the Contractor for preliminary checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.
- (3) The Contractor shall check all subcontractor's Shop Drawings regarding measurements, size of members, materials and details to satisfy himself that they conform to the intent of the Contract Drawings and Specifications. Drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission thereof.
- (4) All details on Shop Drawings submitted for approval shall show clearly the elevations of the various parts to the main members and lines of the structure (s) and where correct fabrications of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted for approval.

1.2.2 Shop Drawing Schedule:

- (1) Within 15 days after the Notice to Proceed, the Contractor shall prepare Shop Drawing submission schedule to the Engineer for review and approval. This schedule shall be updated by the Contractor throughout the contract as necessary. No Shop Drawings will be reviewed until the schedule is approved.

- (2) In order to maintain the construction schedule for this project, the Contractor shall submit all Shop Drawings within 45 days after the Notice to Proceed. The Contractor shall notify the Engineer of any Shop Drawings that require additional time.
- (3) Shop Drawings shall be submitted with adequate time to permit correction resubmission and final approval, as hereinafter specified, without causing any delay in the construction of any work. The Contractor may begin the preparation of Shop Drawings as soon as possible after signing of the Contract. Formal submission of Shop Drawings will begin after execution of the Contract.

1.2.3 Product Data: As specified in individual sections, include but are not necessarily limited to standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, and manufacturer's printed statements of compliances and applicability, catalog cuts, product photographs, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommend spare parts listing, and printed product warranties, as applicable to the Work.

### 1.3 CONTRACTOR'S RESPONSIBILITIES

The Contractor shall review Shop Drawings, product data and samples prior to submission to determine and verify the following:

- Field measurements;
- Field construction criteria;
- Catalog numbers and similar data, and;
- Conformance with the specifications.

Each Shop Drawing, working drawing, sample and catalog data submitted by the Contractor shall have affixed to it the following Certification Statement, signed by the Contractor: "Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved Shop Drawings and all Contract requirements."

Notify the Owner in writing, at the time of submittal, of any deviations in the submittals from the requirements of the contract documents.

No portion of the work requiring a Shop Drawing, working drawing, sample or catalog data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item by the Engineer. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to the approved Shop Drawings and data shall be at the

Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

Project work, materials, fabrication and installation shall confirm with approved Shop Drawings, working drawings, applicable samples and catalog data.

A list of items requiring shop drawing submittals is set forth in the Shop Drawing Schedule included at the end of this section. It should be noted that this Shop Drawing Schedule does not necessarily identify each and every item, which may require shop drawing submittals. The responsibility for shop drawing submittals is set forth above.

#### 1.4 SUBMISSION REQUIREMENTS

Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the Work or in the work of any other Contractor.

Number of submittals required:

- |    |                |                                 |
|----|----------------|---------------------------------|
| 1) | Shop Drawings: | Submit one (1) electronic copy. |
| 2) | Product Data:  | Submit one (1) electronic copy. |

Submittals shall contain:

- 1) The date of submission and the dates of any previous submissions.
- 2) The project title and number.
- 3) Contractor identification.
- 4) The names of:
  - a. Contractor
  - b. Supplier
  - c. Manufacturer
- 5) Identification of the product, with the specification section number.
- 6) Field dimensions, clearly identified as such.
- 7) Relation to adjacent or critical features of the Work or materials.
- 8) Applicable standards, such as ASTM or Federal Specification numbers.
- 9) Identification of deviations from Contract Documents.
- 10) Identification of revisions of resubmittals.
- 11) An 8-inch by 3-inch blank space for Contractor and Engineer stamp.

## 1.5 RESUBMISSION REQUIREMENTS

Make any corrections or changes in the submittals required by the Engineer and resubmit until approved.

Shop Drawings and Product Data:

- 1) Revise initial drawings or data and resubmit as specified for the initial submittal.
- 2) Indicate any changes which have been made other than those requested by the Engineer.

## 1.6 DISTRIBUTION

Distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed six (6).

## 1.7 GENERAL PROCEDURES FOR SUBMITTALS

Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work sections of the Specifications, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabricating, delivery and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the work.

## 1.8 WORKMANSHIP BONDS

Where specific units of work require the issuance of a bond or similar provision, as a means of assuring the Owner that certain possible failures of the work to perform as represented will be rectified at someone else's expense, submit fully executed bond backed by a surety company acceptable to the Owner and in the principal amount indicated. Include information sheet for the Owner's maintenance/operating personnel outlining proper procedures in case of failure or other instances which might affect the validity of the bond; list names, addresses and telephone numbers for the Owner's emergency and follow-up in connection with the implementation of each bond.

PART TWO - PRODUCTS - Not applicable.

PART THREE - EXECUTION - Not applicable



SHOP DRAWING SCHEDULE

Select Fill  
Foundation Material  
Dense Graded Aggregate  
Road Restoration  
Pipe and Appurtenances  
Sanitary Manholes  
Sanitary Drop Manholes  
Air Release Manholes  
Packaged Pumping Stations  
Packaged Pumping Station Controls and Instrumentation  
Automatic Transfer Switches (ATS)  
Natural Gas Generators  
Construction Schedule  
Record Drawings

**END OF SECTION**

## PART ONE - GENERAL

### 1.1 DESCRIPTION

1.1.1 Work Included: Temporary facilities and controls required for this work include, but are not necessarily limited to:

- (1) Construction Meetings and Schedules.
- (2) Maintenance and Protection of Traffic.
- (3) Temporary utilities such as heat, water, electricity, telephone and temporary sanitary facilities.
- (4) Temporary support of utilities such as gas lines and water lines.
- (5) Soil Erosion and Sediment Control Measure.
- (6) Survey and videotape.

1.1.2 Related Work Described Elsewhere:

- (1) All equipment furnished by subcontractor shall comply with all requirements of pertinent safety regulations. Ladders, planks, hoists and similar items, normally furnished by the individual trades in execution of their own portions of the Work are not part of this Section.
- (2) Permanent installation and hook-up of the various utility lines are described in the pertinent other Section of these Specifications.

### 1.2 PRODUCT HANDLING

Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout progress of the Work.

### 1.3 JOB CONDITIONS

Make all required connections to existing utility systems with minimum disruption to services in the existing systems. When disruption of the existing service is required, do not proceed without the Engineer's approval and, when required, provide alternate temporary service.

### 1.4 PRECONSTRUCTION CONFERENCE

The Contractor shall be required to attend a preconstruction conference. The preconstruction conference shall be held at a time and location set by the

Engineer to establish various procedures that shall be followed for the duration of the construction period. Engineer shall preside at the preconstruction conference and shall prepare for distribution minutes that describe the major topics of discussion.

In addition to the items that shall be reviewed in accordance with General Conditions of the Contract, the preconstruction conference agenda shall include but not be limited to:

- (1) Designation of contractor's responsible personnel and phone numbers to be used in the event of an emergency during non-working hours.
- (2) Disclosure of contractor's intended suppliers, vendors, fabricators and major subcontractors.
- (3) Procedures for the implementation of field orders and change orders.
- (4) Contractor's Insurances.
- (5) Procedures for contacting and requirements for providing access for local fire and first aid companies, police, bus companies and local traffic.
- (6) Site Security.
- (7) Housekeeping.
- (8) Record drawings.
- (9) Job site Coordination.
- (10) Protection of Utilities.
- (11) Other topics pertinent to the work that may be presented by conference attendees.

Preconstruction conference attendees shall be as follows:

- (1) Owner.
- (2) Engineer.
- (3) Contractor and major subcontractors.
- (4) Governmental agency representatives including NJDEP, utility owner representatives and other parties who may have control of, or may be affected by the work.

## 1.5 PROGRESS MEETINGS

The Contractor and/or contractor's representatives shall attend regularly scheduled progress meetings held for the purpose of coordinating the execution of the Work. The Engineer shall preside at the progress meetings.

The proceedings of these meetings shall be recorded by the Engineer and the Contractor shall be furnished a copy of the meeting minutes.

During the project meeting the contractor shall provide updated schedules concerning his plans for carrying out each part of the work.

The Contractor shall provide a list of all items which are impacting the completion of the work (i.e. decisions required, easements required, shop drawing approvals required, etc.).

As the Work progresses, the Contractor's actual progress rate shall be compared to the scheduled progress rate.

The Contractor's representatives at these meetings shall be empowered to make binding decisions regarding all matters pertaining to the Work and to make definite reports as to status and anticipated progress of the work.

Progress meetings shall be scheduled at monthly intervals and as ordered by the Engineer.

## 1.6 CONSTRUCTION SCHEDULES

1.6.1 General: Within five (5) days after the effective date of the Agreement, the Contractor shall submit a construction schedule. The schedule shall provide detailed information for all construction activities to complete the project in a clear and organized manner. A Bar Chart type schedule shall be acceptable.

1.6.2 Quality Assurance: The schedule shall be prepared by qualified personnel familiar with preparation of this type of document.

Each activity in the progress of work schedule shall be identified and a time for the performance of such activity indicated. Each activity shall be preceded by all work that must be accomplished prior that activity. All abbreviations, codes and/or symbols used shall be described on the schedule, and shall be those commonly used in the trade. Update schedules shall have completed activities indicated as such.

1.6.3 Submittals: One (1) electronic copy of the construction schedule shall be submitted.

Engineer shall return one (1) electronic copy of the schedule after review.

Detailed required information shall be included but not limited to:

- (1) Name of activity,

- (2) Date of commencement,
- (3) Estimated time for completion including float time,
- (4) Indication of whether activity is by Contractor or Subcontractor, and
- (5) Sequencing and critical path.

## PART TWO - PRODUCTS

### 2.1 MAINTENANCE AND PROTECTION OF TRAFFIC

- 2.1.1 General: The Contractor shall maintain traffic and protect the public from damage to person and property, within the limits of and for, the duration of the Contract as specified herein and in Section 110 of the NJDOT Standard Specifications.
- 2.1.2 Permits: The Owner shall secure all necessary permits and pay all costs and fees associated with each particular permit. This also includes a County Road Opening Permit, if required. All permits obtained shall be submitted to the Engineer before commencement of any work.
- 2.1.3 Maintenance and Protection of Traffic: The Contractor shall be responsible for maintenance within the project limits until acceptance. This maintenance shall consist of continuous and effective work prosecuted day by day with adequate equipment to keep the roadway in satisfactory condition at all times.

Traffic shall be maintained over a reasonable smooth traveled way, which shall be so marked by signs, delineation and/or other methods that a person who has no knowledge of conditions can safely, and with a minimum of discomfort and inconvenience, ride, drive or walk over all or any portion of the roadway under construction where traffic is to be maintained.

Work shall not be permitted on Saturday, Sunday or Legal Holidays unless otherwise directed by the Engineer.

Any damage to the roadway or surroundings due to the Contractor's operations shall be repaired by the Contractor immediately and at no cost to the Owner.

Where driveway access shall be hindered during construction, Contractor shall notify and coordinate with homeowner at least three (3) days in advance, and by the end of each day there shall be access to all driveways.

- 2.1.4 Traffic Control Devices: Traffic control devices shall be placed as shown on the Contract Drawings or as directed by the Engineer. All traffic control devices shall conform with the Manual on Uniform Traffic Control Devices.

The Contractor shall submit a traffic control plan to be reviewed and approved by the Engineer prior to the commencement of work.

All traffic control devices and equipment shall conform to these specifications and as shown in APPENDIX C: CONSTRUCTION DETAILS.

- 2.1.5 Traffic Director: Traffic Directors shall be trained flaggers, in good physical condition including sight and hearing, mentally alert and shall have a sense of responsibility for the safety of the public. Traffic directors shall wear orange or fluorescent orange garment such as a jacket or vest.
- 2.1.6 Police Traffic Director: Police Traffic Directors shall differ from Traffic Directors. Police Traffic Directors shall be off duty police officers from the Borough of Oakland. Police Traffic Directors shall be required as directed by the Engineer or Police Department. The Borough shall be contacted in order to coordinate and obtain the services of Police Traffic Directors. The Contractor shall coordinate all maintenance and protection of traffic activities with the Borough of Oakland Police Department.
- 2.1.7 Contracted Off Duty Employment: For the convenience of those persons and entities which utilize the services of off duty law enforcement officers of the Oakland Police Department and to authorize the outside employment of Borough Police while off duty, the Borough requires that their "Hold Harmless, Indemnification and Moonlighting Agreement" be completed and submitted with the necessary copy of Insurance Certificate. Upon approval of the contract, the scheduling of police officers can be performed. For scheduling, please contact the Police Department three (3) days or more in advance of the time required.

## 2.2 UTILITIES

- 2.2.1 General: All temporary facilities shall be subject to the Engineer's approval.
- 2.2.2 Utility Mains: The Contractor shall temporarily support all existing utility mains as indicated on the Contract Drawings or as determined by the Engineer or utility company. The Contractor shall not commence with any construction activity without the presence of the Engineer and representative of the specific utility company.

The Contractor shall implement extreme caution when working near the gas main and make all necessary provisions to minimize the risk of damaging the existing main.

The Contractor shall follow the exact same procedure when encountering all other utilities in conflict with the sanitary sewer construction.

- 2.2.3 Temporary Power and Light: It shall be the obligation and responsibility of the Contractor to provide and maintain temporary facilities for furnishing light and power for operation and to make all necessary arrangements therefore, including

all required connections, ordering the meter, and paying all fees and inspection charges. Removal of temporary facilities shall be the responsibility of the Contractor. The installation and meters shall remain until completion of the project.

If, in the opinion of the Engineer, the facilities provided are inadequate, the Contractor shall not be permitted to proceed with any portion of the work affected thereby.

All wiring for electrical light and power shall be installed and maintained in a first class manner, as ordered and approved, and at all points securely fastened in place. Unless otherwise permitted circuits separate from lighting circuits shall be used for all power purposes.

2.2.4 Temporary Heating: The contractor shall provide temporary heat as required for all the contractors when work is being carried on during cold weather and to prevent damage to the work. Heat shall be furnished when and as directed by the Engineer, by means of portable or fixed units. The Contractor shall provide and pay for all fuel used in the temporary facilities and shall provide proper smoke pipes or other means to prevent smoke or smudge from marking up walls, ceilings, or other parts of equipment.

2.2.5 Temporary Water: It shall be the obligation and responsibility of the Contractor to provide and maintain temporary water service on the site suitable for the operations of the Contractor and subcontractors and to make all necessary arrangements and payments therefore.

The Contractor for the project shall also provide at his own expense the water supply necessary for drinking purposes for all the subcontractors.

Removal of temporary facilities and drinking water facilities shall be the responsibility of the Contractor. These installations and meters shall remain until need for same by all the contractors has ceased and the project is completed.

2.2.6 Sanitary Facilities: The General Contractor shall provide and maintain, for the use of his employees and the employees of subcontractors, a minimum of one (1) chemical field toilet at each location and shall be screened from public view. The facilities shall be furnished and maintained in strict conformity with State and County health laws.

## 2.3 VIDEOTAPE

2.3.1 General: Videotape shall be used to record pre and post construction conditions. Picture quality and definition shall be to the complete satisfaction of the Engineer. Videotape equipment, if determined to be unsatisfactory by the Engineer, shall

be removed from the job site and replaced with acceptable equipment at no additional cost.

The videotape shall be taken of all unusual construction areas and at street crossings, paved driveway crossings, curb, lawns and all points of possible future controversy before any work at these points is started. The videotapes shall include the following requirements:

- (1) Street name with intersecting street indicated,
- (2) Job name, direction of camera, date, time, location, highlighted on the audio track,
- (3) Running footage counter,
- (4) Commentary on all physical attributes including but not limited to defects, connections and unusual conditions
- (5) No background noise;
- (6) Two (2) copies of a map, approved by the Engineer, illustrating the limits of T.V. inspection. Maps should be affixed to the video tape;

PART THREE - EXECUTION - Not applicable.

PART THREE - EXECUTION - Not applicable.

**END OF SECTION**



## PART ONE - GENERAL

### 1.1 ACCEPTANCE

Operation of any system by the Owner shall not constitute acceptance of the work. The work shall be accepted only after the Contractor receives written notice from the Engineer that the work installed complies with and satisfies the intent of the Contract Documents.

### 1.2 CONDITIONS PRIOR TO CLOSEOUT

The Contractor shall fulfill all of the requirements of the General Conditions of the Contract which apply and form a part of these specifications. These requirements shall include, but not be limited to the following:

- 1) Clean-up;
- 2) Guarantee;
- 3) Bonds;
- 4) Affidavits;
- 5) Record drawings;
- 6) Final inspection requirements;
- 7) Manufacturer's certification of installation;
- 8) Testing;
- 9) Restoration of damages;
- 10) Removal of Contractor-Owned items;
- 11) Manufacturer's equipment or product warrantee; and,
- 12) Operation and Maintenance Manuals.

### 1.3 CLOSEOUT PROCEDURES

- A. The Contractor shall perform all closeout procedures in the presence of the Engineer and a representative of the Owner.
- B. The Contractor shall sequence closeout procedures properly so that work will not be endangered or damaged, and so that every required performance will be fully tested and demonstrated.
- C. The Contractor shall check each item in each system to determine that it is set for proper operation. With the Engineer and the Owner's

representative present, the Contractor shall demonstrate that all equipment and appurtenances are properly installed during a test of appropriate duration as specified elsewhere.

- D. Following the final test, the Contractor shall clean the entire work area thoroughly. Any remaining debris shall be removed from the premises and disposed of properly off-site by the Contractor.

PART TWO - PRODUCTS - Not applicable.

PART THREE - EXECUTION - Not applicable.

**END OF SECTION**

PART ONE – GENERAL

1.1 DESCRIPTION

- 1.1.1 Work Included: The Contractor shall furnish, erect, maintain and remove all temporary works as may be required to ensure safety and adequate protection for any and all persons and the surrounding environment directly or indirectly exposed to the construction environment.

These requirements include material, equipment, labor, material, equipment or any other provisions as necessary, such as guards, lights, barriers, sign posts, etc.

- 1.1.2 Related Work Described Elsewhere:

Temporary Facilities and Controls	Section 01500
Soil Erosion and Sediment Control	Section 02270
Excavation, Backfilling and Compacting	Section 02221

1.2 JOB CONDITIONS

- 1.2.1 General: The Contractor shall minimize environmental impact due to his construction operations during all phases of his work.

- 1.2.2 Definitions: Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents that adversely affect human health or welfare; unfavorably alter ecological balances of plant or animal communities; or degrade the environment from an aesthetic, cultural or historic perspective.

Environmental protection is the prevention/control of pollution and habitat disruption that may occur during construction.

The control of environmental pollution and damage requires consideration of air, water, land, biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive materials; and other pollutants.

1.3 PROHIBITED CONSTRUCTION PROCEDURE

- 1.3.1 General: The Contractor shall not conduct any operations which are considered to be prohibited construction procedures as defined by the New Jersey Department of Environmental Protection and/or the Occupational Safety and

Health Administration. Prohibited construction procedures include, but are not limited to the following activities:

- (1) Dumping of material into any stream corridor, wetlands, surface waters or unspecified location
- (2) Indiscriminate and arbitrary operation of equipment in stream corridors, wetlands or any surface waters.
- (3) Pumping of silt-laden water from trenches or other excavations into surface waters, stream corridors, wetlands and sewer systems.
- (4) Damaging vegetation adjacent to or outside of the access road or the right-of-way.
- (5) Disposal of trees, brush and other debris into streams, wetlands, surface waters or at any unspecified location.
- (6) Permanent or unspecified alteration of the flow line of the stream.
- (7) Open burning of project debris.
- (8) Stockpiling of materials within environmentally sensitive areas without direction from the Engineer.
- (9) Disposing of excess or unsuitable excavated material in wetlands or flood plains even with the permission of the property owner.
- (10) Disposing of asbestos contaminated material as household waste or in any manner less than the required procedure for handling and disposing of hazardous material.

The Contractor shall, upon notification of the Engineer, cease any operations which, in the opinion of the Engineer, are considered to be prohibited construction procedures. The Contractor shall correct, as directed by the Engineer, any defects of said operations, at no cost to the Owner.

Any damage occurring to the surrounding area shall be repaired immediately by the Contractor at his expense.

During construction the Contractor shall take all precautions and use barriers or other protective devices necessary to prevent damage to the existing structures or their contents beyond the limits necessary for the proper completion of the work.

- 1.3.2 Steep Slopes: Slopes exceeding 15 percent require special treatment. Measures such as water diversion berms, sodding, or the use of jute or excelsior blankets should be used as appropriate. Hay bales shall be placed at the base of the slope prior to ground disturbance. Steep slopes that have been disturbed, if not sodded, shall be seeded and mulched immediately after construction is complete. Slope board or other measures necessary to prevent slumping of the disturbed slope shall be incorporated, where appropriate.

1.3.3 Dewatering: When dewatering will occur in the vicinity of structures or potable wells, the contractor must monitor for adverse affects to structures or wells due to dewatering and will be responsible to remedy it to the satisfaction of the Department.

1.3.4 Stockpile, Storage and Disposal: Only environmentally suitable stockpile sites may be used for the purposes of staging or storing materials, equipment and suitable trench backfill material. Environmentally suitable sites must be level, and devoid of mature stands of natural vegetation. Drainage facilities and features, wetlands and stream corridors are not environmentally suitable sites.

The boundary of the stockpile area shall be clearly marked by hay bales, silt fencing or another appropriate method. Where fill is to be stored in excess of 14 days, a suitable means of protecting excavated material from wind and water erosion shall be employed. Erosion control methods may include one or more of the following: mulching, sprinkling, silt fencing, haybailing and stone covering.

1.3.5 Dust Control: In order to control dust, as often as required during each working day, and particularly prior to the conclusion of each working day areas under immediate construction (including access road and other area affected) shall be swept and wet down with water sufficiently to lay dust. In addition, these areas shall be wet down during non-working hours (including weekends) as often as required to keep the dust under control.

1.3.6 Noise Control: In order to limit noise impacts in the vicinity of sensitive receptors, construction operations and activities must be limited as follows:

- (1) Monday through Friday between the hours of 7:00 A.M. and 6:00 P.M. unless variances to these times are granted in times of emergency.
- (2) No driving, pulling, or other operations entailing the use of vibratory hammers or compactors will be permitted, other than between the hours of 8:00 A.M. and 5:00 P.M.
- (3) The numbers of machines in operation at a given time must be limited to the minimum practicable.
- (4) All engine generators or pumps must have mufflers and be enclosed within a temporary structure.

#### 1.4 REGULATIONS

The Contractor shall comply with all applicable Federal, State and local regulations governing the control of air and water pollution and solid wastes.

## 1.5 EXISTING DRAINAGE FACILITIES

The Contractor shall, at all times and during all phases of his operations, provide for continuous and unaffected function of all manmade and natural surface and subsurface drainage systems which may be affected by the construction. Said provisions shall be approved by the Engineer prior to their installation or utilization and shall be performed at no additional compensation.

PART TWO – PRODUCTS - Not applicable.

## PART THREE – EXECUTION

### 3.1 SAFETY REQUIREMENTS

- 3.1.1 Codes: All construction work shall be performed in accordance with all applicable safety codes. Applicable safety codes shall mean the latest edition including any and all amendments, revisions and additions thereto to the Federal Department of Labor, Occupational Safety and Health Administration's "Occupational Safety and Health Standards" (OSHA); and applicable safety, health regulations and building codes for construction in the State of New Jersey.

All work shall be accomplished in a manner to provide for the safety of the workmen, public and others who might be affected by the work. Safety requirements shall also include adherence to all applicable local safety codes and ordinances. The Contractor shall install and maintain all necessary warning signs, lights or other equipment required to maintain the safety of these operations.

- 3.1.2 Hazardous Environment: Various portions of the work shall be performed in a hazardous environment due to existing sewage and sewage gases. The Contractor shall be responsible for the safety of the workers, the general public, and all others who may be affected by the work.

### 3.2 PROTECTION

- 3.2.1 Existing Facilities: The Contractor shall make provision for the protection of all existing structures, utilities, trees, or other which might be damaged in the course of the Contractor's demolition or construction operations.

Provide adequate and suitable protection to the Owner's occupancy and to the surrounding residential occupancy during the execution and completion of the work required as specified herein.

Execution and completion of the work required shall be accomplished in such a manner that any and all residential activities may take place without any interference, interruption or endangerment, and at no time shall public health be compromised. The Contractor shall work in close cooperation and coordination

with the Engineer to assure that no changes in the normal residential activities occur and a minimum of nuisances result from his operations.

**END OF SECTION**

Section 02050  
DECOMMISSIONING  
AND DEMOLITION

PART ONE - GENERAL

1.1 DESCRIPTION

1.1.1 Work Included: The Contractor shall furnish all equipment, materials, labor and supervision required to remove the existing tanks, pumps, controls, piping, structures and all other equipment and appurtenances within the existing Skyview-Hibrook, Oakwood Knolls and Chapel Hill Treatment Plants, and the Hibrook and Skyview Pumping Stations, as specified herein and as shown on the Contract Drawings. No demolition of treatment units shall commence until after the new pumping stations for each site are operational. All tanks, chambers and manholes shall be cleaned of all residual materials and equipment prior to demolition, as specified under Part Three- Execution of this section.

1.1.2 Related Work Described Elsewhere:

Environmental Protection

Section 02030

1.2 QUALITY ASSURANCE

1.2.1 Standards:

- (1) Comply with standards specified herein as listed in the General Conditions of the Contract.
- (2) Comply with ANSI, OSHA, ASTM and all applicable Federal, State and local codes including revisions to date of contract.
- (3) Referenced Specifications: New Jersey Department of Transportation Standard Specifications for Road and Bridge construction, dated 2007, plus addenda when referred to, shall become part of this specification for materials and construction requirements. A referenced Pay Item Number shall serve to describe the required work for this project providing material and construction conforming to all applicable requirements under the NJDOT Specifications except for measurement and payment. The measurement and payment section of the NJDOT Specifications shall **not** apply as all work under this section shall be included in the Contractor's lump sum and unit price bid for this Contract. Where the referenced specifications cite requirements differing from those included in these specifications. The more stringent, highest quality shall govern.



## PART TWO - MATERIALS

### 2.1 SALVAGE MATERIAL

The Owner shall have the opportunity to evaluate all equipment removed as salvageable or rubbish. All items of material and equipment designated as rubbish shall be removed from the property by the Contractor. Any items designated as salvageable shall be delivered to the Borough of Oakland. It shall be deemed that the salvage value of all items retained by the Contractor is reflected in the lump sum price bid for this Contract. The bid price shall also include the complete removal from the site of all materials not to remain the property of the Owner, whether or not the same have salvage value.

## PART THREE - EXECUTION

### 3.1 SAFETY REQUIREMENTS

- 3.1.1 Codes: All work shall be performed in accordance with all applicable safety codes. Applicable safety codes shall mean the latest edition including any and all amendments, revisions and additions thereto to the Federal Department of Labor, Occupational Safety and Health Administration's "Occupational Safety and Health Standards" (OSHA); and applicable safety, health regulations and building codes for construction in the State of New Jersey.

All work shall be accomplished in a manner to provide for the safety of the workmen, public and others who might be affected by the work. Safety requirements shall also include adherence to all applicable local safety codes and ordinances. The Contractor shall install and maintain all necessary warning signs, lights or other equipment required to maintain the safety of these operations.

### 3.2 PROTECTION

- 3.2.1 Existing Facilities: The Contractor shall make provision for the protection of all existing structures to remain, utilities, trees, or other which might be damaged in the course of the Contractor's demolition or construction operations.

Provide adequate and suitable protection for the Owner's occupancy and for the surrounding residential occupancy during the execution and completion of the demolition work required as specified herein. Execution and completion of the work required shall be accomplished in such a manner that any and all residential activities may take place without any interference, interruption or endangerment, and at no time shall public health be compromised. The Contractor shall work in close cooperation and coordination with the Engineer to assure that a no changes in the normal residential activities occur and a minimum of nuisances result from his operations.

- 3.2.2 Utility Lines: Care shall be taken to protect utility lines that are in the site area. The Contractor shall inform the Engineer of their location and shall notify the Engineer of any breaks immediately. In the event of a break of a utility line, caused by the Contractor's operations, the Contractor shall be responsible for either immediately repairing the lines at his own cost or arranging for the appropriate utility to make such repair at the Contractor's cost.

The Contractor shall establish the temporary bypass pumping system prior to any interference with existing facilities.

### 3.3 METHODS OF DEMOLITION

- 3.3.1 General: The methods of demolition to be used by the Contractor shall be approved by the Engineer. Once approved the Contractor shall utilize the approved method to satisfactorily complete the work.

The Contractor shall immediately dispose of all demolished structures, pipes and appurtenances from the project site unless otherwise directed by the Engineer.

All tanks, chambers, and manholes which are to be demolished at each site shall be thoroughly cleaned of all liquids, solids, media, chemicals, etc. in accordance with all applicable Federal, State, and local regulatory requirements. All buried (and/or partially-buried) metallic tanks, chambers, and manholes shall be removed out of the ground.

Demolition of structures shall extend to two (2) feet below existing grades. Structures shall then be backfilled to grade with suitable backfill materials. Connecting buried piping shall be drained, and ends plugged. Surface piping shall be removed

All equipment within structures to be demolished, including, but not limited to, pumps, blowers, comminutors, flow meters, piping, etc. shall be removed.

Treatment equipment inside buildings which are to remain, including generators, blowers, compressors, flow meters, UV equipment, pumps, piping, etc. shall be removed.

Electrical panels associated with equipment to be removed, shall also be disconnected and removed. Main distribution panels in buildings shall remain if their condition is acceptable as determined by the Engineer.

- 3.3.2 Skyview-Hibrook Treatment Plant: Facilities to be demolished Skyview-Hibrook Treatment Plant shall include, but not be limited to, the following:

- 1) Influent and Bypass Valves.
- 2) Comminutor Chamber.

- 3) Influent Splitter Box.
- 4) Aeration and Settling Tanks.
- 5) Junction Box.
- 6) Splitter Box.
- 7) Sand Filters (sand to be removed).
- 8) Flow Meter.
- 9) Chlorine Contact Tank and Building.
- 10) Dechlorination Box.
- 11) Sludge Holding Tank.
- 12) Blower Building Equipment.
- 13) Associated Piping and Controls.
- 14) The Blower Building to remain.

3.3.3 Chapel Hill Treatment Plant: Facilities to be demolished Chapel Hill Treatment Plant shall include, but not be limited to, the following:

- 1) Comminutor and Bar Screen.
- 2) Aeration Tanks.
- 3) Settling Tanks.
- 4) Wet Well.
- 5) Mud Well.
- 6) Denitrification Tank.
- 7) Flocculation Tank.
- 8) Tube Media.
- 9) Media Filters.
- 10) Clear Well.
- 11) UV Equipment.
- 12) Flow Meter.
- 13) Sludge Holding Tank.
- 14) Generator and Fuel Storage Tank.
- 15) Associated Piping and Controls.
- 16) The wood framed building housing the treatment units shall remain.

3.3.4 Oakwood Knolls Treatment Plant: Facilities to be demolished Oakwood Knolls Treatment Plant shall include, but not be limited to, the following:

- 1) Influent Manholes (2).
- 2) Splitter Box.
- 3) Equalization Tank Influent Chamber.
- 4) Equalization Tank.
- 5) Equalization Blowers.
- 6) Aeration and Settling Tank.
- 7) Feed Well.
- 8) Upflow Clarifier.
- 9) Media Filters (2).
- 10) Backwash Tanks (2).
- 11) Chlorine Contact Tank.
- 12) Clear Well.
- 13) Flow Meter Manhole.
- 14) Sludge Holding Tanks (2).
- 15) Generator and Fuel Storage Tank.
- 16) Associated Piping and Controls.
- 17) The building housing the Upflow Clarifier and the Media Filters shall remain.

3.3.5 Not Acceptable: The Contractor shall not use any type of explosive charges or devices that would explode or implode any structure.

Free falling of structural members either by "wrecking ball" or "drop hammer" type equipment shall not be permitted.

Any method that would cause interference, interruption or endangerment to any residential activities, and may compromise the well being of the public health will not be permitted.

Any method attempted other than what has been submitted and approved by the Engineer shall not be permitted.

### 3.4 REMOVAL AND DISPOSAL

All items of material and equipment designated as rubbish, by the Owner, shall be removed from the property by the Contractor. The Contractor shall remove, haul and legally dispose of all material generated from the demolition and removal of existing structures. The Contractor is strongly encouraged to salvage any material he can from the demolition work. All materials not to be utilized on the project shall be removed from the site and properly disposed of by the

Contractor at an approved location. The materials may be stockpiled on the site at a location approved by the Engineer and removed in a timely manner per the approved construction schedule.

Removal of residual materials: grit, screenings, scum, sludges, filter sand and media, chemicals and other solids, shall be as required under New Jersey Administrative Code (NJAC) Section 7:14A- 23:34, Closure Requirements for Wastewater Treatment Units. Full required closure documentation shall be provided to the Owner by the Contractor.

Upon completion of closure activity, Owner shall coordinate with the New Jersey Department of Environment Protection for a certification of closure, a final site inspection, and an Application for Termination.

The Contractor shall correct any closure deficiencies determined from the final site inspections, at no additional cost to the owner

**END OF SECTION**

Section 02200  
SELECT FILL AND  
FOUNDATION MATERIAL

PART ONE - GENERAL

1.1 DESCRIPTION

- 1.1.1 Work Included: Under this section, the Contractor shall provide all labor, equipment and materials necessary to furnish and install all select fill and foundation material complete and in place and as specified herein or as directed by the Engineer.

1.2 QUALITY ASSURANCE

1.2.1 Standards:

1. Comply with ANSI, OSHA, ASTM and all applicable Federal, State and local codes including revisions to date of contract.
2. Comply with ASTM and all applicable Federal, State and Municipal codes including revisions to the date of the contract, such as the ASTM D-2487 Standard Test Methods for Classification of Soils for Engineering Purposes.
3. In all cases where a, device or part of the equipment, is referred to in this section by a singular number (such as "test"), it is intended that such reference shall apply to as many devices as are required to complete the installation.
4. Referenced Specifications: New Jersey Department of Transportation Standard Specifications for Road and Bridge construction, dated 2007, plus addenda when referred to, shall become part of this specification for materials and construction requirements. A referenced Pay Item Number shall serve to describe the required work for this project providing material and construction conforming to all applicable requirements under the NJDOT Specifications except for measurement and payment. The measurement and payment section of the NJDOT Specifications shall **not** apply as all work under this section shall be included in the contractor's lump sum and unit price bid for this Contract. Where the referenced specifications cites requirements differing from those included in these specifications. The more stringent, highest quality shall govern.

- 1.2.2 Qualifications of Manufacturers: Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Engineer.

### 1.3 PRODUCTION HANDLING

- 1.3.1 Protection: Use all means necessary to protect the material of this section up to acceptance by the Owner upon delivery.

## PART TWO - PRODUCTS

### 2.1 SELECT FILL

- 2.1.1 Type: Select Fill to be used if sufficient suitable material for backfill, fill and other purposes is not available from the executed material, then the Contractor shall procure elsewhere, a sufficient quantity of suitable select fill materials as directed by the Engineer.
- 2.1.2 Backfill and Select Fill: And backfill and select fill materials, unless otherwise specified, shall consist of a suitable selected and approved earth generally from storage of approved excavated soil.
- 2.1.3 Acceptance of Materials: A one hundred forty (140) pound bag sample of each type of material to be used as select fill shall be submitted to the Engineer for approval ten (10) days prior to delivery. By submitting samples of this material, the Contractor agrees and guarantees that the material used for procurement will conform with the sample(s) supplied. Final acceptance of material for select fill rests with the Engineer, whose decisions shall be final and binding upon the Contractor. The acceptance of any sample material by the Engineer shall not relieve the Contractor of his responsibility to use the material conforming to the sample(s) as approve by the Engineer.

Each sample bag shall bear an identification tag, naming the site and location of the borrow pit, and shall be submitted with an accompanying report (signed and sealed by a professional engineer licensed in the State of New Jersey). The professional engineer shall be from a qualified geotechnical engineering firm and its laboratory attesting to the adequate properties of the material submitted. The Contractor shall further provide the Engineer with a volumetric computation, indicating the amount of material available at the particular borrow pit from which the approved soils are to be excavated. Any change in site or actual material used shall be similarly submitted to the Engineer for approval.

The Engineer reserves the right, to visit any and all borrow pit sites for purposes of inspection and verification of available supply. The Owner reserves the right of taking specimens and samples for testing by designated personnel which shall be included in the Contractor's lump sum unit price. All testing and reports shall be developed at the cost of the Contractor.

### 2.2 FOUNDATION MATERIAL

- 2.2.1 General: Foundation material shall be Crushed Stone conforming to NJDOT Section 901.04, consisting of hard, sharp, clean material. The material shall be

## Select Fill and Foundation Material

free from any considerable amount of flat, laminated or elongated particles and shells, clay, limestone, shale or other deleterious matter. Foundation material shall conform to the following:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
1½ in	100
¾ in	55-90
No. 4	25-60
No. 50	5-25
No. 200	3-12

Foundation material shall be placed and compacted as specified in Section 02221, EXCAVATION, BACKFILLING AND COMPACTING.

### PART THREE - EXECUTION

#### 3.1 GENERAL

All select fill and foundation material shall be filled and compacted in accordance with Section 02221, EXCAVATION, BACKFILLING AND COMPACTING and as shown on the Contract Drawings or as directed by the Engineer.

Select Fill shall be placed at locations where existing material is deemed unsuitable by the Engineer.

#### 3.2 FIELD TESTING

The Owner reserves the right to taking specimens and samples for testing by designated personnel.

**END OF SECTION**



Section 02221  
EXCAVATION, BACKFILLING  
AND COMPACTING

PART ONE – GENERAL

1.1 DESCRIPTION

- 1.1.1 Work Included: Under this section, the Contractor shall provide all labor, equipment and material necessary to do all excavation, backfilling and compacting complete in place, as specified herein and approved by the Engineer.

In general, work to be included under this section shall include, but not be limited to, the following:

- (1) Unclassified excavation,
- (2) Rock excavation,
- (3) Dewatering,
- (4) Sheet piling and bracing,
- (5) Disposal of excess materials,
- (6) Importing of classified fill material required to construct the structures including pipelines, roadways, etc.,
- (7) Backfilling and compacting, and
- (8) Rough and final grading of the site.

1.1.2 Related Work Described Elsewhere:

Select Fill and Foundation Material	Section 02200
Surface Restoration	Section 02500
Pipe and Pipe Fittings	Section 15076

1.2 QUALITY ASSURANCE

1.2.1 Standards:

- (1) Comply with ANSI, OSHA, ASTM and all applicable Federal, State and local codes including revisions to date of contract.
- (2) Referenced Specifications: New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, dated 2007, plus addenda when referred to, shall become part of this specification for materials and construction requirements. A referenced Pay Item Number shall serve to describe the required work for this project providing material

and construction conforming to all applicable requirements under the NJDOT Specifications except for measurement and payment. The measurement and payment section of the NJDOT Specifications shall **not** apply as all work under this section shall be included in the Contractor's lump sum prices and unit prices bid for this Contract. Where the referenced specifications cite requirements differing from those included in these specifications, the more stringent, highest quality shall govern.

- 1.2.2 Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Engineer.

### 1.3 PRODUCT HANDLING

- 1.3.1 Protection: Use all means necessary to protect the equipment and materials of this section before, during and after installation and to protect the installed equipment and materials of other trades.

## PART TWO – PRODUCTS

### 2.1 EXCAVATION, BACKFILLING AND COMPACTING

- 2.1.1 General: This section includes all excavation, backfill and compaction necessary to complete the work as shown on the Contract Drawings and required for all structures above and below ground. Excavation shall include the removal of all materials as specified by the Engineer. This section also includes the rough and final grading of the site.
- 2.1.2 Approval Required: All materials to be utilized on the project shall be subject to the approval of the Engineer. The Engineer alone shall determine whether a material is suitable or unsuitable for the use intended. This shall require the Contractor's removal of existing unsuitable material from beneath a roadway, paved, or turf areas and the importation of suitable material from offsite. To the extent possible use shall be made of existing material excavated within the site in the course of the construction work. When sufficient on-site suitable material does not exist, the Contractor shall import approved material from offsite.

It shall be noted that fill material of satisfactory character may not be available on the site and selected fill of the required character shall be brought to the site, placed and compacted as required by the Contractor at the unit price bid in the Proposal and shall conform with the requirements of Section 02200, SELECT FILL AND FOUNDATION MATERIAL.

The Engineer shall approve type, mixture and other requirements for Select Fill Material.

2.1.3 Suitable Material: In general, any mineral (inorganic) soil, blasted or broken rock and similar materials of natural or man-made origin, including mixtures thereof, are considered as suitable materials, as determined by the Engineer as suitable for filling, backfilling, embankment construction, as a base for placement of pipe, structures, or fill, or other uses.

2.1.4 Unsuitable Materials: Any material containing clay, vegetable or organic material, such as muck, peat, organic silt, topsoil or sod, that is not satisfactory for the use intended, as determined by the Engineer, is designated as an unsuitable material.

## 2.2 SELECT FILL

Select Fill to be used throughout the project shall be Dense Graded Aggregate (DGA). DGA shall consist of broken stone, or crushed gravel and shall conform to NJDOT Subsection 901.08.

## 2.3 FOUNDATION MATERIAL

Foundation material shall be  $\frac{3}{4}$  inch clean crushed stone conforming to NJDOT Section 901.05, consisting of hard, sharp, clean material. The material shall be free from any considerable amount of flat, laminated or elongated particles and shells, clay, limestone, shale or other deleterious matter.

## 2.5 SHEETING AND BRACING

2.5.1 Wood Sheeting: Wood sheeting shall be of such quality and size that it shall not split in driving. Sheeting and bracing shall be Southern Pine, a structural grade, of 1800 psi stress class and furnished in accordance with the standard rules for grading, dressing and inspection of joists, planks, beams and stringers of the Southern Pine Association. Douglas Fir or other timber of equivalent grade may be substituted. Materials may be either new or used in good condition, and free of large or loose knots. Where close or tight sheeting is required, wood sheeting shall be tongued and grooved.

2.5.2 Steel Sheeting: Steel sheeting shall be manufactured from steel conforming to ASTM Des. A328, latest edition, and bracing shall conform to the standard specifications for bridges and buildings, ASTM Designation A-36, latest edition.

Materials may be either new or used in good condition. The sizes and types required may be indicated on the Contract Specifications, or if not so shown, steel sheeting shall have a minimum thickness of  $\frac{3}{8}$ -inch in web and flange, unless approved otherwise by the Engineer, and shall be as detailed by the Contractor, subject to the approval of the Engineer. All necessary welding of supporting members shall be done in accordance with requirements of the American Welding Society Code.

## PART THREE - EXECUTION

### 3.1 INSPECTION OF CONDITIONS

- 3.1.1 General: Examine the areas and conditions under which work of this section shall be installed. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.
- 3.1.2 Pre-Existing Site Conditions: The Contractor shall perform a field investigation to document the condition of existing structures on adjacent properties. The Contractor shall be solely responsible for protection of existing structures.

During all phases of the Work, the Contractor shall carefully protect existing structures. If damage occurs as a result of the Contractor's operations, the Contractor shall be required to repair the damaged structures, to the satisfaction of the Owner, and at the expense of the Contractor.

### 3.2 JOB CONDITIONS

- 3.2.1 Dust Control: Use all means necessary to control dust on and near the site and on and near all off-site borrow areas if such dust is caused by any of the Contractor's operations during performance of the various contracts, or if resulting from the condition in which the Contractor leaves the site. Thoroughly moisten all surfaces twice a day or as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the site.
- 3.2.2 Protection: Use all means necessary to protect the work of this Section before, during, and after installation and to protect all objects designated to remain. Place temporary fencing, and night illumination and safety blinkers around all open excavations. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.
- 3.2.3 Existing Structures: Settlement observation points shall be installed by the Contractor on existing structures and monitored daily to detect any subsidence caused by dewatering procedures. Contingency plans shall be made for recharging the groundwater at the existing structure locations if unacceptable settlements begin to occur.

### 3.3 EXCAVATION

- 3.3.1 General: Excavation shall be made in open cut to the widths and depths necessary for constructing, according to the Contract Drawings, all structures, pipelines, roads, pavements, walks and other items of work include in this Contract, except those specifically excluded. The excavations shall be of

sufficient size to permit the work to be properly constructed in the manner and of the size specified. Wherever the nature of the ground shall permit, the bottom of the Excavation is to have shape and dimensions shown on the Contract Drawings. The excavation to the grades as shown on the Contract Drawings or as ordered by the engineer may be dug by machine as conditions permit and as the Contractor desires, provided that reasonable care is exercised not to unduly disturb the natural state of the soils below this depth of excavation. Excavations carried below the required depth without specific directions from the Engineer shall be refilled to the proper grade with lean concrete or other materials at the direction of the Engineer, at no additional cost to the Owner. All excavations near existing piping or conduit shall be done by hand. Special care shall be exercised to avoid damage to existing pipes and conduit. Any pipes or conduits damaged during excavation, whether shown on the Contract Drawings or not, shall be repaired or replaced at the Contractor's expense. The top portion of a trench may be excavated with vertical or sloping sides to any width which shall not cause damage to adjoining structures, roadways, pavements, utilities, trees or private property. The slope of the sides of an unshored trench and the size and spacing of members used to shore a trench excavated with vertical sides shall be in accordance with Occupational Safety and Health Act of 1970 (PL 91-596).

A sufficient quantity of approved suitable excavated material shall be stockpiled for use as fill to be used to bring the site to final grade as shown on the Contract Drawings. All suitable excavated materials shall remain the property of the Owner until such time as indicated by the Engineer. The removal and disposal of excess excavated materials and unsuitable materials shall be the responsibility of the Contractor.

Test pits shall be dug in advance of the excavation for trenches or structures, as shown on the Contract Drawings or as ordered by the Engineer, or upon his written approval when requested by the Contractor.

In the event that the materials encountered at the specified elevations are not suitable or in case it is found desirable or necessary to go to additional depth, the excavation shall be carried to such additional depth as the Engineer may direct in writing. The Contractor shall refill such excavated space with either Class B Concrete or Crushed Stone, or other selected fill materials as ordered by the Engineer.

Crushed stone employed for bedding materials shall consist of graded material as described in Section 02200, SELECT FILL AND FOUNDATION MATERIAL.

Bedding material shall be installed for the pipelines and be placed as specified on the Contract Drawings and thoroughly compacted by tamping or slicing with a flat blade shovel.

Bedding under structures shall be placed at a minimum thickness of 8 inches, or as shown on the Contract Drawings.

- 3.3.2 Roadway Excavation, Rock: Shall consist of the removal and disposal of boulders 1.0 cubic yard or more in volume; solid rock; materials that cannot be removed in ledges or aggregate conglomerate deposits that are so firmly cemented as to possess the characteristics of solid rock. Hard and compact materials such as hardpan, frozen earth, cemented-gravel, glacial till, and relatively soft or disintegrated rock that can be removed without continuous and systematic drilling and blasting shall not be considered as roadway excavation, rock. Road pavement, curbs, gutters, walks and structures shall not be considered as rock. Roadway Excavation, Rock shall not be considered as such because of intermittent drilling and blasting that is performed merely to increase production.

On rock surfaces to receive concrete footings, the rock shall be worked down to a satisfactory bed or sidewall. Only drilling, picking, barring, wedging, or similar methods that shall leave the foundation rock in an entirely solid and unshattered condition shall be used on rock surfaces to receive concrete. Approximately level surfaces shall be roughened, and sloped surfaces shall be cut as directed into rough steps or benches to provide a satisfactory bond with concrete. Shales shall be protected from flaking or other erosion resulting from ponding or flow of water.

- 3.3.3 Blasting: Blasting shall only be allowed with written approval by the Engineer. The Contractor shall employ experienced drillers and blasters for this work. The use of air compressors and safety measures shall conform to OSHA, State and Local laws.

Explosives for blasting shall be stored, handled and used in accordance with the laws and regulations of the State of New Jersey, all local regulations and with such additional regulations as the Engineer may require.

The Contractor shall take out such permits as may be necessary and execute a bond if required by the ordinances of the municipality in which the work is located.

In all cases, the delayed type of blasting cap shall be used. No hole shall be loaded to a depth greater than 8 feet below the rock surface.

Drill holes shall not be spaced more than 24 inches apart, and no more than three holes shall be loaded and/or fired at one time.

Blasting shall be conducted so as not to endanger persons or property; and unless otherwise permitted shall be covered or otherwise satisfactorily confined.

The Contractor shall be responsible for and shall make good any damage of whatever nature caused by blasting or accidental explosions.

Prior to the start of any blasting operations, an inspection of the existing facilities, pipelines, etc., is to be made. All cracks, deformations, etc., should be noted and documented with photographs and a report prepared and submitted to the Engineer. The inspection and report is to be prepared by a professional engineer, at no additional expense to the Owner.

The Contractor, at his own expense, must obtain the services of a licensed professional engineer to certify, using approved vibration monitoring instrumentation, the vibration transmitted to the footings and walls of the facilities and to the nearby pipelines. All blasts are to be monitored.

If, during the blast, the peak particle velocity exceeds the specified maximum, all blasting operations are to be stopped and shall not be resumed until notified by the Engineer.

The Contractor shall be required to provide the necessary means, as approved by the Engineer, to prevent damages from fly rock during the blasting operations.

Blasting shall not be permitted within 25 feet of pipelines or structures unless written permission to do so is obtained from the Engineer and the Owner of said property, and a certified copy of such permit is filed with the Engineer. Blasting shall not be carried on within 300 feet of any radio transmitter or radio-frequency emission equipment (such as high-frequency welders), and blasting caps shall be kept in tightly closed all-metal cans when in the vicinity of such equipment. Rock excavation in areas inside of these limits shall be performed by barring, wedging or other approved method.

A sufficient quantity of explosives to avoid delay to the work may be kept on the site, but at no time shall there be a quantity of excess of that which shall be required for use within the following twelve hours. The magazine keeper shall keep accurate daily records and accounts for each piece of explosive detonator and equipment from the time of delivery at the magazine until used or removed from the site.

No blasting of any kind shall be done at any time except between the hours of 7 A.M. and 6 P.M. (and may be further limited by local regulations), not at any time on Sundays or religious holidays.

All complaints shall be investigated by a representative of the Contractor and then reported to the Engineer.

### 3.4 DEWATERING

- 3.4.1 General: Where dewatering is needed, the Contractor shall provide all diking, sheeting and dewatering that may be required to lower the ground water in excavations to a level at least 2 feet below the bottoms of these excavations and to maintain such level so that the roads, pipes and structures can be installed properly in conformance with the Contract Drawings and specifications. Dewatering shall be accomplished by open sumps, well points or other methods and shall be designed by a licensed Professional Engineer and coordinated with any sheet and bracing design. This design shall be approved by the Engineer. There shall be no additional compensation for any dewatering done nor additional compensation for equipment and materials used in connection therewith under this contract. Excavations for site utilities are not to be used as temporary drainage ditches. If diking and sheeting are used during dewatering, the construction and removal of same shall be included in the lump sum price bid for this item. Prior to commencing excavation, the Contractor shall submit to the Engineer for approval his proposed plans for dewatering the excavation. Lowering of ground water to the injury or detriment of other structures shall be part of the Contractor's risk and responsibility. Any structure injured or damaged as a result of the lowering of the ground water shall be repaired or replaced to the satisfaction of the Owners thereof, at the expense of the Contractor.

Before excavation to levels bearing strata is undertaken, well points or deep wells should be installed and the construction area dewatered to at least 2 feet below the planned bottom of the excavation.

### 3.5 SHEETING AND BRACING

- 3.5.1 General: Where excavations are made with sides which require supporting, the sheeting and bracing shall be of sufficient strength to sustain them against inward movement, loss of ground or damage to adjacent structures. Sheeting shall be of wood or steel as approved by the Engineer.

Wood sheeting shall be of such quality and size that it shall not split in driving. Sheeting and bracing shall be Southern Pine, a structural grade, of 1800 psi stress class and furnished in accordance with the standard rules for grading, dressing and inspection of joists, planks, beams and stringers of the Southern Pine Association. Douglas Fir or other timber of equivalent grade may be substituted. Materials may be either new or used in good condition, and free of large or loose knots. Where close or tight sheeting is required, wood sheeting shall be tongued and grooved.

Steel sheeting shall be manufactured from steel conforming to ASTM Des. A328, latest edition, and bracing shall conform to the standard specifications for bridges and buildings, ASTM Designation A-36, latest edition. Materials may be either new or used in good condition. The sizes and types required may be indicated



on the Contract Drawings, or if not so shown, steel sheeting shall have a minimum thickness of 3/8-inch in web and flange, unless approved otherwise by the Engineer, and shall be as detailed by the Contractor, subject to the approval of the Engineer. All necessary welding of supporting members shall be done in accordance with requirements of the American Welding Society Code.

It is an absolute requirement of this Contract that fully signed detailed drawings and design computations, prepared and signed by a Professional Engineer registered in the State of New Jersey, be submitted to the Engineer and meet with his approval prior to the use of any sheeting and bracing on the work. Designs shall take into account the Contractor's program for dewatering.

There shall be no additional compensation for any sheeting done, and the cost of designing, furnishing and driving the sheeting shall be deemed included under the unit price bid for trench excavation and backfill.

In order to maintain the stability of existing structures, sheeting shall be required for excavations adjacent to existing structures where the limits of the excavation are located inside a line which intersects the outside edges of the existing foundation, at the bottom of footing level, and is drawn upward from the bottom of the excavation at a slope of 2.5 horizontal to 1.0 vertical.

Underpinning shall be provided where indicated on the Contract Drawings or as directed by the Engineer. The Contractor shall submit shop drawings for Engineer's approval before proceeding with the underpinning work. All costs for underpinning shall be included under the unit price bid for each particular item requiring excavation.

### 3.6 FILLING, BACKFILLING, AND COMPACTION

- 3.6.1 Compaction Equipment: The Contractor shall supply data on the compaction equipment to the Engineer not less than five (5) days prior to intended use of this equipment and the equipment shall be approved by the Engineer prior to commencing compaction operations. The approval of the Engineer shall be construed merely to mean that at the time the Engineer is unaware of a reason for objecting thereto; and no such approval shall release the Contractor from his full responsibility for the accurate and complete performance of the work in accordance with the Contract Drawings and Specifications. The methods and equipment utilized shall be demonstrated to have sufficient capacity to uniformly compact the subgrade material and subsequent fill lifts for their full depth to the densities specified hereinafter. The Contractor shall include the cost of two (2) density tests and two (2) moisture content tests in the unit price bid for trench excavation and backfill. Tests shall be performed at a testing laboratory approved by the Engineer. The Engineer shall receive a copy of tests directly from the testing laboratory.

- 3.6.2 Compacting of Existing Subgrade and Fill: Compaction shall achieve densities of at least the following percent of the soil's maximum dry density as determined in the laboratory when tested in accordance with the most recent ASTM D-1557 Standard.

<u>Location</u>	<u>Percent Maximum Dry Density</u>
Beneath roadways, slabs, structures pipe bedding and two (2) foot cover thickness	95
Beneath pavements, sidewalks and general pipe backfill	95

Prior to placing backfill the existing subgrade shall be compacted to the minimum specified densities. All areas of the subgrade within roadway, driveway and parking limits shall be proof rolled with equipment previously approved by the Engineer. Areas found to be unsuitable shall be removed and replaced with select fill. Fill shall not be placed until compaction of the existing subgrade is approved by the Engineer. The depth of compaction for the existing subgrade shall be a minimum of 12 inches below the ground surface after removal of unsuitable soil.

When requested by the Engineer, the Contractor shall furnish the elevations of the subgrade to the Engineer.

- 3.6.3 Subgrade Approval: Immediately before placing crushed stone for bedding on compacted fill or virgin soil, the Engineer shall observe the subgrade. The Contractor shall remove any soft spots and replace with properly compacted material. Final subgrade elevations shall be finished within a tolerance of 2" of the required elevation when tested with a 10-foot straight edge. Rain, frost and other factors which in the opinion of the Engineer are potentially damaging to the fill occurring after the final approval, but before or during pouring, shall require additional observation of the compacted fill for approval by the Engineer.

#### 3.6.4 Selection and Classification of Backfill Materials

- (1) Types and Quality of Fill Material: To the extent possible, use shall be made of existing material on the site. For subgrade materials beneath pavements, below building slabs or structures, on-site borrow materials shall be used with and as selected fill used where possible, consisting of hard, durable particles, conforming to the requirements of Section 02200, SELECT FILL AND FOUNDATION MATERIAL.

The fill material shall be free of organic matter, rubble and all deleterious substance.

- (2) Acceptance of Fill Material: In the event the Contractor is permitted to employ fill material, which is not furnished from an on-site source, a one hundred and forty (140) pound bagged sample of each material to be used as fill shall be submitted to a laboratory approved by the Engineer ten (10) days prior to commencing fill operations. This material shall not be used as a compacted fill until approved by the Engineer. By submitting samples of this material, the Contractor agrees and guarantees that the fill material used for construction shall conform with the sample(s) supplied. Final acceptance of fill material rests upon the Contractor. However, the acceptance of any material by the Engineer shall not relieve the Contractor of his responsibility to have the fill materials used conform to the sample(s) approved by the Engineer.

Payment for the select fill, the cost of laboratory services, as well as the transportation of the samples to the laboratory, shall be included in the unit price bid in the Proposal for Select Fill.

3.6.5 Placement and Compaction of Fill: Where compacted fill including crushed stone is required, place and compact fill material in order to ensure the required soil density as specified.

- (1) Placement of Fill: The fill shall be spread evenly by mechanical equipment or by manual means above the approved subgrade and shall be mixed thoroughly and spread in lifts not exceeding 12 inches in thickness when loose and shall be built up in horizontal layers as nearly even as practicable to prevent the thickness of lift from exceeding that specified.
- (2) Moisture Control: The moisture-density curve for the fill used shall be supplied to the Contractor as a guide in controlling moisture to achieve the required degree of compaction. If, in the opinion of the Engineer, fill material becomes too wet for the required compaction, the fill shall be dried by a method approved by the Engineer prior to commencing or continuing compaction operations. Likewise, if, in the opinion of the Engineer, the fill material becomes too dry for the required compaction, the fill shall be moistened by a method approved by the Engineer prior to commencing or continuing compaction operations.
- (3) Drainage of the Site: At all times, maintain and operate proper and adequate surface and subsurface drainage to the satisfaction of the Engineer in order to keep the construction site dry and in such condition that placement and compaction of fill may proceed unhindered by saturation of the area. Soil Erosion Controls shall be used to provide sediment control. Plans for such control shall conform to the approved Soil Erosion and Sediment Control Plan.

- (4) Compaction of Fill: Fill is to be compacted to elevations and limits shown on the Contract Drawings. Any previously approved compacted fill or underlying virgin subgrade that softens due to disturbance, rainfall, exposure or any other cause shall be removed, or dried and recompactd to the approval of the Engineer, before the next lift is placed. Compaction shall conform to reference densities as specified.
- (5) Frost: No fill materials shall be placed when either the fill material or the previous lift or subgrade on which it is placed is frozen. In the event that any fill which has already been placed or the subgrade shall become frozen, it shall be scarified and recompactd, or removed, to the approval of the Engineer before the next lift is placed. Any soft spots resulting from frost shall be removed or recompactd to the satisfaction of the Engineer before new fill material is placed.
- (6) Backfill of Excavation: Any excavation (e.g. utilities, walls, footings, etc.) shall be backfilled and compacted as specified for that area. Where fill is placed adjacent to a wall, the difference in elevation of the top of the fill on either side of the wall can be no more that one foot unless the wall is adequately braced, or the wall shall have been designed to withstand pressures due to the unbalanced fill heights.
- (7) Backfilling and Pipelines: In backfilling of pipelines, each layer shall be thoroughly compacted with proper hand tools in such a manner as not to disturb or damage the pipe. Backfilling shall be carried on simultaneously on both sides of the pipe so that damaging side pressures do not occur.

After selected backfill material has been placed and tamped, the remainder of the trench may be backfilled with general excavated material, provided such material shall not contain more than 1/3 broken rock, of which no single stone shall be larger than 2 inches. Backfill material shall be placed in uniform layers thoroughly compacted with heavy duty power tamping tools, to the density specified and full satisfaction of the Engineer.

Whenever the trenches have not been properly backfilled or settlement occurs, they shall be refilled, smoothed off and finally made to conform to the surface of the ground. Backfilling shall be carefully performed and the original surface including pavement or other surfacing above the settled areas shall be restored to the full satisfaction of the Engineer, and at no additional cost to the Owner. Surplus material shall be disposed of as directed by the Engineer.

- (8) Elevations: The Contractor shall furnish to the Engineer the final elevation of each accepted compacted lift before placing or compacting the next

succeeding lift, the number of such elevations on each lift shall be determined by the Engineer.

- 3.6.6 Backfilling Prior to Approvals: The Contractor shall not allow or cause any of the work performed or installed to be covered up or enclosed by work of this Section prior to all required inspections, tests, and approvals.

Should any of the work be so enclosed or covered up before it has been approved, the Contractor shall uncover all such work at no additional cost to the Owner.

After the work has been completely tested, inspected, and approved, the Contractor shall make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the Owner.

- 3.6.7 Finish Elevations and Lines: For setting and establishing finish elevations and lines, the Contractor shall secure the services of a licensed surveyor in the State of New Jersey acceptable to the Engineer. The cost of the surveyor shall be borne by the Contractor. Carefully preserve all data and monuments set by the surveyor and, if displaced or lost, immediately replace by a licensed surveyor at no additional cost to the Owner.

- 3.6.8 Proof Rolling: The Contractor shall prepare the area as indicated on the Contract Drawings, to be paved. Prior to placement of subbase material, the entire area shall be proof rolled with a minimum 10-ton vibratory roller to assure uniform compaction prior to placement of roadway materials.

### 3.7 TUNNELING OR JACKING

- 3.7.1 General: Jacking may be used at the Contractor's option except where noted specifically. Tunnel or jacking shafts shall be located at points as approved by the Engineer.

In accordance with the provisions of the Contract, the Contractor shall submit to the Engineer for approval, before commencing any work in tunnel, plans and specifications for his plan and his methods of construction and handling of materials, in such detail and form as the Engineer may require.

- 3.10.3 Jacking: Where jacking is used, the Contractor shall submit for approval a description of the equipment and methods to be used.

Where the Contractor uses a casing pipe, The Contractor shall submit the diameter, thickness and material for approval. Joints of the casing shall be welded and shall be capable of resisting the jacking forces involved. The sewer pipe shall be placed in the casing on approved blocks that are secured in an

approved manner and that are arranged to hold the sewer on true line and grade. The annular space between the casing and the sewer pipe shall be filled with grout.

The jacking pit shall be located at the downstream side of the crossing. The backstop shall be designed to resist, without excessive deflection, jacking pressure equal to the capacity of the jacks used. If struts between wales are used below the pipe, a minimum of 12 in. clear must be maintained between the bottom of the pipe and the top of the strut.

The jacking operation shall be continuous, once started. Where conditions permit, the Contractor shall not excavate beyond the limits of the outside diameter of the pipe. If such excavation is necessary for maintaining alignment or for the removal of an obstruction, the Contractor shall, upon completion of the jacking, drill grout holes through the pipe at these locations and grout these annular spaces in accordance with the procedure outlined for grouting tunnel liner plates.

**END OF SECTION**

PART ONE - GENERAL

1.1 DESCRIPTION

- 1.1.1 Work Included: Under this section, the Contractor shall provide all labor, equipment and material necessary to control soil erosion resulting from construction operations and prevent excessive flow of sediment from the construction site, as shown on the Contract Drawings or as specified herein and approved by the Engineer. The Contractor shall perform all work required, such work may include the installation of water diversion structures, diversion ditches and sediment basins and seeding, mulching or sodding critical areas to provide temporary protection.

Every effort shall be made to prevent and correct problems associated with erosion and sedimentation, which could occur and after project construction. At a minimum, erosion and sediment control measures shall conform to the following:

- a. All erosion and sedimentation control measures shall be in place prior to any grading operations or construction of proposed facilities and shall be maintained until construction is complete and the construction area is stabilized. After restoration is complete, temporary control measures shall be removed and disposed of properly.
- b. All erosion and sedimentation control measures shall be constructed and maintained in accordance with the current "Standards for Soil Erosion and Sediment Control in New Jersey," prepared by the New Jersey State Soil Conservation Committee.
- c. Disturbed areas that will be exposed in excess of fourteen (14) days shall be temporarily seeded and/or mulched until proper weather conditions exist for establishment of a permanent vegetative cover.

In general, work to be included under this section shall include, but not be limited to, the following:

- (1) Erosion Control and Sediment Control.
- (2) Soil Stabilization.

1.1.2 Related Work Described Elsewhere:

Excavation, Backfilling and Compacting

Section 02221

1.2 QUALITY ASSURANCE

1.2.1 Standards:

(1) Comply with ANSI, OSHA, ASTM and all applicable Federal, State and local codes including revisions to date of contract.

(2) Referenced Specifications:

New Jersey Department of Transportation Standard Specifications for Road and Bridge construction, dated 2001, plus addenda when referred to, shall become part of this specification for materials and construction requirements. A referenced Pay Item Number shall serve to describe the required work for this project providing material and construction conforming to all applicable requirements under the NJDOT Specifications except for measurement and payment. The measurement and payment section of the NJDOT Specifications shall **not** apply as all work under this section shall be included in the contractor's lump sum and unit price bid for this Contract. Where the referenced specifications cites requirements differing from those included in these specifications. The more stringent, highest quality shall govern.

1.3 EROSION CONTROL

1.3.1 General:

Erosion control procedures shall be utilized along brook embankment, right-of-way, access roads and stockpile areas as shown on the Contract Drawings or as directed by the Engineer. Erosion control shall commence immediately and shall be maintained for the entire duration of the project.

The Contractor shall control erosion during all phases of construction, as shown on the Contract Drawings or as directed by the Engineer. When no work is performed for more than 10 days, work areas shall be protected by temporary seeding, mulching, sodding or the slope lengths shall be reduced by the installation of diversions or other means. When topography permits, debris basins shall be constructed at points of water concentration from critical areas that will remain unprotected longer than 10 days. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by paving or other means acceptable to the Engineer.

1.4 SEDIMENT CONTROL



- 1.4.1 General: To allow sediment to settle out of water that interferes with construction and before such water enters any surface waters, dewatering operation shall direct pumped as far as possible from the stream bank or receiving water. Care should be taken not to damage or kill vegetation by excessive watering or by damaging silt accumulation in the discharge area. Settling basins shall be constructed and used as specified by the Engineer where necessary to protect vegetation and to achieve environmental objectives.

The selection, design and construction of areas where excess excavated material, material hauled in for roads, access roads and stripped top-soil are to be placed, shall be consistent with environmental objectives and constraints. All such areas shall be approved by the Engineer. To avoid siltation due to construction, stockpile and dispersal of excess material, disposal of stockpile areas and access routes, shall not be located within or in adjacent areas which siltation could occur, to stream corridors and wetlands.

## PART TWO - PRODUCTS

### 2.1 SEDIMENT CONTROL

#### 2.1.1 Silt Fence:

- A. Geo-textile fabric section shall have a width of at least 3 feet. The total exposed silt fence height shall be 2 feet high after 1 foot of fabric is buried in the existing soil.
- B. Heavy duty silt fence shall consist of Geotextile fabric whose width shall be at least 4 feet to provide for a 3 feet high fence after 1 foot of fabric is buried in the existing soil.
- C. Geotextile Sections shall be joined in such a manner that, when in operation, the sections work effectively as a continuous fence. Fence posts shall be installed at a slight angle toward the anticipated runoff source.

- 2.1.2 Inlet Filters: Inlet filters, consisting of welded wire mesh and Geotextile fabric, shall be installed to control sedimentation at existing and proposed inlet drainage structures.

For existing inlet structures, Geotextile fabric shall be placed under the grates, over the curb and extend beyond a minimum of 6 inches. Coarse aggregate size No. 8 shall be placed behind each curb piece and on the Geo-textile fabric to secure the fabric in place.

Inlet filters shall be removed the same day as scheduled paving operations.

- 2.1.3 Inlet Sediment Traps: Inlet sediment traps, consisting of silt fence and temporary stone inlets, shall be constructed to control sedimentation at existing and new inlet drainage structures.

The silt fence shall be installed around the drainage structure and meet into the stone inlets. Fence posts shall be installed at a slight angle toward the anticipated flow.

The temporary stone inlets, consisting of coarse aggregate size No. 2, shall be placed in each flow line upgrade of the inlet structure. The coarse aggregate shall be placed on Geotextile fabric, which shall be buried in the soil. When sections of Geotextile fabric need to be joined, the sections shall be overlapped a minimum of 18 inches in the direction of flow.

- 2.1.4 Wheel Cleaning Blankets: At poorly drained locations, subsurface drainage gravel filter or geotextile shall be installed before installing the stabilized construction entrance.

Percent Slope of Roadway	Length of Stone Required	
	Coarse Grained Soils	Fine Grained Soils
0 to 2%	50 ft	100 ft
2 to 5%	100 ft	200 ft
>5%	Entire Surface stabilized with FABC base course	

Individual lot entrance and egress- After interior roadways are paved, individual lot ingress/egress points may require a stabilized construction entrance consisting of No. 3 stone (1 inch to 2 inches) to prevent or minimize tracking of sediments. Width of the stone ingress/egress shall be equal to lot entrance width and shall be a minimum of 10 feet in length. If space is limited, vehicle tires may be washed with clean water before entering a paved area. A wash station must be located such that wash water will not flow onto paved roadways or into unprotected storm drainage systems.

When construction access exits onto a major roadway, a paved transition area may be installed between the major roadway and stoned entrance to prevent loose stones from being transported out onto the roadway by heavy equipment entering and leaving the site.

- 2.1.5 Maintenance: The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto roadways. This may require periodic top dressing with additional stone or additional length as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spilled, dropped, washed, or tracked onto roadways (public or private) or other impervious surfaces must be removed immediately.

Where accumulation of dust/sediment is inadequately cleaned or removed by conventional methods, a power broom or street sweeper will be required to clean

paved or impervious surfaces. All other access points which are not stabilized shall be blocked off.

- 2.1.6 Hay Bales: Haybales shall be bound with wire or baling twine. The twine shall be an ultraviolet light stabilized polypropylene which has a knot strength of 170 pounds and straight break strength of 300 pounds.
- 2.1.7 Turbidity Barriers: A temporary floating barrier at streams or waterways within the construction site shall be provided.

To prevent the siltation of streams or waterways that pass through or about the construction site.

Floating turbidity barriers shall be used whenever construction operations are directly located in a stream or water course, or where a drainage pipe that may carry silt discharges into a stream or waterway.

This practice will limit the dispersion of runoff-borne sediment (and floatable material) to the immediate area of construction, thereby facilitating maintenance and cleanup. Sediment trapped behind the barrier will be permitted to drop out of suspension before being carried further downstream.

#### Design Criteria

1. Barrier material will be a Polyethylene Plastic sheet, 10 mil., or suitable alternate to fit existing conditions
2. Weights will be at 10-ft intervals along the entire length. They shall be 5 pounds and extend 12 inches below the bottom of the material.
3. Floats will be at 5-ft intervals; there will be two floats at each location, one on either side of the material.
4. Rope will be ¼-inch nylon or manila.

#### Placement:

1. Barrier will be set on a 50-ft radius from the point of discharge when discharging through a conduit. If the radius cannot be accommodated, barrier shall be placed in accordance with No. 3 below.
2. Barrier will extend parallel to the channel bank(s) for the full length of the work area for shoreline disturbances.

3. Barrier will extend across the entire channel when work is performed within the channel.

### PART THREE - EXECUTION

#### 3.1 DUST AND DIRT CONTROL

- 3.1.1 Dust Control: The Contractor shall employ construction methods and means that keep flying dust to the minimum. Laying of water or other dust control materials on the project and on roads, streets and other areas immediately adjacent to the project limits, wherever traffic or buildings that are occupied or in use, are affected by such dust caused by his hauling or other construction operations. The materials and methods used for dust control are subject to approval and shall be as directed.

The use of Calcium Chloride is prohibited.

- 3.1.2 Dirt Control: The Contractor shall provide for prompt removal from existing roadways of all dirt and other materials that have been spilled, washed, tracked or otherwise deposited thereon. The Contractor shall haul off site or use any other methods to dispose of whenever the accumulation is sufficient to cause the formation of mud, interfere with drainage, damage pavements or create a traffic hazard.

In order to minimize tracing of dirt and other materials onto existing roadways, a construction driveway shall be constructed at locations where vehicles exit a work site.

The construction driveway shall consist of a layer of broken stone which shall be a minimum 4 inches thick and 100 feet long where practical and of sufficient width to serve the intended purpose. The broken stone shall be 2½ inches nominal size. The driveway shall be maintained by top dressing with additional stone, as directed, and shall be removed when no longer required.

#### 3.2 SOIL EROSION AND SEDIMENT CONTROL MAINTENANCE

Soil erosion and sediment control measures shall be maintained during the construction season as well as during winter months and other times when the project is closed down, throughout the life of the project, to ensure that the measures function properly. Soil erosion and sediment controls shall be immediately inspected after each rain and any corrective work shall immediately be performed to return the soil erosion and sediment control measures to proper function, as directed. Riprap stones, coarse aggregate, silt fence, or hay bales damaged due to washouts or siltation shall be replaced as directed.

Sediment traps and basins shall be cleaned out when they are 50 percent filled. Silt fences, stone outlet structures, dams, and hay-bales shall have sediment

removed when the sediment reaches 50 percent of the height of the soil erosion and sediment control measure. Sediment removed shall be disposed of in accordance with NJDOT subsection 202.12.

**END OF SECTION**

PART ONE - GENERAL

1.1 DESCRIPTION

1.1.1 Work Included

Under this section, the Contractor shall provide all labor, equipment and material necessary to furnish and install chain link fence and gates at the Belmont Site, complete in place, and as shown on the Contract Drawings, specified herein and approved by the Engineer.

In general, work to be included under this section shall include, but not be limited to, the following:

- (1) 6-inch High Chain link fence
- (2) 6-inch High by 12-inch double swing gate

1.1.2 Related Work Described Elsewhere:

Excavation, Backfilling and Compacting	Section 02221
Precast Manholes and Chambers	Section 02601
Cast-In-Place Concrete	Section 03300

1.2 QUALITY ASSURANCE

1.2.1 Standards: Comply with standards specified herein as listed in the General Conditions of the Contract.

1.2.2 Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Engineer.

1.3 SUBMITTALS

1.3.1 General: Submit shop drawings in accordance with Section 01340, SUBMITTALS.

1.3.2 Product Data:

- (1) Manufacturer's specifications and other data required to demonstrate compliance with the specific requirements.
- (2) A complete materials list showing all items to be furnished and installed under this Section.

- (3) Complete shop drawings of all work of this Section, showing dimensions and locations of all items, including supporting structure and clearance requirements.

#### 1.4 PRODUCT HANDLING

- 1.4.1 Protection: Use all means necessary to protect materials of this section before, during and after installation and to protect installed work and materials of all other trades.
- 1.4.2 Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

### PART TWO - PRODUCTS

#### 2.1 CHAIN LINK FENCE

- 2.1.1 Fence Fabric: Fabric shall be fabricated of Heavy duty aluminized 9-gauge wire woven in 2-inch mesh. Fabric height shall be 6 feet. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.
- 2.1.2 Privacy Slats: Privacy slats are made from flat, tubular plastic with three center supports for extra strength.
- 2.1.3 Posts: Posts shall be constructed of galvanized steel and include the following:
  - 1) Top rail.
  - 2) Line post.
  - 3) Corner post.
  - 4) Bottom tension wire.

#### 2.2 CHAIN LINK GATE

- 2.2.1 General: The gate shall be a standard heavy duty commercial double swing gate. The gate shall have the following components:
  - 1) Provide forged steel; non-lift-off type hinges.
  - 2) Provide privacy slats.
  - 3) Provide fork type latch to permit operation from either side of the gate.
  - 4) Provide gate stop consisting of mushroom or flush plate with anchors.
  - 5) Provide locking device and padlock eyes as an integral part of the latch, requiring only one padlock for locking both gates.

2.2.2 Fence Fabric: Fabric shall be fabricated of Heavy duty aluminized 9 gauge wire woven in 2-inch mesh. Fabric height shall be 6 feet. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.

2.2.3 Gate Posts: Gate posts shall be constructed of galvanized steel.

## 2.3 CONCRETE

ASTM C 94/C 94M, using 3/4 inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Grout shall consist of one part Portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

## 2.4 PADLOCKS

Padlocks shall be keyed into the Owner's master key system.

# PART THREE – EXECUTION

## 3.1 GENERAL

Examine the areas and conditions under which the fence and gates shall be installed. Correct any conditions detrimental to the proper and timely completion of the Work. Do not proceed until all unsatisfactory conditions have been corrected, unless otherwise directed by the Engineer.

## 3.2 PREPARATION

Furnish setting drawings and instructions for installation of anchorages, such as concrete inserts, and other miscellaneous items having integral anchors, which are to be embedded in the concrete construction. Coordinate the delivery of all such items to the project site.

## 3.3 INSTALLATION

3.3.1 General: Fence shall be installed to the lines and grades indicated. The area on either side of the fence line shall be cleared to the extent indicated.

Line posts shall be spaced equidistant at intervals not exceeding 10 feet. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Fabric shall be continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Any damage to galvanized surfaces, including welding, shall be repaired with paint containing zinc dust in accordance with ASTM A 780.



3.3.2 Excavation: Post holes shall be cleared of loose material. Waste material shall be spread where directed. The ground surface irregularities along the fence line shall be eliminated to the extent necessary to maintain a 2-inch clearance between the bottom of the fabric and finish grade.

3.3.3 Post Installation: Posts shall be set plumb and in alignment. Except where solid rock is encountered, posts shall be set in concrete to the depth indicated on the drawings.

Where solid rock is encountered with no overburden, posts shall be set to a minimum depth of 18 inches in rock. Where solid rock is covered with an overburden of soil or loose rock, posts shall be set to the minimum depth indicated on the drawing unless a penetration of 18 inches in solid rock is achieved before reaching the indicated depth, in which case depth of penetration shall terminate. All portions of posts set in rock shall be grouted.

Portions of posts not set in rock shall be set in concrete from the rock to ground level. Posts set in concrete shall be set in holes not less than the diameter shown on the drawings. Diameters of holes in solid rock shall be at least 1 inch greater than the largest cross section of the post. Concrete and grout shall be thoroughly consolidated around each post, shall be free of voids and finished to form a dome.

Concrete and grout shall be allowed to cure for 72 hours prior to attachment of any item to the posts. Group II line posts may be mechanically driven, for temporary fence construction only, if rock is not encountered. Driven posts shall be set to a minimum depth of 3 feet and shall be protected with drive caps when being set.

3.3.4 Top Rail: Top rail shall be supported at each post to form a continuous brace between terminal posts. Where required, sections of top rail shall be joined using sleeves or couplings that will allow expansion or contraction of the rail.

3.3.5 Tension Wires: Tension wires shall be installed along the bottom of the fence line and attached to the terminal posts of each stretch of the fence. Tension wire shall be installed within the bottom 6 inches of the installed fabric. Tension wire shall be pulled taut and shall be free of sag.

3.3.6 Chain Link Fabric: Chain link fabric shall be installed on the side of the post indicated.

Fabric shall be attached to terminal posts with stretcher bars and tension bands. Bands shall be spaced at approximately 15-inch intervals. The fabric shall be installed and pulled taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric

height. Fabric shall be fastened to line posts at approximately 15-inch intervals and fastened to all rails and tension wires at approximately 24-inch intervals.

Fabric shall be cut by untwisting and removing pickets. Splicing shall be accomplished by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be plus or minus 2½ inches above the ground

#### 3.4 GATE INSTALLATION

Gates shall be installed at the locations shown. Hinged gates shall be mounted to swing as indicated. Latches, stops, and keepers shall be installed as required. Padlocks shall be attached to gates or gate posts with chains. Hinge pins, and hardware shall be welded or otherwise secured to prevent removal.

**END OF SECTION**

PART ONE - GENERAL

1.1 DESCRIPTION

1.1.1 Work Included: Under this section, the Contractor shall provide all labor, equipment and material necessary to furnish and install pavements, topsoil and seeding complete in place, and as shown on the Contract Drawings, specified herein and approved by the Engineer.

In general, work to be included under this section shall include, but not be limited to, the following:

- (1) Pavements.
- (2) Traffic Stripes and Markings.
- (3) Topsoil, Fertilizing and Seeding.

The aim of restoration is to restore the disturbed area to a condition as nearly equal to predisturbed condition as possible. At a minimum, restoration shall conform to the following:

- (1) Final restoration shall be undertaken as soon as an area is no longer needed for construction stockpiling or access.
- (2) Care should be taken to avoid damage to adjacent vegetation.
- (3) Topsoil shall be replaced with adequate amounts of topsoil material to restore the disturbed area to its original, pre-disturbance grade and depth of topsoil.
- (4) Rates and types of fertilization, liming, and seeding shall be as recommended by the local Soil Conservation District based on soil tests and local conditions. Seed mixtures shall be selected that are best suited for the particular site conditions. Seed selection shall provide for a quickly germinating initial growth, to prevent erosion, and for secondary growth that will survive without continuing maintenance. Mulching shall occur immediately after seeding, and in no case shall more than five days elapse between seeding and mulching.
- (5) In landscaped areas, environmental features shall be replaced or restored to pre-disturbance condition or better. This includes sodding, replacement of trees and shrubs fences, drives, and other landscape features in kind.

1.1.2 Related Work Described Elsewhere:

Excavation, Backfilling and Compacting

Section 02221

1.2 QUALITY ASSURANCE

1.2.1 Standards:

- (1) Comply with ANSI, OSHA, ASTM and all applicable Federal, State and local codes including revisions to date of contract.
- (2) Referenced Specifications: New Jersey Department of Transportation Standard Specifications for Road and Bridge construction, dated 2001, plus addenda when referred to, shall become part of this specification for materials and construction requirements. A referenced Pay Item Number shall serve to describe the required work for this project providing material and construction conforming to all applicable requirements under the NJDOT Specifications except for measurement and payment. The measurement and payment section of the NJDOT Specifications shall **not** apply as all work under this section shall be included in the contractor's lump sum and unit price bid for this Contract. Where the referenced specifications cite requirements differing from those included in these specifications, the more stringent, highest quality shall govern.

1.2.2 Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Engineer.

1.3 SUBMITTALS

1.3.1 General: Submit shop drawings in accordance with Section 01340, SUBMITTALS.

1.3.2 Product Data:

- (1) Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;
- (2) A complete materials list showing all items to be furnished and installed under this Section, and
- (3) Design mix and laboratory.

1.4 PRODUCT HANDLING

1.4.1 Protection: Use all means necessary to protect the equipment and materials of this section before, during and after installation and to protect the installed equipment and materials of other trades.

- 1.4.2 Replacements: In the event of damage, the Contractor shall immediately make all repairs and/or replacements necessary, to the approval of the Engineer and at no additional cost to the Owner.

## PART TWO - PRODUCTS

### 2.1 PAVEMENT RESTORATION

- 2.1.1 General: The Contractor shall thoroughly prepare the subbase prior to placement of any asphalt pavement. This work shall include placement of additional DGA to fill missing subbase material, removal of unsuitable material and thoroughly proof rolling the entire roadway subbase prior to paving, as indicated on the Contract Drawings.

- 2.1.2 Road Restoration (Concrete Base Encountered): All asphalt pavement courses shall be hot mix asphalt pavement conforming to material requirements of the following:

Course Type:

- (A) Concrete Base Course: NJDOT Section No. 305, 8 inch, 4000 psi Portland Cement Concrete.
- (B) Subbase Course: NJDOT Section No. 208 Conforming with Section 02221, EXCAVATION, BACKFILLING AND COMPACTING.
- (C) Tack Coat: NJDOT Section No. 404.13 and 404.02 Tack coat-emulsified asphalt.

- 2.1.3 County Road Restoration (Concrete Base Not Encountered, 10" Force Main): All asphalt pavement courses shall be hot mix asphalt pavement conforming to material requirements of the following:

Course Type:

- (A) Surface Course: New Jersey Asphalt Pavement Association, The Hot Mix Asphalt Pavement Design Guide and NJDOT Section 902.02; 2 inch, 12.5M64.
- (B) Base Course: New Jersey Asphalt Pavement Association, The Hot Mix Asphalt Pavement Design Guide and NJDOT Section 902.02 ; 10 inch, 19M64.
- (C) Subbase Course: New Jersey Asphalt Pavement Association, The Hot Mix Asphalt Pavement Design Guide; Dense Graded

Aggregate Base Course. Conforming with Section 02200, SELECT FILL AND FOUNDATION MATERIAL and Contract Drawings.

- (D) Tack Coat: NJDOT Section No. 404.13 and 404.02  
Tack coat-emulsified asphalt.

2.1.4 Road Restoration (Concrete Base Not Encountered, 20" DIP Sewer Pipe): All asphalt pavement courses shall be hot mix asphalt pavement conforming to material requirements of the following:

Course Type:

- (A) Surface Course: New Jersey Asphalt Pavement Association, The Hot Mix Asphalt Pavement Design Guide and NJDOT Section 902.02; 2 inch, 12.5M64.
- (B) Base Course: New Jersey Asphalt Pavement Association, The Hot Mix Asphalt Pavement Design Guide and NJDOT Section 902.02 ; 4 inch, 19M64.
- (C) Subbase Course: New Jersey Asphalt Pavement Association, The Hot Mix Asphalt Pavement Design Guide; 6 inch, Dense Graded Aggregate Base Course. Conforming with Section 02200, SELECT FILL AND FOUNDATION MATERIAL and Contract Drawings.
- (D) Tack Coat: NJDOT Section No. 404.13 and 404.02  
Tack coat-emulsified asphalt

2.1.5 Design Mix: All paving materials shall conform to a design mix for the job utilizing materials from a single source. Design mix shall be developed by a laboratory engaged by the Contractor in the design and control of road pavement materials and their installation. No laboratory shall be engaged without prior approval of the Engineer.

The laboratory shall collect at the site of the work a minimum of two samples daily from each batch of paving materials produced or utilized and shall test same for adequacy in proportioning of material, strength, compaction, and thickness in place. Laboratory service shall include costs for obtaining pavement cores daily. All sample collection and analyses shall conform to the AASHTO requirements, latest revision.

All costs incurred for the use of laboratory services for the life of the Contract shall be included in the unit price bid for these items.

2.1.6 Source of Paving Materials: All paving materials for the base course and tack coat shall be derived from a single source, batch or continuous mix plant,

capable of quality control to the limits set in the NJDOT Specifications. The Contractor shall employ only such plant as has been previously certified as an acceptable source of paving materials by the NJ Department of Transportation.

## 2.2 CONCRETE SWALE AND CURB

2.2.1 General: All curbs shall be of concrete as shown on the Contract Drawings and in accordance with NJDOT Section 605.

## 2.3 TOPSOIL AND SEEDING

2.3.1 General: Topsoil and seeding shall be placed to repair or replace areas, if damaged, as directed by the Engineer, at no additional cost to the Owner.

2.3.2 Topsoil: The Contractor shall place topsoil on the top and slopes of backfills and other places that may be directed by the Engineer prior to seeding. Topsoil shall be obtained from stripping operations specified in Section 02221, EXCAVATION, BACKFILL AND COMPACTING. If sufficient suitable material is not available from the stripping operations, the Contractor shall obtain the additional material required from an approved source. The cost of topsoil in place whether obtained from stripping operations or purchased from an approved source shall be included in the unit price bid.

Topsoil from sources other than that obtained from stripping operations shall consist of natural loam obtained from an area that has never been stripped and shall be free from hard clods, stiff clay, partially disintegrated stone, lime, cement, ashes, sticks, roots or other undesirable material. Topsoil shall contain at least six percent (6%) organic matter with a pH range of 5 to 7.

2.3.3 Seeding: Seeding shall consist of furnishing and placing ground limestone, fertilizer, arsenate of lead and seed.

Ground limestone (calcium carbonate) shall conform to the following:

50 percent passing a No. 200 sieve  
90 percent passing a No. 100 sieve  
100 percent passing a No. 10 sieve

Total carbonate shall not be less than 80 percent or 44.8 percent calcium oxide equivalent. Commercial fertilizer 8-16-8 mixture shall contain the following percentages by weight:

8 percent nitrogen	-consisting of 50 percent organic nitrogen, 25 percent nitrates and 25 percent ammonia salts;
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16 percent phosphoric acid	-as super-phosphate, bone or tankage, and
8 percent potash	-as sulfate of potash.

Fertilizer shall be delivered mixed as specified, in standard size bags, showing weight, analysis, and name of vendor. The bags shall be stored in a weatherproof storage space, in such manner as not to impair its effectiveness.

Manure shall be well rotted, unleached horse or cow manure, or a combination of both. It shall be free from chemicals used to hasten decomposition, sawdust, salt hay, tan-bark, shavings, refuse of any kind and shall contain not over twenty-five percent (25%) of straw or other bedding material acceptable for landscape use.

Arsenate of lead shall be a commercial product in dry powder form of recent manufacture and meeting the following analysis:

- (1) Arsenate of lead, not less than 97 percent;
- (2) Inert ingredients, not more than 3 percent;
- (3) Total arsenic (metallic), not less than 19.3 percent;
- (4) Arsenic oxide, not less than 30 percent; and
- (5) Water soluble arsenic (as metallic) not over 0.75 percent.

Grass seed shall be fresh, recleaned seed of the latest crop, mixed in the following proportions by weight:

- (1) 25 percent Kentucky Blue Grass;
- (2) 45 percent Chewings Fescue;
- (3) 28 percent Red Top; and
- (4) 2 percent Kent County English.

All grass seed shall be delivered in standard size bags, showing weight, analysis and name of vendor. It shall be stored in such a manner as not to impair its effectiveness.

## 2.4 FERTILIZER

Fertilizer for establishing turf shall have a commercial designation of 10-20-10 or any 1-2-1 ratio fertilizer containing a minimum five percent nitrogen, ten percent available phosphoric acid, and five percent soluble potash.

If the fertilizer is to be applied with mechanical spreader in the dry form, a minimum of 75 percent shall pass a No. 16 sieve and a minimum of 75 percent shall be retained on a 1.18-millimeter sieve, and the maximum free moisture content shall be two percent.



Fertilizer for establishing sod shall be any 1-2-2 ratio fertilizer containing a minimum of five percent nitrogen, ten percent available phosphoric acid, and ten percent soluble potash.

Each delivery of fertilizer shall be accompanied by a delivery slip showing the weight and a certified chemical analysis of the composition of the fertilizer.

## 2.5 LIMESTONE, PULVERIZED.

Pulverized limestone shall be composed of not less than 85 percent calcium and magnesium carbonates to not less than 40 percent calcium and magnesium oxides.

Each delivery of pulverized limestone shall be accompanied by a delivery slip indicating its weight and certified analysis of its chemical composition and gradation, including calcium and magnesium oxide equivalents, which shall be furnished at the time of delivery.

## 2.6 STRAW MULCH

Straw shall be stalks of oats, wheat, rye, or barley relatively free from seeds, noxious weeds, and other foreign material.

# PART THREE - EXECUTION

## 3.1 INSPECTION

Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

## 3.2 BITUMINOUS PAVEMENTS

3.2.1 General: Bituminous pavement shall be constructed where shown on plans and in accordance with the requirements of the referenced NJDOT Specifications as detailed on the construction plans. This shall include all requirements for equipment, weather, placement, spreading, tolerance, temperature, protection testing, and all related and incidental construction requirements for each component of the pavement structure.

3.2.2 Finish Tolerances: Finish all surfaces to the following tolerances:

- (1) Base course: Plus 0.00 ft. to minus 0.10 ft. from line and grades shown of the Contract Drawings.
- (2) Asphaltic concrete and Portland cement concrete surfaces: Plus or minus 0.05 ft. at any point from line and grade shown on the Contract Drawings.

### 3.3 PAVEMENT STRIPES AND MARKINGS

- 3.3.1 General: This work shall consist of applying white or yellow pavement stripes or markings to bituminous concrete or Portland cement concrete surfaces.

Furnish for approval, 20 calendar days prior to placement, a complete schedule of operations for applying pavement markings, including the numbers and types of equipment, and procedures for the project.

- 3.3.2 Equipment: The equipment for applying thermoplastic material shall be capable of providing continuous mixing and agitation of the material.

The parts of the equipment conveying the material between the main reservoir and the shaping die shall be so constructed in order to prevent accumulation and clogging. The mixing and conveying parts and the shaping dies or spray gun shall be capable of maintaining the material at optimum plastic temperature. The equipment shall be so constructed to ensure continuous uniformity in the dimensions of the entire stripe or marking. The kettle provided for the melting and heating of the thermoplastic material shall be equipped with an automatic thermostat control device and heated by a controlled heat-transfer liquid rather than by a direct flame. The heating kettle and applicator shall be equipped and arranged to meet the national board of fire underwriters and state and federal regulations. The parts of the equipment which come in contact with the material shall be easily accessible for cleaning and maintenance.

All equipment for applying traffic stripes or traffic markings shall be equipped with glass bead dispensers of a type that will mechanically and automatically dispense beads uniformly on wet stripes or markings at the rates specified.

- 3.3.3 Surface Preparation: Remove, immediately prior to striping or marking the pavement surface, all dirt, oil, grease, existing types of traffic stripes or traffic markings, and other foreign material, including curing compound on new Portland cement concrete, from the surface areas on which the various traffic stripes or traffic markings are to be placed. Clean the pavement 1 inch beyond the perimeter of where the stripe or marking is to be placed.

Apply a primer-sealer conforming to NJDEP Volatile Organic Content (VOC) requirements to the areas of bituminous concrete surfaces, when recommended by the manufacturer, and to the areas of Portland cement concrete surfaces where long life thermoplastic traffic markings are to be placed.

- 3.3.4 Application: Apply either preformed or hot extruded thermoplastic traffic markings using equipment and procedures that produce markings that are straight and have sharp edges; that are the specified color, width, and thickness; that have uniform retroreflectivity and that are properly bonded to the pavement.

- (a) Preformed Thermoplastic: Place preformed thermoplastic traffic marking tape on thoroughly dry surfaces and during anticipated dry weather. Melt the preformed thermoplastic using flame from a propane torch, according to the manufacturer's recommendations, to bond the traffic markings permanently in position.

If required, apply additional glass beads to the hot-wet material, in a uniform pattern, to attain the minimum initial retroreflectance value specified in Subsection 617.09 for thermoplastic.

- (b) Extruded Thermoplastic: Heat the thermoplastic material uniformly and apply the melted material at a temperature between 400 and 425 degrees Fahrenheit (°F), to thoroughly dry surfaces and during anticipated dry weather, when the ambient and surface temperatures are a minimum of 50°F. Extrude the thermoplastic traffic markings on the bituminous or Portland cement concrete pavement in a thickness of 90 mils.

Immediately after, or in conjunction with the thermoplastic application, apply by mechanical means glass beads to the wet material in a uniform pattern and at a minimum rate of 10 pounds per 100 square feet of markings. Hand throwing of the beads will not be allowed.

- 3.3.5 Defective Stripes or Markings: Replace long life traffic stripes or traffic markings determined to be in nonconformance with the specifications, not placed at the locations or in the dimensions specified, or that have overlapped a different type of long life material. Remove the defective stripes or markings according to Paragraph 3.3.7.

Replace defective long life thermoplastic traffic markings based on the following:

- 1) Replace the entire area of marking determined to be less than the required thickness,
- 2) to have an incorrect color or width,
- 3) to have failed to bond to the pavement, or to have chipped or cracked.

The minimum replacement area is an individual word or symbol, or entire length of longitudinal line from where the deficiency first occurs to where it no longer exists.

At no cost to the Borough, remove all traffic paint where the striping or markings will not be directly under long life material. Replace long life traffic stripes or traffic markings damaged due to any sawing or sealing of joints in the bituminous concrete overlay.

3.3.6 Opening to Traffic: Complete each application of all types of traffic stripes or traffic markings and allow to thoroughly dry before opening them to traffic.

Should ambient and surface temperatures be below minimums specified for various materials, with approval, traffic stripes or traffic markings may be placed at temperatures as low as 35°F in order to open the traveled way to traffic. Placement of long life epoxy resin or thermoplastic may be delayed for up to 4 days after paving.

As a minimum, center lines on undivided roadways and broken lines between lanes shall be delineated before the traveled way is opened. Unless directed, temporary pavement markers shall be used for the interim delineation until permanent stripes and markings are applied. The engineer will determine when the traveled way is to be opened.

3.3.7 Removal of Traffic Stripes or Traffic Markings: Remove all types of traffic stripes or traffic markings by methods that do not damage the integrity of the underlying pavement or adjacent pavement areas, or causes gouging, or creates ridges or grooves in the pavement that may result in compromising vehicular control. Obliterating stripes or markings by painting over them will not be permitted.

Before starting removal operations, demonstrate the proposed method to accomplish the removal of approximately 95 percent of the stripe or marking without the removal of more than 1/16 of an inch of pavement. Area of removal includes the area of the stripe or marking plus 1 inch on all sides. Removal operations will not be permitted until the method of removal has been approved.

Replace, at no cost to the state, all existing pavement reflectors that have been damaged by removal operations. Equipment for removing the various types of traffic stripes or traffic markings shall be designed with a vacuum system to remove all millings from the pavement surface and prevent airborne residue from escaping into the atmosphere.

3.4 TOPSOILING

The storage piles of topsoil and the areas from which stored topsoil has been removed, within the project limits, shall be fertilized and seeded.

Topsoil shall not be placed until the area to be topsoiled has been approved. All stones, 2 inches or larger in any dimension, and other debris such as wires, cables, tree roots, pieces of concrete, clods, and lumps shall be removed and the surface scarified to provide an improved bond between slope and topsoil. Slopes steeper than 1H:2V shall not be bladed smooth.

The topsoil shall be spread on a previously prepared surface in a uniform layer to produce the prescribed compacted thickness.

Topsoiled areas outside the limits of work shall be protected against damage caused by the delivery, handling, or storage of materials, by washouts due to drainage diversion, by workers, or by equipment. Any such damage shall be repaired by grading, fertilizing, seeding, and mulching at no cost to the Owner.

Where either embankment or excavation slopes become eroded during the Work and before Acceptance, repairs shall be made at no cost to the Owner.

### 3.5 FERTILIZING AND SEEDING

- 3.5.1 General: Fertilizing and seeding shall be carried out as soon as a unit or portion of the Project, such as a structure or trench has been. Planting beds shall not be fertilized or seeded.

When the soil to be seeded has a pH value of less than 5.8, sufficient pulverized limestone shall be incorporated to increase the soil pH value to 6.5.

Recommended amounts (kilograms per hectare) of total oxides (calcium and magnesium) to raise the pH of a 4 inch layer of different soil textural classes to approximately 6.5 are as follows:

Soil (pH)	Loamy Sand	Sandy Loam	Loam	Silty Loam
5.7	0.3	0.7	1.0	1.3
5.3 - 5.6	0.7	1.2	1.7	2.0
4.9 - 5.2	1.0	1.7	2.4	2.7
4.5 - 4.8	1.3	2.0	3.0	3.4
4.1 - 4.4	1.7	2.4	3.7	4.0

The quantity of pulverized limestone required shall be in proportion to its magnesium and calcium oxide content.

The fertilizer for establishing turf shall be limited to one selection throughout the Project. Fertilizer shall be applied in the quantity necessary to yield 30 pounds of nitrogen per acre.

- 3.5.2 Placing Fertilizer and Seed: The placing of fertilizer and seed shall conform to the following:

1. Soil Preparation. All areas to be seeded shall be cultivated to provide a reasonably firm but friable seedbed. The depth of cultivation shall be 75 to 100 millimeters. On slopes steeper than 1H:3V, the Engineer may direct the depth of cultivation to be reduced. All areas to be seeded shall meet the specified finish grades and shall be free of any weed or plant growth, stones of 50 millimeters or larger in any dimension, and other debris.
2. Optimum Seeding Seasons. Seeding should be completed from March 1 to May 15 and from August 15 to October 15.

When weather and soil conditions are suitable, the Engineer may permit seeding at other times for soil erosion control and sediment control. The Engineer shall be notified 24 hours prior to the seeding operation.

3. Application. Seed mixtures shall be sown at the rate of 110 kilograms per hectare (kg/ha).

Seed and fertilizer may be placed by either of the following methods:

- a. Hydraulic Method: The seed and fertilizer shall be mixed in water and then applied under pressure at the specified rates. Any area inadequately covered shall be retreated.
- b. Dry Method: Mechanical seeders, seed drills, landscape seeders, cultipacker seeders, and fertilizer spreaders may be used when seed and fertilizer are applied in dry form. Fertilizer in dry form shall be spread separately at the rates specified.

Hand operated seeding devices may be used when seed and fertilizer are applied in dry form on areas which are inaccessible to mechanical seeders.

Finished seeded areas shall be smooth and shall conform to the prescribed lines and elevations. All seeded areas shall be mulched.

- 3.5.3 Care During Construction: Seeded areas shall be protected and maintained until Acceptance. Any damage to seeded areas caused by pedestrian or vehicular traffic or other causes, due to the Contractor's activity, shall be repaired at no cost to the Owner.

When a satisfactory stand of grass, practically weed free and containing plants in reasonable proportion to the various kinds of seed in the grass seed mixture, is not established on areas of seeding, the deficient areas shall be mowed, refertilized, reseeded, and remulched at no cost to the Owner, until a satisfactory stand of grass is established.

### 3.6 MULCHING

Seeded areas shall be mulched within seven days. Seeded areas shall be mulched with straw uniformly spread in a layer 1 to 1½ inches thick, loose measurement, and shall be bound in place with fiber mulch.

When immediate protection of newly graded slopes is necessary at other than during optimum seeding seasons, straw mulch shall be applied with a temporary seed mixture.

Straw mulch shall be left in place and allowed to disintegrate.

If, prior to Acceptance, any straw mulch is displaced before the grass has made a growth of 2 inches, the area shall be re-fertilized, reseeded, and remulched without additional compensation.

The specified plant pits of individual trees or shrubs including the saucer to its outer edge and the entire beds, where material is planted in beds, shall be mulched with a 3- to 4-inch layer of wood chips, stone, or gravel, as directed. If, prior to Acceptance, any mulch is displaced, the planting area shall be re-mulched without additional compensation.

**END OF SECTION**

Section 02601  
PRECAST MANHOLES  
AND CHAMBERS

PART ONE - GENERAL

1.1 DESCRIPTION

1.1.1 Work Included: Under this section, the Contractor shall provide all labor, equipment and material necessary to furnish, install and test all precast structures complete in place, and as shown on the Contract Drawings, specified herein and approved by the Engineer.

1.1.2 Related Work Described Elsewhere:

Select Fill and Foundation Material	Section 02200
Excavation, Backfilling and Compacting	Section 02221
Pipe and Pipe Fittings	Section 15076

1.2 QUALITY ASSURANCE

1.2.1 Standards:

- (1) Comply with standards specified herein as listed in the General Conditions of the Contract.
- (2) Comply with ANSI, OSHA, ASTM and all applicable Federal, State and local codes including revisions to date of Contract.

1.2.2 Qualifications of Manufacturer: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Engineer.

1.3 SUBMITTALS

1.3.1 General: Submit shop drawings in accordance with Section 01340, SUBMITTALS.

1.3.2 Product Data:

- (1) Manufacturer's specifications and other data required to demonstrate compliance with the specific requirements.
- (2) A complete materials list showing all items to be furnished and installed under this Section.



- (3) Complete shop drawings of all work of this Section, showing dimensions and locations of all items, including supporting structure and clearance requirements.

#### 1.4 PRODUCT HANDLING

- 1.4.1 Protection: Use all means necessary to protect materials of this Section before, during and after installation and to protect installed work and materials of all other trades.
- 1.4.2 Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

### PART TWO - PRODUCTS

#### 2.1 PRECAST MANHOLES AND CHAMBERS

- 2.1.1 General: The Contractor shall furnish precast manholes and chambers conforming to the requirements specified herein and as shown on the Contract Drawings.
- 2.1.2 Cast-in-Place Concrete: The Contractor shall provide all labor, equipment and materials necessary to furnish, install and test all cast-in-place concrete complete in place for work such as base slab, concrete encasement of piping and other work as shown on the Contract Drawings, specified herein and approved by the Engineer.

Except as noted in these specifications and as ordered by the Engineer, structural bases shall be constructed of reinforced concrete.

Reinforced concrete work shall conform to all the requirements of ACI 301, ACI 302, ACI 315 and ACI 315R.

Concrete shall have a 28-day minimum compressive strength of 4000 psi. Reinforcing bars shall conform to ASTM A615, Grade 60, deformed.

Waterstops shall be dumbbell type, center bulb, polyvinyl chloride, conforming to Corps of Engineers Standard CRD-C-572, Size 9 x 3/8 x 1-1/2.

- 2.1.3 Precast Concrete Structures: Precast concrete structures shall be as manufactured by Rotondo & Sons, Inc., Precast Concrete Products, or equal.

Precast concrete manholes shall be designed by a professional engineer, licensed in the State of New Jersey and include the following attributes:

Minimum Concrete Strength: 5,000 psi at 28 days

Steel Reinforcing: ASTM A-615-79, Grade 60, 1 in. min. cover

Design Loading:	AASHTO HS20-44
Depth of Chamber:	See Contract Drawings
Water Table:	At the finished grade
Construction Joint:	Sealed with 1in. butyl rubber

All precast structures shall be watertight.

2.1.4 Painting: All concrete structures (i.e. manholes, wet well, (etc.) shall be painted in accordance with the following requirements:

(1) Preparation of concrete surfaces: Surface preparation for painting shall not commence until one week after the concrete has been pronounced cured. All surfaces shall then be scrubbed with a solution of 1.5 ounces of soap chips and 1.5 ounces of trisodium phosphate dissolved in each gallon of water used. Flush away all soap and dirt with clean water, then etch the surface with a 15-20% solution of muriatic acid until an open-faced, granular texture, similar to sand paper, is achieved. Any areas remaining smooth are to be re-etched until the desired texture is achieved. Flush and scrub away all acid and loosened particles with clean water under pressure.

(2) Schedule

<u>Material</u>	<u>Condition</u>	<u>Coats</u>		
		<u>1</u>	<u>2</u>	<u>3</u>
Concrete	Submerged	F*	F	
	2 Ft. above Submerged Surface	F*	F	F
	Exterior Below Grade	F*	F	F
	In Contact with Aluminum/Steel	F*	F	

Notes

(1) Letter designation F is MC-Tar or approved equal, with a dry film thickness of 6 to 7 mils and wet 8 to 11 mils.

## 2.2 MANHOLE/CHAMBER APPURTENANCES

2.2.1 Manhole/Chamber Rungs: Manhole rungs shall be constructed of copolymer polypropylene sure-footed tread design, staggered barbed ends for greater holding power and seven (7) water seal rings.

Manhole rungs shall be Model No. F-14938 as manufactured by Lane or approved equal and shall be suitable for building into concrete or precast manholes as shown on the Drawings.

All polypropylene steps shall meet the requirements of ASTM C-478 and AASHTO M-199.

2.2.2 Manhole Penetrations: Pipe to chamber shall be A-Lok gaskets as manufactured by A-Lok Products, Inc. The gasket assembly rubber gasket shall conform to ASTM C923, cast integrally in the chamber and located as required.

2.2.3 Manhole Cover: Manhole frames and covers shall be heavy duty, flared type frame Pattern 1202B as manufactured by the Campbell Foundry Company or equal.

### 2.3 MODIFY EXISTING MANHOLES

Existing sanitary manholes shall be modified at locations as shown in the Contract Drawings and directed by the Engineer.

These modifications include by not limited to, new invert elevations, new piping, manhole bench modifications, and any corbel repairs.

## PART THREE - EXECUTION

### 3.1 INSPECTION OF CONDITIONS

Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

3.2.1 General: Install the work of this Section in strict accordance with the approved Drawings.

3.2.2 Assembly: Riser sections shall be handled carefully to prevent cracking or chipping. Particular attention shall be paid to achieving a uniform seating of the bottom riser on the bedding to prevent the development of cracks as further riser sections are added. If preformed openings must be enlarged or altered, or if new openings must be made in the field, care shall be taken to minimize the amount of material removed in order to provide closely matched surfaces for grouting. Gaskets shall be utilized in accordance with manufacturer's recommendations when placing riser and cone sections to produce a watertight structure.

- 3.2.3 Inverts: Inverts shall be clearly constructed, with special care exercised in laying the channels and adjacent pipes to grade. Channels shall be properly formed and rounded and shall be troweled smooth. The connection of the pipe with the wall and channel of the manhole shall be tight and smooth.

**END OF SECTION**

SECTION 03100  
CONCRETE FORMWORK

PART 1 – GENERAL

1.1 DESCRIPTION

- 1.1.1 General: Under this section, the CONTRACTOR shall provide all labor, equipment and material necessary to furnish all formwork for cast-in-place concrete complete in place, and as shown on the drawings, specified herein and approved by the ENGINEER.

In general, work to be included under this section shall include, but not be limited to, the following:

- (1) Provide formwork in accordance with the provisions of this Section for all cast-in-place concrete shown on the Drawings or required by other Sections of these Specifications.
- (2) Coordinate installation of items furnished by other trades.

1.1.2 Related Work Described Elsewhere:

Section 03200	Concrete Reinforcement
Section 03300	Cast-In-Place Concrete

1.2 QUALITY ASSURANCE

1.2.1 Standards:

- (1) ACI 302: Recommended Practice for Concrete Floor and Slab Construction.
- (2) ACI 318: Building Code Requirements for Reinforced Concrete.
- (3) ACI 347: Recommended Practice for Concrete Formwork.

1.2.2 Allowable Tolerances: Conform to ACI 301, Section 4.3.

1.3 SUBMITTALS

- 1.3.1 General: Submit shop drawings in accordance with the General Conditions of the Contract.

- (1) Shop Drawings: Submit details of form types, methods of form construction and erection, design computations, and location of form joints, form ties and embedded items.

- (2) Certificates: Submit certificates from manufacturers stating that materials meet specified requirements.

## PART 2 - PRODUCTS

### 2.1 FORM MATERIALS

- 2.1.1 General: Conform to ACI 301 and ACI 302 unless otherwise shown or specified.

- 2.1.2 Forms: Construct formwork for exposed (painted or unpainted) concrete surfaces with smooth faced undamaged plywood or other panel type materials acceptable to the ENGINEER to provide continuous, straight, smooth as-cast surfaces. Furnish in largest practical sizes to minimize number of joints.

Construct formwork for concrete concealed from view or covered with cement plaster with rough sawn boards of sound grade, as approved by the ENGINEER, to provide a mechanical bond for subsequent application of plaster.

Provide form material with sufficient thickness to withstand pressure of newly placed concrete without excessive and objectionable bow or deflection.

- (1) Wood Forms:

- a. Framing Lumber: Stress-graded.
- b. Lumber in Direct Contact with Concrete: Dressed on at least the contact side, with dressed or tongue-and-groove edges.
- c. Other Lumber: Dressed or rough.

- (2) Plywood Forms:

- a. Grade marked.
- b. B-B Plyform, Exterior Class 1 and 2 and HDO High Density Concrete form Plywood, Class 1 and 2 conforming to Product Standard PS 1, minimum thickness 3/4 inch.

- (3) Hardwood Forms: Tempered smooth-one-side (SIS), not less than 3/16 inch thick, conforming to Product Standard PS 58.

- (4) Fiber-Glass-Reinforced-Plastic Forms: Sizes and cross sections as required, with thickness, reinforcement, and surface finish to form concrete surfaces that are smooth and free of irregularity.

- (5) Steel Forms: Sizes and cross sections as shown or required, with metal gauges, reinforcement, stiffeners, and surface finish to form concrete surfaces that are smooth, free of irregularity and concrete stains.
- (6) Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

## 2.2 DESIGN OF FORMWORK

### 2.2.1 General: Conform to ACI 301 and ACI 302 unless otherwise shown or specified.

- (1) Design, erect, support, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure.
- (2) Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose.
- (3) Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position.
- (4) Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
- (5) Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof.
- (6) Provide trussed supports when adequate foundations for shores and struts cannot be secured.
- (7) Support form facing materials by structural members spaced sufficiently close to prevent objectionable deflection.
- (8) Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within allowable tolerances.
- (9) Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads.

- (10) Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

### PART 3 - EXECUTION

#### 3.1 GENERAL

Unless otherwise shown or specified, install and remove formwork in accordance with ACI 301, Chapters 4, 10, 11, 13 and 15; and ACI 302, Chapter 3.

#### 3.2 SURFACE CONDITIONS

Examine the substrate and conditions under which work of this Section is to be performed, and correct unsatisfactory conditions which would prevent proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

#### 3.3 FORM CONSTRUCTION

- 3.3.1 General: Construct forms complying with ACI 347, to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in finish structures.

Provide for openings, offsets, sinkages, keyways, recesses, mouldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required. Use selected materials to obtain required finishes.

Forms for openings, and construction which accommodates installation by other trades whose materials and products must be fabricated before the opportunity exists to verify the measurements of adjacent construction which affects such installations, shall be accurately sized and located as dimensioned on the Drawings. In the event that deviation from the Drawing dimensions results in problems in the field, the CONTRACTOR shall be responsible for resolution of the conditions as approved by the ENGINEER, without additional expense to the Owner.

- 3.3.2 Fabrication: Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where the slope is too steep to place concrete with bottom forms only. Keep, groove, notch wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.

Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of



concrete. Brace temporary closures and set tightly to temporary openings on forms in as inconspicuous locations as possible, consistent with design requirements. Form intersecting planes to provide true, clean-cut corners.

- 3.3.3 Falsework: Erect falsework and support, brace and maintain it to safely support vertical, lateral, and asymmetrical loads applied until such loads can be supported by in-place construction. Construct falsework so that adjustments can be made for take-up and settlement.

Provide wedges, jacks, or camber strips to facilitate vertical adjustments. Carefully inspect falsework and formwork during and after concrete placement operations to determine abnormal deflection or signs of failure; make necessary adjustments to produce work of required dimensions.

- 3.3.4 Forms for Exposed Concrete: Drill forms to suit ties used to prevent leakage of concrete mortar around the tie holes. Do not splinter forms by driving ties through improperly prepared holes.

Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.

Use extra studs, walers, and bracing to prevent objectionable bowing forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form material which will produce bow.

Assemble forms so that they may be readily removed without damage to exposed concrete surfaces.

- 3.3.5 Corner Treatment: Unless shown otherwise, form chamfers with strips on external corners of columns, walls, girders, beams, foundation walls projecting beyond overlying masonry, and other external corners that will be exposed. Extend terminal edges to required limit and miter chamfer strips at changes in direction.

- 3.3.6 Control Joints: Locate as indicated on the contract drawings.

- 3.3.7 Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Verify size and location of openings, recesses and chases with the trade requiring such items. Accurately place and securely support items to be built into forms.

- 3.3.8 Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before concrete is placed. Retighten forms immediately after concrete placement as required to eliminate mortar leaks.

### 3.4 FORM COATINGS

Coat form contact surfaces with form-coating compound before reinforcement is placed. Do not allow excess form-coating material to accumulate in the forms or to come into contact with surfaces which will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions.

### 3.5 INSTALLATION OF EMBEDDED ITEMS

- 3.5.1 General: Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.

Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finished slab surface. Provide and secure units to support types of screeds required.

Those trades whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to install embedded items before the concrete is placed.

Electrical conduits, junction boxes, pipes, sleeves, inserts and similar items shall be placed in the concrete in accordance with all of the requirements of the Building Code. Such items shall be protected to the extent that they are not displaced or damaged during the placing of concrete.

Openings in slabs shall be provided for pipes, conduits and the like required for the work of other trades. When such work is completed, the excess part of the respective openings shall be completely closed up to the pipe sleeve or inserts, matching the adjoining work.

Sleeves for miscellaneous metal work, such as castings, pipes and anchors shall be set as indicated, true and to proper alignment.

Waterstops shall be installed so as to form a continuous watertight diaphragm. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. Splices shall be made in conformance with the recommendations of the waterstop manufacturer.

### 3.6 ANCHORAGE ITEMS

Anchorage items shall be of sufficient number, size and location to ensure sufficient anchorage for the purpose intended.

Adequate slots or inserts shall be provided for anchoring members at openings. Slots and dowels shall be provided for anchoring ends and tops of masonry partitions abutting concrete.

Inserts for suspended ceilings shall be spaced at 4 feet on centers.

### 3.7 JOINTS

Unless otherwise approved, provide isolation, control, contraction, expansion and construction joints only where shown.

Continue reinforcing steel and wire fabric across construction joints where not indicated as being free to move.

Install premoulded joint filler at locations shown. Extend fill from bottom of concrete up flush to finish concrete surface or hold down below finish surface as detailed.

Make splices in premoulded filler in manner to preclude penetration of concrete between joint faces.

If construction joints necessary for the progress of the Work are not shown on the Drawings, shown them in complete detail on the Shop Drawings.

For slabs on grade, locate the indicated joints in a manner to divide the slab into areas not in excess of 600 square feet (ft<sup>2</sup>), with one dimension being not greater than 120 percent of other dimension.

Provide keyways at least 1½ inches deep in all construction joints in walls, slabs, and between footings and walls.

Isolation Joints in Slab on Grade: Provide isolation joints in slabs on grade at points of contact between slabs on grade and vertical surfaces where indicated. Caulk in accordance with Section 07900.

Sealant Slots: Where premoulded joint filler is held down below finish concrete face, install in the form a water-soaked wood strip of dimensions shown to form, after removal, a proper size slot to receive sealant.

### 3.8 SHORES AND SUPPORTS

Comply with ACI 347 for shoring and reshoring in multi-story construction, and as herein specified. Submit a shore removal and reshoring schedule and drawings for the Engineer's review before proceeding with this work. Do not proceed until schedule and drawings have been reviewed.

### 3.9 REMOVAL OF FORMS

Forms shall not be removed without the permission of the ENGINEER. In general, forms shall not be removed until the concrete has hardened sufficiently to support its own load safely, plus any superimposed loads that might be placed thereon. In any event, forms shall be left in place at least the minimum required length of time specified below, after the date of placing concrete:

1. Housekeeping Pads

2 days

The removable portion of form ties shall be withdrawn from the concrete immediately after taking down the forms. The holes left by such ties shall be filled with grout from a grout gun, and the surface shall be finished with a steel spatula or rubbed with sack cloth.

Care shall be taken in removing forms, wales shorings, supports, and form ties to avoid spalling or marring the concrete. The required rubbed finish and such patching as may be necessary shall be started immediately after removal of the forms.

### 3.10 REUSE OF FORMS

Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork. When forms are reused for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.

**END OF SECTION**

SECTION 03200  
CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

1.1.1 General: Under this section, the CONTRACTOR shall provide all labor, equipment and material necessary to furnish and install all steel required for reinforcement of cast-in-place concrete complete in place, and as shown on the drawings, specified herein and approved by the ENGINEER.

1.1.2 Related Work Described Elsewhere:

Section 03300      Cast-In-Place Concrete

1.2 QUALITY ASSURANCE

1.2.1 Standards:

- (1) ACI 301: Specifications for Structural Concrete for Buildings.
- (2) ACI 302: Recommended Practice for Concrete Floor and Slab Construction.
- (3) ACI 315: Details and Detailing of Concrete Reinforcement.
- (4) ACI 315R: Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.
- (5) ACI 318: Building Code Requirements Concrete.
- (6) AWS D1.4: Structural Welding Code - Reinforcing Steel.
- (7) CRSI: Manual of Standard Practice.
- (8) Comply with standards specified in Section 17 of the General Conditions of the Contract.

1.2.2 Allowable Tolerances: Conform to ACI 301, Section 5.4.

1.3 SUBMITTALS

1.3.1 General: Submit shop drawings in accordance with Section 01340, Submittals, of the General Conditions of the Contract.

1.3.2 Shop Drawings: The CONTRACTOR shall submit complete Shop Drawings of all material proposed to be furnished and installed under this Section.

- (1) Show detail layouts of jointing and reinforcement, including dimensions, openings and spacings, embedded items; bending details; bar schedules; welds; and similar items required for the proper construction of the work.
  - (2) Detail the reinforcement in accordance with ACI 315, ACI 315R and CRSI Manual.
  - (3) Include the bar schedules, the individual weight of each bar, the total weight of each bar size, and the total weight of bars on each schedule list. Base the calculated weights on the theoretical unit weights shown in Table 1, ASTM A615.
  - (4) Include in the minimum concrete, cover for reinforcement.
- 1.3.3 Samples: Accompanying the above submittal, submit samples of exposed-to-view bolsters and supports.
- 1.3.4 Mill Certificates: Accompanying the Shop Drawings, submit steel producer's certificates of mill analysis, tensile, and bend tests for reinforcing steel.
- 1.4 PRODUCT HANDLING
- 1.4.1 Delivery: Deliver reinforcement to the job site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.
- 1.4.2 Storage: Store reinforcement at the job site in a manner to prevent damage and accumulation of dirt and excessive rust.

## PART 2 – PRODUCTS

### 2.1 GENERAL

Conform to ACI 301, ACI 315, and ACI 315R unless otherwise shown or specified.

### 2.2 MATERIALS

2.2.1 Reinforcing Bars: ASTM A 615, Grade 60, deformed.

2.2.2 Steel Wire: ASTM A 82.

2.2.3 Welded Wire Fabric: ASTM A 185.

2.3.4 Supports for Reinforcement: Bolster, Chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place:

- (1) Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, and other unacceptable materials.
- (2) For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
- (3) For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with either plastic protected legs or stainless steel legs.

## 2.3 FABRICATION

2.3.1 General: Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI Manual. In case of fabricating errors, do not rebend or straighten reinforcement in a manner that will injure or weaken the material.

2.3.2 Unacceptable Materials: Reinforcement with any of the following defects will not be permitted in the Work:

- (1) Bar lengths, depths, and bends exceeding specified fabrication tolerances.
- (2) Bend or kinks not indicated on Drawings or final Shop Drawings.
- (3) Bars with reduced cross-section due to excessive rusting or other cause.

## PART 3 – EXECUTION

### 3.1 INSPECTION

Examine the substrata, formwork, and the conditions under which concrete reinforcement is to be placed, and correct conditions which would prevent proper and timely completion of the Work. Do not proceed with the work until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

3.2.1 General:

- (1) Comply with the specified standards for details and methods of reinforcement placement and supports, and as herein specified.
- (2) Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.

- (3) Position, support, and secure reinforcement against displacement of formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
  - (4) Place reinforcement to obtain the minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports together with 16 gauge wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
  - (5) Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh.
  - (6) Provide sufficient numbers of supports and of strength to carry reinforcement. Do not place reinforcing bars more than 2 inches beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- 3.2.2 Splices: Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying. Where welded splices are approved, conform to AWS D1.4.
- 3.2.3 Encased Steel Members: Unless otherwise shown wrap structural steel members to be encased in concrete, with 6-inch by 6-inch mesh of 10 gauge galvanized steel wire applied around the steel over spacers to provide 3/4 inch clearance from the metal. Lap and tie the edges of the mesh and make all loose ends fast with not lighter than 16 gauge wire.

**END OF SECTION**



PART 1 – GENERAL

1.1 DESCRIPTION

- 1.1.1 Work Included: Under this section the Contractor shall provide all labor, equipment and materials necessary to furnish, install and test all cast-in-place concrete complete in place, and as shown on the drawings, specified herein and approved by the Engineer.

1.2 QUALITY ASSURANCE

1.2.1 Standards:

- (1) ACI 304: Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
- (2) ACI 305R: How Weather Concreting.
- (3) ACI 306R: Cold Weather Concreting.
- (4) ACI 308: Recommended Practice for Curing Concrete.
- (5) National Ready-Mixed Concrete Association (NRMCA): Certification of Ready-Mixed Concrete Production Facilities.

- 1.2.2 Qualifications of Installers: Throughout the progress of installation of the work of this Section, provide at least one person who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills and who shall be present at the site and direct all the work performed under this Section.

In actual installation of the work of this Section, use adequate numbers of skilled workmen to ensure installation in strict accordance with the approved design.

In acceptance or rejection of work performed under this Section the Engineer will make no allowance for lack of skill on the part of the workmen.

1.3 PRODUCT HANDLING

- 1.3.1 General: Conform to ACI 301 and ACI 304.

- 3.3.2 Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the work and materials of all other trades.

1.3.3 Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

#### 1.4 JOB CONDITIONS

##### 1.4.1 Environmental Requirements:

(1) Cold Weather Concreting: Conform to ACI 301 and ACI 306R.

(2) Hot Weather Concreting: Conform to ACI 301 and ACI 305R.

1.4.2 Protection: Conform to ACI 301, Chapter 12 and ACI 302, Chapter 8.

### PART 2 – PRODUCTS

#### 2.1 GENERAL

Conform to ACI 301 and ACI 302 unless otherwise shown or specified.

#### 2.2 CEMENT

2.2.1 General: Portland, conforming to ASTM C150, except that 28-day cube strength shall be a minimum of 5500 psi.

Cement shall be Type I or Type V. All concrete in contact with sewage effluent shall employ Type V cement; elsewhere, Type I cement may be used.

Do not use cement having a temperature greater than 140 degrees Fahrenheit (°F). Do not use air-entraining cement.

2.2.2 Sequence of Use: Use only one brand of cement for the entire work and use in the same sequence as received at the site.

#### 2.3 AGGREGATES

##### 2.3.1 Coarse Aggregate:

(1) Crushed stone, ASTM C 33.

(2) Quarried or washed in fresh water.

##### 2.3.2 Fine Aggregate:

(1) Natural sand or stone sand, ASTM C33.

- (2) Washed in fresh water.

2.3.3 Aggregate Sources: Provide aggregate from one source of supply only.

2.3.4 Aggregate Sizes: Maximum aggregate size shall be not larger than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of the minimum clearing space between individual reinforcing bars or bundles of bars.

## 2.4 WATER

Water for use in concrete shall be free from objectionable quantities of oil, acid, alkali, organic matter, salt or other impurities and shall be similar in quality to drinking water fit for human consumption.

Water for curing shall not contain any substance injurious to concrete, or which might cause staining.

## 2.5 ADMIXTURE

The use of admixtures shall not be construed as permitting a reduction in cement content.

Air-Entraining Admixture: W.R. Grace "Darex AEA" Master Builder "MB-VR"; Sika "AER"; or approved equal.

Water Reducing and Retarding Admixture: W.R. Grace "Daratard"; Master Builders "Pozzolith"; Sika "Plastiment" or approved equal.

## 2.6 CURING MATERIALS

- (1) Liquid Curing Compounds: ASTM C309, Type 1.

- (2) Sheet Materials: ASTM C171.

- (3) Burlap Cloth: Jute or kenaf, weighing approximately 9 ounces per square yard (oz/yd<sup>2</sup>), AASHTO M 182, two layers.

## 2.7 OTHER MATERIALS

### 2.7.7 Non-Shrink Grout:

Metallic Grout: Pre-mixed metallic aggregate product requiring only the addition of water at the job site, having the following attributes:

- a. Be capable of producing a flowable grouting material having no drying shrinkage or settlement at any age.
- b. The compressive strength of grout 2-inch cubes shall not be less than 5000 psi at age seven days and 750 psi at age 28 days.

Non-Metallic Grout: A.C. Horn "Non-Metallic", L&M "Crystex", W.R. Meadows "588", pre-mixed, non-shrink, non-metallic, non-staining grout or approved equal.

## 2.8 PROPORTIONING OF CEMENT

- 2.8.1 General: Classes of concrete are designated by numerals corresponding to their 28-day compressive strength in pounds per square inch.

Concrete classes are indicated on the drawings and are specified in various sections of these specifications. When class is not indicated or specified, 4000 psi concrete shall be provided.

- 2.8.2 Water-Cement Ratio: 0.45 maximum, by weight.

- 2.8.3 Slump:

- (1) Minimum Slump: 1 inch.
- (2) Maximum Slump:
  - a. Footings, foundations walls: 3 inches.
  - b. Walls, columns, beams: 4 inches.
  - c. Floors, exterior slabs, other building components: 3 inches.
  - d. Massive concrete: 2 inches.

If pumping of concrete is permitted by the Engineer, the maximum slump may be increased by one inch except for floors and exterior slabs.

- 2.8.4 Air Content: In accordance with ACI 301 and ACI 302.

- 2.8.5 Admixtures: Use air-entraining admixture in all concrete. Add air-entraining admixture of manufacturer's prescribed rate to result in concrete at point of placement having air content within limits specified.

Use admixtures for water-reducing and retarding in compliance with manufacturer's directions.

Use type of admixture appropriate to climatic conditions prevailing at time of placing. Adjust quantities and types of specified admixtures as required to maintain quality.

### PART 3 – EXECUTION.

#### 3.1 MIXING, CONVEYING AND PLACING CONCRETE

3.1.1 General: Mix, transport and place concrete in accordance with ACI 301, Chapters 7, 8 and 11; ACI 302, Chapters 6 and 7; and ACI 304, unless otherwise specified.

3.1.2 Hot Weather Concreting: Perform concreting in accordance with ACI 305R and as follows:

- (1) Concrete placed during hot weather shall have the lowest temperature practicable to produce under the conditions. The temperature of concrete as placed shall not exceed 85°F except where an approved retarder is used. The mixing water and/or aggregates will be cooled, if necessary, to maintain a satisfactory placing temperature.
- (2) In no case shall the placing temperature exceed 95°F.

3.1.3 Cold Weather Concreting: Perform concreting in accordance with ACI 306R and as follows:

The ambient temperature of the space adjacent to the concrete placement and surface to receive concrete shall be maintained at not less than 40°F. The temperature of the concrete when placed shall not be less than 50°F nor more than 75°F. Mixing water or aggregates shall be heated as required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow or frozen lumps.

Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing.

3.1.4 Preparation for Placing Concrete:

- (1) Conform to ACI 301, ACI 302 and as follows.
- (2) Rock Foundations:
  - a. The rock surface shall be prepared by roughening, where necessary, and thorough cleaning. Loose rock, dried grout, flaky and scaly coatings, organic deposits and foreign material shall be removed.

Open fissures shall be cleaned to a suitable depth and to firm rock on the sides.

- b. Cleaning shall be done by use of stiff brooms, picks, jets of water and air applied at high velocity, waterblasting or any other effective means, followed by thorough washing. Accumulations of wash water in depressions shall be removed prior to placing of concrete.
- c. The rock surface shall be completely surface dried by air jets. The presence of any free surface water, which may be indicated by shininess, will not be permitted.

3.1.5 Batching, Mixing and Transporting Equipment: Ready-mixed concrete shall be batched, mixed and transported in accordance with ASTM C94, except as otherwise specified. Truck mixers, agitators and non-agitating units shall comply with TMMB "Truck Mixer and Agitator Standards". Plant equipment facilities shall conform to NRMCA "Certification of Ready Mixed Concrete Production Facilities".

## 3.2 FINISHES

3.2.1 Repair of Surface Defects: Immediately after form removal, repair defects in accordance with ACI 301, Chapter 9.

3.2.2 Formed Surfaces: General: Finished formed surfaces in accordance with ACI 301, Chapter 10 and as follows:

- (1) Exposed Exterior Surfaces: Smooth form finish, ACI 301, Section 10.2.2.
- (2) Exposed Interior Surfaces: Grout cleaned finish, ACI 301, Section 10.3.2.

3.2.3 Slabs:

- (1) Types of Finish: Conform to ACI 301, Section 11.8.
- (2) Finishing Tolerances: Conform to ACI 301, Section 11.9.2.
- (3) Finishing Procedures:
  - a. Conform to ACI 302, Chapters 7, Section 7.1 through 7.2.10, Section 7.8 and Section 7.11.
  - b. Troweling: Provide a second troweling only in areas where slab is to remain exposed.

- c. Do not use any finishing or troweling machine or other apparatus which has a water attachment, for wetting the concrete during finishing.

3.2.4 Shop Platforms and Mechanical Equipment Areas: Provide two trowelings and a broom finish by drawing a soft-bristle broom over troweled surface to produce non-slip texture. Prepare sample finished area for approval prior to placing any concrete.

### 3.3 CURING AND PROTECTION

Cure and protect concrete in accordance with ACI 301, Chapter 12 and ACI 302, Chapter 8.

Provide appropriate measures for the prevention of plastic shrinkage cracking, in accordance with ACI 302, Section 8.4.

3.3.1 Curing Compound: Do not use curing compound on surfaces to receive cementitious setting beds or toppings; terrazzo; paint; insulation, roofing or waterproofing; resilient tile; carpeting; thinset ceramic tile or on any other surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete.

Concrete surfaces which have been subjected to rainfall within three hours after curing compound has been applied shall be resprayed at the coverage herein specified.

3.3.2 Correction of Defective Appearance: If the use of any curing method results in stained, discolored, streaked or blotchy appearance, the use of that method shall be stopped and another acceptable curing method shall be substituted until the cause of the defective appearance is corrected.

All such defective surfaces shall be remedied to the satisfaction of the Engineer.

### 3.4 REPAIR OF DAMAGED WORK

Before final acceptance of work, neatly repair damaged surfaces, corners of concrete and concrete finish, whether such damage resulted from action of elements or from any cause whatsoever.

Finish damaged concrete where surface repairs are permitted to a smooth, dense, watertight condition.

### 3.5 CORRECTIVE WORK

If the Engineer gives permission for defects to be corrected, remove defective concrete, then roughen, key and soak surface with water before patching with concrete or mortar of color to match surrounding concrete. White cement shall be added as required material to produce same color as original concrete.

Prepare mortar used in pointing not more than 30 minutes prior to use.

Correct high areas in slab surface by grinding, after concrete has cured at least fourteen (14) days.

### 3.6 MODIFYING EXISTING CONCRETE

3.6.1 Special Construction: Special construction will be required for the modification of existing concrete to permit proper installation of new equipment and materials and the placing of new concrete. Such work shall conform to the details shown, specified or required.

#### 3.6.2 Cutting and Demolishing Concrete:

- (1) The Contractor shall cut the concrete, as shown, specified or required for the construction of new work.
- (2) Unless otherwise shown, the bottom and sides of all cuts shall be sharp and square at the surface edges. Square cuts shall be made with a concrete saw to a depth of one inch.
- (3) To minimize concrete breaking beyond the lines shown, line drilling shall be used. Drilled holes shall be one inch in diameter and spaced 3 inches on centers. Holes shall be respaced as required to preclude cutting of reinforcement. Wedging, sledging, barring or breaking up with a power tool will be permitted for removing the remaining concrete. The use of explosives will not be permitted.
- (4) Except as noted on the Drawings, the top of holes and pockets shall be cut on a 1 on 3 upward slope toward the face of the wall from which side the concrete will be placed. Where the cut must slope upward toward each face to provide keying action, the concrete shall be placed from both sides.
- (5) If existing reinforcement other than that shown is uncovered or exposed during chipping or cutting of concrete, the Engineer shall be notified so that an inspection may be made and orders as to procedures issued. No existing reinforcement shall be cut, other than where shown until approval is given by the Engineer. All loose rust shall be wire brushed or sandblasted from exposed reinforcement. Existing reinforcement shall be bent as shown or required.



### 3.6.3 Preparation of Cut Concrete Surfaces:

All surfaces of the cuts and drilled holes shall be roughened. Interior corners shall be rounded to a minimum radius of one inch. If overbreaking occurs, the area shall be chipped out to a minimum depth of one (1) inch and squared with the surface leaving no feather edges.

Approved cuts shall be cleaned by washing with an air-water jet. In some cases, this may have to be done prior to installing the material in the hole because of the small clearances. In these cases, the surface shall be protected in approved manner and again washed with an air-water jet prior to placing the concrete or non-shrink grout.

For a minimum of four (4) hours prior to placement of concrete or non-shrink grout, the surface of cuts and holes shall be kept continuously wet.

After inspection and approval by the Engineer, the Contractor shall proceed with installation of materials and the placement of the required steel reinforcement and welded wire fabric.

### 3.6.4 Repair and Replacement of Concrete: Repair and replacement of existing concrete shall be made by using non-shrink grout, where noted.

Concrete areas which are to be surface patched as noted, shall be coated with an epoxy adhesive patching compound equal to Sika Chemical Corporation's Colma-Dur. The concrete surfaces shall be completely cleaned before applying the patching compound. The concrete surface shall then be primed by brush coating the patching compound. After priming, sand shall be added to the compound in a ratio of one part sand to one part compound by volume. The sand and epoxy mixture shall be applied by a trowel. The application of the patching compound shall conform to the recommendations of the manufacturer.

## 3.7 FIELD QUALITY CONTROL

### 3.7.1 Responsibilities and Duties of Contractor: Conform to ACI 301, Section 16.7

Additional testing may also be required if there is evidence of faulty workmanship or a violation of project requirements. The cost of these tests shall be borne by the Contractor.

**END OF SECTION**

PART ONE - GENERAL

1.1 DESCRIPTION OF WORK

- 1.1.1 Furnish one (1) new complete factory-built and tested submersible Grinder Pump Station, consisting of a two (2) FLYGT MP3085.891HT-257 grinder pump, or approved equal, 4 HP submersible electric motor, 208 volts, 3 phase, 60 hertz, 4-wire service, lifting chain or stainless-steel cable (the working load of the lifting system shall be 50% greater than the pump unit weight), with 15 feet of submersible cable (SUBCAB) suitable for submersible pump applications, turnkey basin package, level control system, Nema 4X, or equal, fiberglass control panel, Nema 4X, or equal, junction box, stainless steel lifting chain, 2-inch ball & check valves and Schedule 80 discharge pipe (2-inch).
- 1.1.2 Grinder pumps shall be specifically designed and intended for service in pressure sewer systems and guide bar mounted. All pumps supplied on the project for this service shall be of the same manufacturer. Each grinder pump shall contain special cutters to reduce sewage to a fine slurry. The stationary cutter shall consist of hardened 316 "L" stainless steel and the rotary cutter shall consist of chrome alloyed cast iron. The pump shall be supplied with a mating cast iron 2-inch discharge connection.

1.2 DESCRIPTION OF SYSTEM

- 1.2.1 The new pump system shall consist of a 72-inch internal diameter fiberglass basin wet well with submersible wastewater grinder pump and alarm panel, and discharge connection and appurtenances.
- 1.2.2 All the equipment specified herein is intended to be engineered equipment for macerating and pumping all material in normal domestic wastewater.

1.3 QUALIFICATIONS

- 1.3.1 All of the equipment furnished herein shall be the product of a manufacturer experienced in the design and manufacture of grinder pumps designed for use in low pressure sewer collection systems. All parts shall be properly stamped for identification and location as shown in the Operation and Maintenance Manuals furnished. Nameplates giving the name of the manufacturer, the rated capacity, head speed and all other pertinent data shall be attached to each packaged pump station.
- 1.3.2 All equipment furnished under this Specification shall be new and unused, shall be the standard product of pump manufacturer having a successful record of manufacturing and servicing the equipment and systems specified herein.

- 1.3.3 All manufacturers must have been in the business of manufacturing grinder pumps for a minimum of ten years. Manufacturer must demonstrate to the satisfaction of the Engineer that the proposed pumping equipment will meet system flows and heads required.

#### 1.4 SUBMITTALS

- 1.4.1 After receipt of notice to proceed, the manufacturer shall furnish the Engineer one (1) electronic set of shop drawings of all materials required to establish compliance with the specifications. Submittals shall include the following:

- (1) AutoCAD drawing illustrating details of fiberglass package pump station with discharge elevation, basin diameter and depth with side and top view.
- (2) Package station components, shut-off and ball, plug, check valves, discharge rail assembly, stainless steel lifting chain, Nema 4X junction box, float level controls, float bracket, 8-inch Sch. 80 inlet flange, and 72-inch fiberglass basin with its corresponding cover.
- (3) MP3127, or equal, 4 HP, 230 volts, three phase grinder pump specification sheets with motor and performance curve. Pump motor monitoring device data. Electrical motor data.
- (4) Duplex Nema 4X stainless steel control panel, or equal, drawing, wire schematic and spare parts list. Individual electrical control panel components cut sheets.
- (5) Engineering report illustrating the hydraulic design analysis utilizing the MP3085, or equal, grinder pump hydraulic pump curve (pump performance curves).
- (6) Wet well elevation depth below ground surface.
- (7) Force main elevations as shown on the drawings.
- (8) Details of the simplex centrifugal pump.
- (9) Technical manuals.
- (10) Typical installation guides.
- (11) Parts list.
- (12) Printed warranty (and certified agreement to the conditions of warranty)
- (13) Furnish all submittals within 30 days of receipt of notice to proceed.

#### 1.5 OPERATING INSTRUCTIONS

- 1.5.1 Six (6) copies of an operating and maintenance manual for the grinder pump station shall be furnished to the Engineer prior to completion. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operating and maintenance personnel familiar and unfamiliar with such equipment.
- 1.5.2 A factory service technician or factory trained service technician, who has complete knowledge of proper operation and maintenance, shall be provided for one (1) day onsite to instruct representatives of the Owner on proper operation and maintenance. If there are difficulties in the operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

## PART TWO – PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

- 2.1.1 The pumps and equipment covered by this section are intended to be of robust designs and proven ability as manufactured by reputable firms having extensive experience in the production of such pumps and equipment. The pumps and equipment furnished shall be designed and constructed in accordance with the best practice and methods.
- 2.1.2 All parts shall be so designed and proportioned as to have liberal strength and stiffness and to be especially adapted for the work to be done. Ample room and facilities shall be provided for inspection, repairs and adjustment.
- 2.1.3 Brass or stainless-steel nameplates giving the name of the manufacturer, the rated capacity, head, speed, serial number, model number, horsepower, voltage, amperes and all other pertinent data shall be attached to each pump.

### 2.2 SUBMERSIBLE GRINDER PUMP STATION

#### 2.2.1 General

- (1) Furnish and install two (2) submersible grinder wastewater pump(s) Flygt model MP3085.891HT – 257, or approved equal. Each pump shall be equipped with a 4 HP submersible electric motor, connected for operation on 208 volts, 3 phase, 60 hertz, 4-wire service, with 30 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. Required cable field length to be confirmed by Contractor before ordering.

#### 2.2.2 Operating conditions

Each pump shall have the following performance curve characteristics:

- (1) Primary Duty Point: 27.7 GPM @ 92.7-ft TDH
- (2) Secondary Performance Point: 20.1 GPM @ 98.5-ft TDH
- (3) Minimum Shut off Head: 110 ft
- (4) Impeller diameter: 143 mm
- (5) Motor RPM: 3415
- (6) Maximum Motor Rating: 4HP
- (7) Voltage/ phase: 208V/3PH
- (8) Discharge Connection: 2 inches
- (9) Manufacturer: Flygt or Approved Equal

### 2.2.3 Wiring and terminations

- (1) Pump power and float level control wiring shall be field installed by a certified electrician. All electrical cables penetrating or passing through the conduit flange of the pump station must be water-tight and sealed by the electrician prior to start up. Color coded 14/7 insulated wire for power cord, 18/2 insulation wire for float level sensors.
- (2) The pump power cable shall be connected directly into the Nema 4X junction box and spliced connected to the appropriate color-coded wire gage for proper terminal strip placement. If direct burial cable is utilized in lieu of conduit, a waterproof electrical connector certified to NEC will be required at the conduit. Direct burial cable must be factory approved prior to installation to assure proper wire / terminal strip placement.
- (3) All wires shall be run parallel to side walls of panels and/or in covered wiring troughs. Wiring passing across hinged areas shall be protected by abrasion resistant cabling material
- (4) All connections shall be made on mechanical compression type terminals whenever possible. When screw terminals must be used, wire ends shall be equipped with compression applied lugs. All connections for incoming and outgoing electrical wires in all panels and junction boxes shall be made on fully labeled terminal boards mounted inside the panel.
- (5) Wire ties and/or wire track shall be used to maintain panel wiring in neat bundles for maintenance and to prevent interference with operating devices. Each wire shall be number coded to match schematics. A schematic shall be permanently attached to the inside surface of the front door.

- (6) All ground connections shall be made with fork terminals and star washers to assure proper ground.
- (7) Terminal blocks with box type lugs shall be supplied to terminate all wiring for floats, heat sensors, and seal sensors for the pump, if required. The pump leads shall be terminated at box type terminal blocks.
- (8) Control voltage shall be 120 VAC and may be accomplished by the means of a transformer should the input voltage be unable to produce a 120 VAC signal. Control fuse(s) and an on-off switch/circuit breaker shall protect and isolate the control voltage from the line.
- (9) Wiring shall be done in accordance with numbered per drawing attached to enclosure door.

#### 2.2.4 Check Valve

Pump discharge pipe shall be equipped with a factory-installed gravity operated ball check valve. The valve will provide a fully ported passageway when open and shall introduce a friction loss of less than six inches of water at maximum rated flow. Working parts shall be made of heavy duty cast iron 300 series stainless steel and non-wicking fabric reinforced neoprene flap to ensure corrosion resistance, repeatability and dimensional stability.

#### 2.2.5 Redundant Check Valve

- (1) Each basin package will require a redundant check valve for installation provided by the contractor in the service lateral between the grinder pump station and the low pressure main. Valves shall be 2.0-inch NPT and only require ½ pound of backpressure for complete closure.
- (2) Redundant check valve will be identified on a separate line item bid sheet.

#### 2.2.6 Pump Controller

- (1) *The pump controller shall be model PC3000X as manufactured by Primex Controls, or approved equal.* Thirty-two (32) character alpha-numerical LCD for level, status and setpoint. Alternation selection switch on front panel to run alternation. Simplex menu structure for easy display/modification of setpoints. Built-in ETMs for all pumps. 4-20mA main sensor input with loop power supply for easy connection to most transducers. Pump seal fail and over temp inputs with indication. Scalable 4-20mA level output transmitter. Built-in single float backup system. Three auxiliary inputs. Built-in horn relay with input for external mute button. Relay outputs for both high- and low-level alarms. Individually selectable setpoints for up to three pumps. All inputs are filtered and transient protected. Built-in software, no programming required.

- (2) *Enclosure.* Nema 4X Stainless Steel enclosures shall be 304 type, and shall include a three-point latch and shall be provided with an inner door swing panel. The enclosure shall have provisions for padlocking. A nameplate shall be permanently affixed to the panel and include the voltage, phase, hertz, pump full load ampere rating, and pump horsepower rating. A warning label stating the power should be disconnected before servicing shall appear on the panel. Pilot devices, pump controller, breakers etc. shall be mounted on the enclosure door for indoor rated enclosures (Nema 12) and on the inner door swing panel for outdoor rated (Nema 4 or 4x) enclosures.
- (3) Alternation selection switch on front panel to run alternation.
- (4) *Pump Breakers – Schneider Electric.* QOU series breakers shall be used for 120/208/230V applications less than 100A. H Frame HDL breakers shall be used for all 460V applications or 230V applications greater than 100A. Pump Breakers shall be operable through the enclosure door on indoor rated enclosures or through the inner door swing panel on outdoor rated enclosures.
- (5) *Branch Circuit Breakers – Schneider Electric.* QOU series of Multi-9 C60 series breakers shall be used for branch circuit protection. Breakers shall be operable through the enclosure door on indoor rated enclosures or through the inner door swing panel on outdoor rated enclosures.
- (6) *Surge Protection – Schneider Electric.* Control Panel should be provided with Surge Protection wired to the incoming power. Model SDSA1175 shall be used for single phase applications. Model SDSA3650 shall be used for three phase applications.
- (7) *Motor Starters – Schneider Electric.* Each Pump shall be provided with an IEC rated motor starter with overload protection sized for motor load. Starters shall include auxiliary contacts for indicating when the motor starter is energized and when the overload relay has tripped. An overload reset mechanism shall be provided for manually resetting motor overload conditions. Reset mechanism shall be operable through the enclosure door on indoor rated enclosures or through the inner door swing panel on outdoor rated enclosures.
- (8) *Terminal Blocks – Phoenix.* Phoenix UT Series terminals shall be provided for all field connections including floats, pumps, and alarm circuits. Terminals shall be mounted to din rail on 45-degree angled brackets.
- (9) *Relays – Schneider Electric.* Relays shall be RXM series 4 Pole, 6A rated, with LED indicator, manual position indicator and a test switch. Model RXM4AB2F7 for 120V coils. Model RXM4AB2BD for 24VDC coils. Relay bases shall be Model RXZE2M114M.

- (10) *Time Delay Relays – Schneider Electric and Macromatic.* On Delay relays shall be Schneider Electric REXL series 4 pole with LED indicator adjustable from 0.1s-100h. Off Delay relays shall be Macromatic TE-8812U series 2 pole with LED indicator adjustable from 100ms-10days.
- (11) *Pilot Devices – Schneider Electric.* All selector switches and lights shall be Schneider Electric XB4 series and 22 mm in size. All pilot devices shall be mounted to the enclosure door for indoor rated enclosures or mounted to the inner door swing panel for outdoor rated enclosures. All pilot devices shall be clearly labeled with engraved plates that match the control wiring diagrams. All pilot lights shall be rated 120V and include LED type bulbs. Green Pilot lights shall be used to indicate pump running signals. Red pilot lights shall be provided to indicate level alarms or pump failures.
- (12) *Elapsed Time Meters – ENM.* Each pump shall be provided with an elapsed time meter for tracking run times of the pumps. Elapsed Time Meters shall be ENM model T50B2.
- (13) *Alarm Beacon – Ingram Products.* Alarm Beacon shall be Ingram Products Model SBN120ACR. Alarm Beacon shall be mounted to the top or side of the enclosure so it is clearly visible. Alarm Beacon shall indicate and level alarms or pump failure conditions.
- (14) *Phase Monitor Relay – Macromatic.* A phase monitor relay shall be wired to the incoming power supply to prevent the pumps from operating in the event of undervoltage, overvoltage, and phase loss or phase reversal conditions. Phase Monitor shall be Macromatic Model PMPU with a 70169-D socket.
- (15) *Intrinsically Safe Barriers – Turck.* For sewerage applications or other applications where level sensors will be installed in a classified location intrinsically safe barriers shall be utilized for the level sensor connections. For float (contact closure) connections Turck Model IM1-22EX-R barriers shall be used. These barriers shall be two channel and include LED indicators.
- (16) *Power Supplies – IDEC or Phoenix.* For applications requiring 12V or 24V DC power power supplies rated for system load shall be provided. For standard applications IDEC series PS5R-V shall be used. For applications requiring battery back-up (UPS) operation Phoenix brand Mini DC or Trio-UPS shall be utilized. Batteries shall be as recommended by power supply manufacturer.
- (17) *Pump Protection Modules – Xylem or other.* Pump protection relays as recommended by the pump manufacturer shall be provided for each pump. Pump protection shall monitor the pump for motor overtemp and seal failure conditions. The relay shall include indicating LED's for



overtemp and seal failure. Motor overtemp conditions must prevent the pump from operating. Pump protection relays shall be mounted through the enclosure door for indoor enclosures or through the inner door swing panel for outdoor enclosures. When it is not possible to mount the pump protections relays through the door or the relay does not provide status indicating LED's pilot lights shall be provided to indicate motor overtemp and seal failure conditions.

#### 2.2.7 Liquid Level Detection

- (1) Level detection for controlling pump and alarm operation shall be accomplished by use of a four mechanical float switches. Switches utilized in the system shall be hermetically sealed in a submersible watertight protective housing with a weight attachment.
- (2) Floats shall be Primex Kwikswitch Series, or approved equal. Alternates will not be accepted. Each Kwikswitch manifold will include four quick release connections to accommodate up to four KwikSwitch floats. When the quantity of floats exceeds the four ports on a KwikSwitch manifold additional manifolds shall be supplied to accommodate the application.
  - i. KwikSwitch floats are available in normally open and normally closed configurations.
  - ii. Sealing plugs for unused KwikSwitch ports that provide CSA certified submergence rating of not less than 6 feet for 72 hours.
  - iii. The contractor shall install the and connect the float connection systems including 4 port manifold(s), matching Kwikswitch quick release floats, and stainless-steel mounting bracket.
  - iv. The Kwikswitch manifold shall be provided with a single multi-conductor shielded cable with not less than 50 ft.
  - v. The Kwikswitch floats shall be supplied with a minimum cable length of 50 ft.
- (3) Mechanical switch shall be guaranteed by the manufacturer to meet UL approval for submersion.
- (4) The level control shall be suspended by a float bracket and easily adjustable for proper height requirements in the field.

#### 2.2.8 Vent Assembly

A 4-inch wetwell vent assembly with schedule 40 PVC pipe and fittings and a steel vent with bronze screen and powder coat finished shall be furnished. The vent assembly shall be designed for installation through the sump cover.

### 2.2.9 Shut-Off Valve

The pump discharge pipe connection shall be equipped with a factory installed manual gate valve. Gate valve shall be fully ported, constructed of bronze with stainless steel ball, stainless steel stem and hardware, and Teflon seats, with a minimum rated pressure of 150 PSI. An extension valve handle will be supplied for manual operation from top of basin secured with a stainless steel support bracket.

### 2.2.10 Anti-Siphon Valve

The pump shall be constructed for a positively primed, flooded suction. As added assurance that the pump cannot lose prime, even under negative head conditions in the discharge piping, provision for a PVC Anti-Siphon valve will be made available after the check valve.

### 2.2.11 Fiberglass prepackage, or approved equal

(1) General: The PumpCon duplex non-clog pump station (or approved equal) shall be as described in these specifications and accompanying drawings, and shall consist of (but not be limited to), the following:

- i. Sump Basin
- ii. Sump Cover
- iii. Vent Assembly
- iv. Inlet Pipe Connection
- v. Guiderail Assemblies
- vi. Discharge Piping Assembly
- vii. Level Control Suspension Bracket
- viii. Conduit connections

All equipment shall be installed unless otherwise noted in these specifications to provide a single unit package when delivered to the job site.

(2) Sump Basin: The basin shall be watertight. The minimum design and manufacturing requirements for Filament wound Fiberglass Reinforced Plastic Sump Basins and Wetwells for use in sanitary and storm sewer applications.

- i. ASTM D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

- ii. ASTM D3753, Standard Specification for Glass-Fiber Reinforced Polyester Manholes and Wetwells.
- iii. AWWA C950, Fiberglass Pressure Pipe.
- iv. ASME RTP-1 MN3-321.
- v. Shell design shall be in accordance with the methods and formulas in AWWA C950 M-45. Design of flat bottoms shall account for both limiting stress and deflection. Design shall be based on industry standard lamination analysis for the glass reinforcement layers and resins system. Design shall determine cylinder and flat bottom thickness.
- vi. Laminate properties: The minimum flexural modulus in the circumferential direction shall be 2,000,000 PSI and in the longitudinal directions shall be 1,000,000 PSI.
- vii. Wall thickness shall vary with the basin/wetwell height. Calculated wall thickness shall be based on the following site assumed conditions: (a) Soil Modulus: 700 PSI and (b) Soil Density: 120 pounds per cubic foot (lb/ft<sup>3</sup>). Calculations shall employ a Lucher's safety factor of two (2).
- viii. Material:
  - Resin:* Resins used shall be commercial grade unsaturated polyester type, suitable for the intended service as indicated by usage history or resin manufacturer's recommendation.
  - Cure system:* Resin promotion and catalyst system used shall follow resin manufacturer's guidelines.
  - Fillers and Additives:* No fillers or resin extenders of any type shall be utilized. A maximum of two percent by weight of any commercial grade thixotropic agent may be added to resins for the purpose of viscosity control.
  - Reinforcing materials:* Reinforcing material shall be commercial grade "E" type glass fibers in the form of chopped strand mat, chopped roving woven roving or continuous roving. Uni-directional glass shall be used in addition to any other glass used. Glass fibers shall be treated with a coupling agent that facilitates bonding between the reinforcement and the resin
- ix. Laminate:

*General:* Basin laminates shall consist of three layers (inner surface,

interior layer and structural layer). The tank manufacturer will provide calculations verifying acceptable wall stress/thickness upon request.

*Inner surface:* The inner surface shall consist of resin rich layer with no exposed fibers.

*Interior layer:* The interior layer shall consist of a resin rich reinforced layer with a nominal fiber content of 30 percent. Reinforcements shall be chopped strand mat or chopped roving.

*Structural layer:* The structural layer shall be chop-hoop filament wound consisting of chopped strand and continuous roving reinforcement oriented in the hoop direction. As required, uni-directional roving shall be incorporated into this layer to enhance longitudinal properties. The exterior surface shall be relatively smooth with no exposed fibers or sharp projections. Nominal fiber content on the structural layer shall be a minimum of 62 percent.

x. Appurtenances:

*Top flange:* The basin shall have a top flange that is 3 inches larger in diameter than the interior of the tank.

*Bottom:* The bottom of the wet well shall be built to withstand full exterior water column with a maximum deflection of 3/8 inch.

*Bottom anti-flotation flange:* The bottom anti-float flange shall be a minimum of 3 inch larger in diameter than the wetwell and be constructed to withstand the maximum uplifting force that could be exerted with an empty well and full water column outside the tank.

*Basin/wetwell:* Shall be designed to withstand H-20 traffic load, when properly installed.

*Cover attachment:* Stainless steel threaded inserts shall be installed in the top flange of the basin/wetwell to accommodate attachment of covers. The inserts shall be 3/8-inch diameter in a 6-bolt pattern, 60 degrees apart and secured using polyester resin to permanently hold in place.

*Lifting lugs:* Three (3) epoxy coated lifting lugs, strategically located on the wetwell shall be supplied to assist in handing and setting of the wetwell.

xi. Quality Assurance:

*Visual acceptance:* The inner surface shall be free of exposed fibers, crazing and delaminations. No Blisters larger than 1/2 inch or

wrinkles more than 1/8 inch in depth will be allowed.

*Laminate cure:* Laminate cure shall be indicated by means of Barcol hardness measured in accordance with ASTM D2583. The average Barcol hardness shall not be less than 90 percent of the resin manufacturer's recommendation for clear resin castings.

*Workmanship:* All workmanship and materials throughout shall be of the highest quality available.

- (3) Sump Cover: The sump cover shall be fabricated of ¼-inch aluminum 6061 treadplate material. Hinged hatch doors shall be supplied for wetwell and valve vault access. Lifting handles, hatch door hold open devices, 4-inch vent connection, padlock provisions and stainless steel hinges shall be provided. The cover shall be secured to the basin with stainless steel bolts.
- (4) Vent Assembly: A 4-inch wetwell vent assembly with schedule 40 PVC pipe and fittings and a steel vent with bronze screen and powder coat finished shall be furnished. The vent assembly shall be designed for installation through the sump cover.
- (5) Inlet Pipe Connection: A bolt-on, cast iron, caulking type inlet hub for the 8-inch inlet pipe shall be furnished. The inlet hub shall be shipped loose for location and installation in the field.
- (6) Guiderail Assembly: The guiderail assembly shall consist of two (2) pieces of 2-inch Schedule 40 304 stainless steel pipes, per pump. The guiderails shall be secured in the wetwell by attaching to a base disconnect located on the floor of the wetwell and the upper guiderail brackets, bolted to the hatch cover.
- (7) Discharge Piping Assembly: The discharge piping shall consist of Schedule 80 PVC pipe and fittings and brass swing check valves and brass gate valves. The valves shall be located in the valve vault. The discharge piping shall terminate at valve vault wall with a common female NPT connection. Rubber ring gaskets shall be installed between each flanged connection and 304 stainless steel flange nuts and bolts shall be used.
- (8) Level Control Suspension Bracket: A bracket assembly shall be furnished for the suspension of up to six level control cords. Construction shall be of 304 stainless steel material with stainless steel mounting hardware.
- (9) Conduit Connection: Three (3) 2-inch bolt-on conduit connections shall be installed on the station. The conduit connections shall consist of an aluminum coupling with an aluminum mounting plate. Stainless steel hardware shall be used for attaching the conduit connection to the basin

wall.

- (10) Painting: All internal metal parts that are not brass, galvanized steel or stainless steel shall be painted with coal-tar epoxy paint to resist corrosion, unless otherwise noted.

## 2.3 PUMPS

### 2.3.1 Design

- (1) Each grinder pump shall be a heavy-duty pump used as a grinder. Each grinder pump shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects", such as paper, wood, plastic, glass, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 2-inch diameter Sch. 80 discharge piping. The stationary cutter and rotary cutter shall consist of hardened stainless steel.
- (2) The cutter materials shall provide maximum corrosion and abrasion resistance. The remaining portion of the grinder pumps, with the exception of seal materials and wet end, shall be similar to the heavy-duty pumps used in larger pump stations for daily operation.
- (3) The grinder pump shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. No portion of the pump shall bear directly on the sump floor.
- (4) Each pump shall be equipped with a 4HP, submersible electric motor connected for operation on 208 volts, 3 phase, 60 hertz, and 3 wire service with 30 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval.
- (5) The pump shall be supplied with a mating cast iron 1<sup>9/16</sup>-inch discharge connection and 30.6 GPM against a rated total dynamic head of 89.6 feet (Primary Duty Point) and 22.3 GPM at 97 feet (Secondary Performance Point). Each pump shall be fitted with 30 feet of stainless-steel lifting chain. The working load of the lifting system shall be 50% greater than the pump unit weight.
- (6) Furnish with each submersible pump one complete Flygt Pump Lift™ system or approved equal. The system shall consist of 33 ft of Nylon guide rope, short length of high tensile strength proof-tested chain and forged steel Grip-Eye for use with a mechanical lifting device (furnished by others). System shall be appropriately sized for weight of pump to be lifted.

- (7) *Optional mix-flush valve.* One pump in each sump shall be equipped with an automatically operating valve that will provide a mixing action within the sump at the start-up of the pumping cycle. This valve shall be mounted directly on the pump volute and shall direct a portion of the pumpage into the sump to flush and re-suspend solids and grease by the turbulent action of its-discharge. The turbulent action caused by the flow shall also provide some sump aeration benefits. The valve shall be mounted on the pump volute so that it can be removed from the sump along with the pump during normal and routine maintenance checks and shall be positioned on the volute to provide for non-clogging operation. The valve shall be equipped with an adjustable, wear-resistant discharge nozzle which shall be used to direct flow from the valve to optimize mixing action within the sump. The valve shall not require any external power source or control to operate, neither electric nor pneumatic. The use of the external power source is not acceptable. The valve shall be suitable for use in Class I, Division 1 hazardous locations. The valve shall open at the beginning of each pumping cycle and shall automatically close during pump operation after a pre-selected time of operation. The valve shall operate automatically by differential pressure across the valve and shall be actuated through a self-contained hydraulic system which uses an environmentally safe fluid. A method of adjusting the valve operating time shall be provided.

### 2.3.2 Performance

In order to ensure proper operation under all conditions, pump must provide, without overheating in continuous operation, the maximum head condition required by the system. Pump must also be capable of operating at zero or negative heads without damage to the pump.

### 2.3.3 Construction

- (1) Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. The lifting handle shall be of stainless steel. All exposed nuts or bolts shall be AISI type 316 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
- (2) Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
- (3) Rectangular cross sectioned gaskets requiring specific torque limits to

achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

#### 2.3.4 Cable Entry System

The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

#### 2.3.5 Electric submersible Motor

- (1) The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of no less than 30 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. The motor and the pump shall be produced by the same manufacturer.
- (2) The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to



exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting current and no-load characteristics.

- (3) The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

#### 2.3.6 Bearings

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two-row angular contact bearing to compensate for axial thrust and radial forces. Sleeve or single row lower bearings are not acceptable. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

#### 2.3.7 Mechanical Seal (2x), Pump Shaft, Impeller, Volute, Protection, MiniCAS, Explosion proof

- (1) Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, corrosion and abrasion resistant tungsten-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, corrosion and abrasion resistant tungsten-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.
- (2) The following seal types shall not be considered acceptable or equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to

effect sealing shall be used. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load. Where a seal cavity is present in the seal chamber, the area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action. Seal lubricant shall be non-hazardous.

- (3) Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. If a shaft material of lower quality than stainless steel – ASTM A479 S43100-T is used, a shaft sleeve of stainless steel – ASTM A479 S43100-T is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided in the oil housing and above. Therefore, the use of stainless-steel sleeves will not be considered equal to stainless steel shafts.
- (4) The impeller(s) shall be of grey cast iron, Class 35B, dynamically balanced, single shrouded design having a long throughlet without acute turns. The impellers shall be capable of handling fine slurry from the special cutters. Impeller(s) shall be taper collet fitted and retained with an Allen head bolt. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.
- (5) Pump volute(s) shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any media that may enter the impeller. Minimum inlet and discharge size shall be as specified.
- (6) All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125°C (260°F), the thermal switches shall open, stop the motor and activate an alarm. A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will send an alarm and, if desired, stop the motor. **USE OF VOLTAGE SENSITIVE SOLID-STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.** The thermal switches and FLS shall be connected to a MiniCAS (Control and Status) monitoring unit. The Mini CAS is designed to be mounted in any control panel.
- (7) Furnish and install one Flygt MiniCAS (Mini Control and Status) module to

monitor the temperature and leakage detectors installed in each Flygt pump. The MiniCAS shall be capable of monitoring the thermal switches embedded in the stator end coils, the FLS (float switch type) float leakage sensor. The MiniCAS shall monitor both the series connected thermal switches and leakage sensor by outputting 12 VDC on a single two wire circuit. The MiniCAS circuitry shall operate on the current sensing principle whereby a change in temperature or leakage condition shall change the resistance of the associated sensor and thus alter the current in the sensing circuit. The MiniCAS shall contain two sets of form C dry contacts, one for over-temperature and one for leakage. The dry contacts shall change status upon occurrence of an over temperature or leakage condition so as to indicate that condition to other control components in the pump control panel. In the case of an over-temperature, and in keeping with Flygt's warranty policy, the over-temperature dry contacts shall be used to trip the pump off line. The MiniCAS shall be designed to be plugged into a standard 11-pin circular socket. Detailed technical data and wiring connections shall be found in the MiniCAS Manual.

- (8) Explosion proof pumps: The pump system including the pump, motor and power cable shall be approved for use in areas classified as hazardous locations in accordance with the NEC Class I, Div. 1, Group C and D service as determined and approved by a U.S. nationally recognized testing laboratory (U.L., FM, CSA) at the time of the bidding of the project. As required by Factory Mutual (FM) the motor shall be capable of operating in pumped media up to 104°F. Motor thermal switches shall monitor and protect the motor from excessive temperature. An internal Float Switch shall be available, in the motor chamber. Service of explosion-proof submersible units shall be performed by qualified FM experienced personnel. The pump manufacturer must provide training schools to qualify personnel in the proper service and repair of explosion-proof pump.

## 2.4 AUTOMATIC CONTROL / ALARM PANEL

### 2.4.1 General

The Control system shall include all equipment, devices, wiring, and incidental materials to operate the system and display or relay information in accordance with these specifications. All circuits and devices for protection of installed equipment shall be included in the lump sum bid. The contractor shall furnish a Duplex, 4 HP, 208 Volt, 3 Phase control panel with transducer primary operation and two float back-up operation manufactured by a UL508A and UL698A certified panel shop and shall bear the UL698A label. All components shall be UL listed including those supplied by the pump manufacturer and the control panel shall house all necessary controls including circuit breakers, motor starting components, and other equipment specified herein. The panel shall be built to meet NEMA4X ratings and shall in all respects conform to the National Electric Code and all other state and local codes

which may apply.

The panel shall have a formed aluminum switch mounting plate. All control switches and indicator pilot lights shall be mounted on the switch mounting plate.

All conduit entrances shall be made in a NEC approved manner. The conduits to the wet well shall have approved seal-off fittings installed and properly sealed to protect the control panel from adverse damage from the wet well.

All components shall be securely mounted to the back plate with plated machine screws through machine thread tapped holes in the back plate. The screws shall be of adequate size for the device being secured.

Alarm panel shall be equipped with an automatic dialer programmed to the police department.

#### 2.4.2 References

- i. ANSI®/NFPA® 70 – National Electrical Code® (NEC®)
- ii. IEC 61000 – Electromagnetic Compatibility
- iii. NEMA 250 – Enclosures for Electrical Equipment
- iv. NEMA ICS7 – Industrial Control and Systems Adjustable Speed Drives
- v. UL® 50 – Enclosures for Electrical Equipment
- vi. UL 98 – Disconnect Switches
- vii. UL 507 – Electric Fans
- viii. UL 508 – Industrial Control Equipment
- ix. UL 508C – Power Conversion Equipment
- x. UL 698A – Circuit extension into hazardous locations
- xi. UL 991 – Safety Tests
- xii. IEEE-519 – Harmonic levels

#### 2.4.3 System Description – Wastewater Pumping Station

- (1) The control panel shall utilize standard “off the shelf” equipment. Job specific, “one-of-a-kind” customized software and hardware compartments will not be accepted. A standard system is defined, as one, which has been published in literature, is available at the time of bid, with fully tested hardware and software, such that no development must be done beyond

system configuration.

- (2) The control panel shall provide both manual and automatic operation of the pumps.
- (3) Each Pump shall be provided with a Hand-Off-Auto switch, run light and elapsed time meter.
- (4) Each Pump shall be provided with a motor protection relay as recommended by the pump manufacturer to monitor the pumps for motor overtemp and seal fail conditions.
- (5) A phase monitor shall be provided to monitor the incoming power to the pump station and prevent the pump from operating when power is outside its normal range or has lost a phase or a phase reversal has occurred.
- (6) A back-up active indicating light and a back-up reset pushbutton shall be provided to allow the system to be returned to PC3000 operation.
- (7) Dry alarm contacts for remote monitoring level alarms, pump failures, back-up active, and the status of the phase monitor relay shall be provided.
- (8) Primex Kwikswitch connection system shall be provided for float connection(s) in wet well. A four port manifolds shall be provided to accommodate the two float connections required for this project. Sealing plugs shall be provided for the unused ports on the manifold.
- (9) Pumping station shall be equipped with receptacle and transfer switch for portable generator.

#### 2.4.4 Submittals

Product Data: Manufacturing data sheets for all components indicating pertinent data and identifying each component by item number and nomenclature as indicated on the drawings and in the specifications. Designation as listed in the bill of material shall be clearly indicated on the data sheet. If multiple products or options are shown on the same sheet, Contractor shall clearly indicate which products and options are intended for the item being provided.

#### 2.4.5 Substitutions

The Engineer will consider proposals for substitution of materials, equipment, methods and services only when proposals are accompanied by full and technical submittal data and all other information required by the Engineer for the proposed substitution. Substitution of materials, equipment, methods and/or services is not allowed unless such substitution has been specifically approved by the Engineer.

#### 2.4.6 Quality Assurance

All control equipment must conform to UL 508A and NEC Standards.

#### 2.4.7 Warranty

Twelve (12) months from date of manufacture. The warranty shall apply to being free to defects in material and workmanship.

### 2.5 SPARE PARTS

2.5.1 A complete set of manufacturer's recommended spare parts shall be provided for each group of pumps operating in the system.

2.5.2 All spare parts shall be properly protected for long periods of storage and packed in containers which are clearly identified with indelible markings as to the contents.

### 2.6 CORROSION PROTECTION

2.6.1 All materials exposed to wastewater shall have inherent corrosion protection: i.e., coated cast iron, fiberglass, polyethylene, engineered polypropylene copolymer, stainless steel, bronze, and PVC or CPVC.

### 2.7 SAFETY

2.7.1 The grinder pump station shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the grinder pump and panel shall be listed by Underwriters Laboratories.

2.7.2 The grinder pump station shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low-pressure sewer system applications.

### 2.8 PRODUCT HANDLING

2.8.1 All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from time of shipment.

2.8.2 Factory assembled parts and components shall not be dismantled for shipment.

2.8.3 Finished surfaces of all exposed pump openings shall be protected.

2.8.4 After hydrostatic or other tests have been completed, all trapped water shall be removed prior to shipment and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

2.8.5 Each box or package shall be properly marked to show its contents.

## 2.9 LIMITED WARRANTY

2.9.1 The manufacturer shall provide a warranty on materials and workmanship for a period of twenty-four (24) months after notice of Owner's acceptance, but no greater than twenty-seven (27) months after receipt of shipment. The Owner will return any equipment found defective to the manufacturer for inspection and validation of the defect. Defective equipment will be repaired or replaced at manufacturer's discretion and shipped back to Owner at no charge.

## PART THREE – EXECUTION

### 3.1 FACTORY TESTING

3.1.1 Testing performed upon each pump shall include: (a) impeller, motor rating and electrical connections shall be checked for compliance with this specification; (b) each pump shall be run dry to establish correct rotation; (c) each pump shall be run submerged in water (at least for 5 minutes); (d) motor and cable insulation shall be tested for moisture content or insulation defects; and (e) pump performance test shall cover three (3) different points of operation on its curve, with the maximum pressure not less than that required by the system design.

3.1.2 Each grinder pump appurtenances and controls which will be installed in the field, shall be 100% factory tested.

3.1.3 Each pump shall be tested in accordance with the latest test code of the Hydraulic Institute (H.I.) at the manufacturer to determine head vs. capacity and kilowatt draw required.

3.1.4 All control panels shall be shop assembled and factory tested prior to delivery to the site. Final as-built drawings shall be made to reflect all adjustments and modifications made to the systems after start-up has been completed satisfactorily. All equipment and devices shall be mounted, adjusted, calibrated and operated exactly as recommended by the manufacturer of each component.

3.1.5 Control switches, pilot lights, and other devices shall be grouped in a logical arrangement for ease of operation.

3.1.6 Control equipment shall be mounted to panel back plates with screws or bolts fastened into drilled and tapped holes. Nuts shall not be used. Panel face mountings shall be made by cutting holes exactly to manufacturer's instructions including keyways, etc. Engraved legend plates indicating function and operational instructions as applicable shall be mounted on all devices. All equipment shall be labeled and identified with designations which match the control wiring diagrams.

### 3.2 INSTALLATION

- 3.2.1 The grinder pump station and related components shall be installed in accordance with approved shop drawings and manufacturer's written instructions. The panel shall be wall mounted per drawings.

### 3.3 TRAINING & START UP SERVICES

- 3.3.1 Conduct one (1) operation and maintenance seminar on site for the benefit of Owner(s) and operating personnel. Owner to provide building facilities for conducting seminar. The grinder pump station exactly as furnished for the project including all appurtenances and product handling, shall be provided and demonstrated. Seminar time and date will be mutually agreed upon between the owner and manufacturer.
- 3.3.2 An authorized service technician will perform start up on the residential grinder pump station. Start up procedure is to be conducted and scheduled between the engineer, authorized service technician and owner of maintaining the pressure sewer system.

**END OF SECTION**



Section 11210B  
PACKAGED PUMP STATION  
LAKESIDE BOULEVARD

PART ONE - GENERAL

1.1 DESCRIPTION OF WORK

1.1.1 Furnish one (1) new complete factory-built and tested submersible Pump Station, consisting of a two (2) Keen Pump KG(X)3, or approved equal, 3 HP submersible electric motor, 208 volts, 3 phase, 60 hertz, 4-wire service, lifting chain or stainless-steel cable (the working load of the lifting system shall be 50% greater than the pump unit weight), with 50 feet of submersible cable (SUBCAB) suitable for submersible pump applications, turnkey basin package, level control system, Nema 4X, or equal, fiberglass control panel, Nema 4X, or equal, junction box, stainless steel lifting chain, 3-inch ball & check valves and schedule 80 discharge pipe (3-inch).

1.1.2 Pumps shall be specifically designed and intended for service in pressure sewer systems and guide bar mounted. All pumps supplied on the project for this service shall be of the same manufacturer. The pump shall be supplied with a mating cast iron 3-inch discharge connection.

1.2 DESCRIPTION OF SYSTEM

1.2.1 The new pump system shall consist of a 4 foot diameter fiberglass basin wet well with submersible wastewater grinder pump and alarm panel, and discharge connection and appurtenances.

1.2.2 All the equipment specified herein is intended to be engineered equipment for macerating and pumping all material in normal domestic wastewater.

1.3 QUALIFICATIONS

1.3.1 All of the equipment furnished herein shall be the product of a manufacturer experienced in the design and manufacture of grinder pumps designed for use in low pressure sewer collection systems. All parts shall be properly stamped for identification and location as shown in the Operation and Maintenance Manuals furnished. Nameplates giving the name of the manufacturer, the rated capacity, head speed and all other pertinent data shall be attached to each packaged pump station.

1.3.2 All equipment furnished under this Specification shall be new and unused, shall be the standard product of pump manufacturer having a successful record of manufacturing and servicing the equipment and systems specified herein.

1.3.3 All manufacturers must have been in the business of manufacturing grinder pumps for a minimum of ten years. Manufacturer must demonstrate to the satisfaction of the Engineer that the proposed pumping equipment will meet system flows and heads required.

#### 1.4 SUBMITTALS

1.4.1 After receipt of notice to proceed, the manufacturer shall furnish the Engineer one (1) electronic set of shop drawings of all materials required to establish compliance with the specifications. Submittals shall include the following:

- (1) AutoCAD drawing illustrating details of fiberglass package pump station with discharge elevation, basin diameter and depth with side and top view.
- (2) Package station components, shut-off and ball, plug, check valves, discharge rail assembly, stainless steel lifting chain, Nema 4X junction box, float level controls, float bracket, 8-inch Sch. 80 inlet flange, and 72-inch fiberglass basin with its corresponding cover.
- (3) KG(X)3, or equal, 3 HP, 208 volts, three phase pump specification sheet with motor and performance curve. Pump motor monitoring device data. Electrical motor data.
- (4) Duplex Nema 4X stainless steel control panel, or equal, drawing, wire schematic and spare parts list. Individual electrical control panel components cut sheets.
- (5) Engineering report illustrating the hydraulic design analysis utilizing the KG(X)3, or equal, grinder pump hydraulic pump curve (pump performance curves).
- (6) Wet well elevation depth below ground surface.
- (7) Force main elevations as shown on the drawings.
- (8) Details of the pump.
- (9) Technical manuals.
- (10) Typical installation guides.
- (11) Parts list.
- (12) Printed warranty (and certified agreement to the conditions of warranty)
- (13) Furnish all submittals within 30 days of receipt of notice to proceed.

## 1.5 OPERATING INSTRUCTIONS

- 1.5.1 Six (6) copies of an operating and maintenance manual for the grinder pump station shall be furnished to the Engineer prior to completion. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operating and maintenance personnel familiar and unfamiliar with such equipment.
- 1.5.2 A factory service technician or factory trained service technician, who has complete knowledge of proper operation and maintenance, shall be provided for one (1) day onsite to instruct representatives of the owner on proper operation and maintenance. If there are difficulties in the operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the owner.

## PART TWO – PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

- 2.1.1 The pumps and equipment covered by this section are intended to be of robust designs and proven ability as manufactured by reputable firms having extensive experience in the production of such pumps and equipment. The pumps and equipment furnished shall be designed and constructed in accordance with the best practice and methods.
- 2.1.2 All parts shall be so designed and proportioned as to have liberal strength and stiffness and to be especially adapted for the work to be done. Ample room and facilities shall be provided for inspection, repairs and adjustment.
- 2.1.3 Brass or stainless-steel nameplates giving the name of the manufacturer, the rated capacity, head, speed, serial number, model number, horsepower, voltage, amperes and all other pertinent data shall be attached to each pump.

### 2.2 SUBMERSIBLE GRINDER PUMP STATION

#### 2.2.1 General

- (1) Furnish and install two (2) submersible wastewater pump(s) Keen Pump KG(X)3, or approved equal. Each pump shall be equipped with a 3 HP submersible electric motor, connected for operation on 208 volts, 3 phase, 60 hertz, 4-wire service, with 50 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. Required cable field length to be confirmed by Contractor before ordering.

#### 2.2.2 Operating conditions

Each pump shall have the following performance curve characteristics:

- (1) Primary Duty Point: 72.4 GPM @ 54-ft TDH
- (2) Impeller diameter: 4.50"
- (3) Motor RPM: 3450
- (4) Maximum Motor Rating: 3 HP
- (5) Voltage/ phase: 208V/3PH
- (6) Discharge Connection: 3 inches
- (7) Manufacturer: Keen or Approved Equal

## 2.3 SUBMERSIBLE MOTOR CONSTRUCTION

2.3.1 General: All castings in the stator housing construction shall be ASTM A48 Gray Cast Iron Class 35. The submersible motor stator and rotor shall be of an induction type, NEMA® L (Single-Phase) or NEMA® B (Three-Phase) squirrel cage design.

The stator is to be press-fit in watertight, oil-filled, TENV chamber to provide the maximum heat dissipation. The armature assembly of the motor must meet or exceed the balance specification as defined in ISO 1940 G2.5.

Stator housing shall be filled with clean, high dielectric oil that lubricates bearings and seals, transferring heat from windings and rotor to the outer cast housing.

Proprietary KEEN I.C.E. oil ensures industry-low operating temperatures. KEEN I.C.E. oil is a synthetic blend with wear-additives, specifically engineered for submersible pump motors.

### 2.3.2 Submersible Motor Design:

Horsepower:	3HP
RPM:	3450 rpm
Voltage:	208V
Phase:	3 Phase
Service Factor:	1.20

2.3.3 Insulation System: The insulation system of the submersible motor design shall be of Class F as defined in NEMA® MG-1 and established in accordance with IEEE® std. 1 rated for 311° F (155° C). To include:

1. The stator windings shall be constructed of material to meet the Class F insulation system.

2. The insulation varnish in the system must be applied in a dip and bake manner.
3. Stator lead material must meet or exceed Class F insulation system.
4. Thermal limiting device shall be designed, secured to the stator and constructed to meet the Class F insulation system.
  - a. The thermal limiting devices shall be attached to each phase winding.
  - b. The thermal limiting devices shall be used in conjunction with and supplemental to external motor overload protection and must be connected to the motor control center.

2.3.4 Operation of the motor shall be designed for the following:

1. Intermittent duty handling pumped media of 140° F (60° C) ambient and shall not exceed NEMA® Class B operating temperature rise of 176° F (80° C).
2. Capable of 10 evenly spaced starts per hour.
3. A combined service factor, in combination with effect of voltage, frequency and specific gravity, shall be at a minimum of 1.00.
  - a. Acceptable voltage variation is +/- 10%.
  - b. Acceptable frequency variation is +/- 5%.
  - c. Voltage unbalance must not exceed 1% as defined per NEMA MG-1 12.45.
  - d. Current unbalance must not exceed 5%.
4. The horsepower of the motor shall be adequately designed to be non-overloading across the entire pump performance curve, to include pump shut-off and pump run-out.

2.3.5 The submersible motor and pump must be designed, constructed and assembled by the same manufacturer.

2.4 SUBMERSIBLE MOTOR CORD ENTRY CONSTRUCTION

- 2.4.1 General: The cord entry housing shall be ASTM® A48 Grey Cast Iron Class 35. Power and control cables shall be secured and sealed to the submersible motor. Construction shall be of a method to provide anti-wicking barriers to the submersible motor.

1. The outer jacket of the power and control cables shall be sealed with an agency-approved, watertight strain relief cord grip fitted with a nitrile compression grommet or rubber compression grommet.
2. The connections between the power cable and the stator leads and control cable and the internal motor control leads shall be potted and encapsulated in a two-part epoxy in the cord entry system.

2.4.2 All bolted connections in the cord entry construction shall be:

1. Secured with 304 stainless steel fasteners.
2. Secured joints in the construction shall be compression fitted with nitrile o-rings.

2.4.3 The power and control cables shall be recognized by Underwriters Laboratory® (UL) & Canadian Standard Association® (CSA) and will be delivered in a standard length of 40 foot.

2.4.4 The cord entry housing shall be fitted with a stainless steel lifting bale sized and of adequate design to securely lift the complete construction of the submersible grinder pump.

2.4.5 The power and control cables shall be jacketed in a material suitable for submersion, oil resistant, and be flexible for portable installation.

2.4.6 Cable sizing shall be in accordance to NEC® specifications.

## 2.5 MECHANICAL SEALS

2.5.1 General: Each pump shall be constructed with a tandem mechanical shaft seal system incorporating two independent shaft seal assemblies. Seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the seal faces at a constant rate.

Inboard and outboard seal construction shall be of the following material:

1. Primary stationary ring shall be constructed of silicon carbide face material.
2. Primary rotating ring shall be constructed of silicon carbide face material.
3. Elastomers shall be constructed of Viton® materials.
4. Metal components shall be constructed of stainless steel for corrosion resistance.

The inboard shall be hydro-dynamically lubricated and operated in a sealed oil reservoir. The inboard seal chamber seal shall be designed and constructed to prevent lubricant over-filling and provide adequate lubricant expansion to avoid over-pressuring of the seal.

The pump shall be capable of operating in the clockwise or counter clockwise direction without damaging the seal faces. The pump shall be capable of operating in a dry environment without damage to the seal faces.

Class 1, Division 1, explosion-proof models shall contain an additional line bearing seal constructed of bronze, CDA836 material, and is mounted in the lower seal housing.

The line bearing seal will minimize shaft deflection and serve as the flame path for the motor assembly.

## 2.6 PUMP BEARINGS

- 2.6.1 General: Bearings shall be designed to an ABEC® System 1 or better. Each pump shall be constructed with a two-bearing system design. The upper bearing shall be a Conrad type, single row, deep groove ball bearing designed to adequately handle the required radial loads. The lower bearing shall be a Conrad type, single row, deep groove ball bearing designed to adequately handle the required radial loads.

The bearings shall be designed to deliver a minimum L-10 bearing life of 100,000 hours when operation is within the limitations of the manufacturer's performance curve. The bearings shall be lubricated in oil and will not require maintenance as described in ANSI/HI 1.4-2010 A.6.

## 2.7 PUMP SHAFT

- 2.7.1 General: The pump shaft shall be an extension of the motor shaft. Any other construction that would include coupling of two shafts is not acceptable. The pump shaft shall be a Ferritic grade AISI® Type 400 series stainless steel. Pump shaft material crystal structure shall be body centered cubic (bcc). Pump shaft shall be of a ferromagnetic material.

## 2.8 IMPELLER

- 2.8.1 General: Material shall be ASTM® A536 ductile cast iron. ASTM® A48 gray cast iron shall be unacceptable. The design shall be one-piece, 10-vane, vortex flow and dynamically balanced to ISO 1940 G6.3.

The impeller shall be designed with pump out vanes on the back shroud of the pump impeller to prevent the pump media from entering the outboard seal cavity. The impeller shall be threaded to the pump shaft.

All wetted fasteners shall be of a corrosion resistant stainless steel material. The mass moment of inertia calculations shall be provided by the pump manufacturer upon request.

## 2.9 GRINDING MECHANISM

2.9.1 General: The grinder assembly shall consist of a single rotating grinding cutter and stationary grinding ring secured to the inlet of the volute case.

1. The rotating grinding cutter shall be threaded onto the pump shaft and secured with a washer and bolt.
2. The stationary grinding ring shall be secured in place with a metal clamping ring.

Both the stationary and rotating grinding mechanisms shall be removable without disassembling the pump. No adjustment or shimming grinder assembly shall be necessary. The grinder components shall be constructed of a martensitic AISI 440C stainless steel hardened to 56-60C Rockwell. The grinder mechanism shall be capable of producing 17,250 cuts/second.

## 2.10 VOLUTE CASE

2.10.1 General: Material shall be ASTM® A48 class 35 gray cast iron. Design shall be a single piece and a modified constant velocity. Constructed of smooth passage ways large enough that any macerated solid can enter the impeller.

The discharge is to be of a horizontal centerline configuration. The discharge is to be 2-1/2" or 3" ANSI® standard Class 125, 4-bolt configuration

## 2.11 FIBERGLASS BASIN

2.11.1 General: Basin shall be made from a fiberglass reinforced polyester resin. Resins used shall be of commercial grade polyester and shall be evaluated as a laminate test or determined by previous service to be acceptable for the intended environment. The reinforcing material shall be a commercial grade of glass fiber having a coupling agent to provide a suitable bond between the glass reinforcement and the resin. The manufacturer may supply either (continuous strand, chopped-strand, continuous mat and/or non-continuous mat) or (non-continuous glass strands having fiber lengths from 0.5 to 2.0 inches). The completed material shall be inert and acceptable to the environment. The basin shall be water-tight.

Diameter	Depth	Invert Height	Discharge Height
4'	17'	383.85'	382.85'

2.11.2 Inner Surface: The inner surface shall be smooth and resin rich, free of cracks, exposed fibers, porosity and crazing.

2.11.3 Exterior Surface: The exterior surface shall be relatively smooth with no exposed fibers or sharp projections. If a pigment is added, color should be relatively equal



throughout. Foreign inclusions, dry spots, pinholes or pits, de- laminations, large dimples not meeting thickness requirements, and air bubbles are not acceptable.

2.11.4 Tank Wall: Wall thickness shall vary with the basin height to provide the aggregate strength necessary to meet the tensile and flexural physical properties requirements. The basin wall laminate must be designed to withstand wall collapse or buckling based on:

- A. Wall thickness
- B. Hydrostatic pressure (62.4 lbs per square foot)
- C. Saturated soil weight (120 lbs per cubic foot)
- D. Soil Modulus (700 lbs per square foot)
- E. Pipe stiffness values as specified (ASTM D3753)

Tank wall laminate must be constructed to withstand or exceed (2) two times the actual imposed loading on any depth of basin.

2.11.5 Tank Bottom: The basin bottom shall be of sufficient thickness to withstand applicable hydrostatic uplift pressure. In saturated conditions, the center deflection of the empty basin bottom shall be less than 3/8" (elastic deflection) and shall not interfere with bottom pump mounting requirements. Any mounting studs, plates, or cap screws in tank bottom shall be stainless steel and resin covered except for threads. Any inserts shall be stainless steel or brass and resin covered except for threads.

2.11.6 Tank Collar (Anti-Flotation): A means to counteract buoyancy forces shall be provided on the tank bottom in the form of a ring, and shall extend a minimum of 2" beyond the O. D. of the basin wall. Wall and collar should be blended with a radius not to exceed 1 ½" beyond wall O.D.

2.11.7 Top Flange: The top flange shall be parallel to the tank bottom/collar and perpendicular to the tank wall. Corrosion resistant inserts shall be embedded in the top flange for securing the basin cover. The inserts shall be totally encapsulated to prevent turning (minimum turning torque shall not be less than 30 foot/lbs.) pullout.

2.11.8 Basin Cover: Steel and aluminum covers with solid or access hatch design as required.

2.11.9 KL1-CV Rail Assembly: Each lift-out system shall consist of a ductile iron discharge base, stainless steel pump guide plate and cast iron elbow/check valve. All exposed nuts, bolts, and fasteners shall be 300 series stainless steel.

Discharge elbow shall be 1 ¼" X 2" NPT and shall be integral to the base assembly. The elbow/check valve shall attach to the pump with provided threaded adapter. A downward sliding motion of the pump and guide plate on the

guide rails shall cause the unit to be automatically connected and sealed to the base. The discharge flange o-ring seal shall be leak proof at all operating pressures.

Two guide rail pipes shall be used to guide the pump from the top of basin to the discharge base connection. The guide rails shall be 3/4" schedule 40 stainless steel pipe. The weight of the pump shall bear solely on the discharge base and not on the guide rails. Rail systems which require additional support directly below pump which might interfere with the flow of solids into the pump suction will not be considered equal. The guide rails shall be firmly attached to either a wall support or the access hatch frame. Systems deeper than 20 feet shall require an intermediate guide for each 20 feet of basin depth.

An adequate length of 1/4", 300 series stainless steel lifting chain shall be supplied for removing the pump. The chain shall be of sufficient length and strength for easy removal.

2.11.10 Piping: Discharge piping shall be 1-1/4" PVC Schedule 80 and shall connect to the stationary discharge base assembly and terminate at a 1-1/4" NPT flange (with a reducing bushing) mounted on the basin at the height shown in the plans.

2.11.11 Check Valve: The lift-out check valve shall be of the ball type with a corrosion resistant neoprene ball. The ball shall be the only moving part and shall move automatically out of the path of flow, thus providing an unobstructed smooth flow through the valve body. Upon pump shut-off the ball shall automatically roll to the closed position to provide a positive seal against back pressure or back flow.

2.11.12 Shutoff Valve: The schedule 80 PVC true union ball type shutoff valve shall be furnished and installed as an integral part of the internal pipe assembly. If the discharge depth is more than 2 feet from the surface, a stainless steel handle extension shall be supplied. Handle is attached to the valve stem and is supported near the top of basin within reach for service personnel.

2.11.13 Anti-Siphon Valve: The basin assembly shall include a PVC riser pipe for acceptance of an anti-siphon valve which may be factory installed or field installed. The riser pipe shall extend from the pump discharge between the check valve and the ball valve to within two feet of the surface of the basin. The riser shall be capped.

An anti-siphon valve kit shall be supplied to easily assemble to the riser pipe. The valve assembly shall include all materials required to complete the assembly. The anti-siphon valve shall mount horizontally, shall be made of PVC and will not interfere with pump removal and installation.

2.11.14 Inlet Flange: A one-piece, flexible basin inlet fitting for 4" SCH 40 plastic pipe shall be shipped loose for field installation.

2.11.15 Junction Box: A U.L. listed, Type 6 junction box shall be provided. Junction box shall be formed from corrosion resistant, flame retardant thermoplastic. The enclosure shall be of adequate thickness and properly reinforced to provide good mechanical strength. The junction box shall have a fully gasketed, hinged cover that is held in place by four (4) stainless steel screws. The hinged cover shall prevent dropping the cover into the basin during service.

An adequate number of sealing-type cord grips shall be supplied for incoming pump and level control cords. The cord grips shall be made of non-corrosive material such as PVC or nylon, and shall make an effective seal around the wire jacket.

The junction box shall have a PVC solvent weld socket with an integral 2" NPT pipe for attaching basin conduit hub. The hub shall be made of a corrosion resistant material and shall be of adequate size to accommodate the number of wires required for pump and level control operation.

The incoming wires shall be sealed by external means, (supplied by others), so that condensation from the conduit or groundwater will not enter the enclosure. The interior of the enclosure shall be of adequate size to accommodate the wires and connections for pump and level control operation.

The wires (supplied by others) running between the control panel and the junction box shall be color-coded and fastened to the pump and level controls by means of adequately sized and insulated twist lock or crimp connectors.

## 2.12 ELECTRICAL CONTROL PANEL AND APPURTENANCES

### 2.12.1 Control Panel Model / General Construction

Control Panel with Float Switch Operation. Simplex – Weather Proof Controller with Alarm and shall be relay logic. Panels utilizing printed circuit boards are not considered equal because of the inability to troubleshoot control issues.

### 2.12.2 General Operation / Construction

A complete wiring diagram and installation instructions will be provided. The control panel assembly shall be completely factory tested and shall be "UL" 508A listed and labeled. The control panel must be manufactured by the pump supplier.

A Hand-Off-Auto switch shall be provided for and mounted for convenient control of the pump state. In the "Auto" position, the level control circuit will control the pump. In the "Hand" position, the pump will be turned on, and in the "Off" position the pump will be disabled from running. The TEST/SILENCE pushbutton shall be of momentary contact design and be accessible on outside

of control box. The motor contactor shall be an 18 amp. heavy duty I.E.C. rated contactor. It shall provide the electrical start / stop control for the pump along with an integral overload protection and have 120 volt operating coil.

### 2.12.3 Control Panel Testing

Each control panel shall receive a factory test to ensure proper operation prior to shipment. Factory Tests shall include at a minimum:

1. All control logic functions, including: turn on, turn off, alarms, etc.
2. All fuses and circuit breakers
3. All indicator lights and switches
4. Audible and visual alarm indicators Power transfer circuit to pump motor
5. Float switch input circuits (for float operated models)

2.12.4 Enclosure: Durable NEMA 4X Enclosure, made from a poly carbonate material or fiberglass and intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose directed water; undamaged by the formation of ice on the enclosure. The resin system also shall include a flame retardant to obtain a flammability rating which meets U.L. 94V-O. Heat distortion temperature shall be 350 degrees Fahrenheit. The resin system shall be resistant to ultraviolet light.

Hinged door with standard lockable stainless steel latches, for safe operation indoor and outdoor.

### 2.12.5 Alarms / Indicators

Visual Alarm Circuitry – A top mounted high intensity flashing red light with various flashing modes depending on alarm condition.

Audible Alarm Circuitry – Audible piezo alarm, +/- 95 db with in 2 feet, with a bottom mounted push to silence button and circuitry as a standard feature.

Seal Failure Indication – The control panel shall provide a means for connecting the seal failure probe(s) from the pump. The control panel shall incorporate a seal failure warning light that provides a visual indication of moisture entry into the motor. The seal failure indication light shall not stop the pump.

Motor Heat Sensor (3 phase only) – The control panel shall provide a means for connecting the motor heat sensor from the pump. The heat sensor shall be wired in series with the motor contactor coil to disable the circuit if an overheat condition occurs.

### 2.12.6 Circuit Breakers

**Control Circuit Breakers** The 120 Volt common control circuit shall be protected by an auxiliary single (1) pole circuit breaker. Breaker shall be rated 10,000 Amps interrupt current (10KAIC).

**Motor Circuit Breakers** The pump breakers shall be thermal magnetic trip devices and provide for individual motor disconnect and overload / short circuit protection as required by the NEC rating for motor branch circuit protection. Breaker shall be rated 10,000 Amps interrupt current (10KAIC). The voltage rating shall match that of the panel incoming service.

#### 2.12.7 Level Controls

**Float Switch Control Operation** – The control panel shall provide terminal strip inputs for: pump off, pump on, and alarm float controls.

**Float Controls:**

1. Simplex control panel operation shall be automatically controlled by 3 mercury level controls. Float switches shall control off, on and alarm functions.
2. Float switch shall be capable of operating at temperatures between 32 and 170 degrees F. Float switches shall activate and deactivate between 5 degrees above horizontal and 5 degrees below horizontal. Float switch shall be constructed with a polypropylene outer shell for durability and resistance to wastewater environment. Outer shell shall be filled with polyurethane foamed interior to provide best buoyancy, water tight integrity and protect the mercury switch.
3. Float switches shall be of normally open type.
4. Float switch cables shall be made of chlorinated polyethylene, type SJOOW, 18 AWG, 2-wire type. Float switch contacts and shall be capable of handling 10 amps at 115 VAC or 3 amps at 240 VAC.
5. Float switch shall be third party safety listed by cUL,US and shall be capable of operating intrinsic safe relays.
6. Float switches shall have an external zinc plated cast iron weight. Weight shall be of the split design and shall be easily adjustable for tether length. Float switch weights made of heavy metals which may contaminate the waste flow stream shall not be acceptable.

#### 2.4 SPARE PARTS

2.4.1 A complete set of manufacturer's recommended spare parts shall be provided for each group of pumps operating in the system.

2.4.2 All spare parts shall be properly protected for long periods of storage and packed in containers which are clearly identified with indelible markings as to the contents.

## 2.5 CORROSION PROTECTION

2.5.1 All materials exposed to wastewater shall have inherent corrosion protection: i.e., coated cast iron, fiberglass, polyethylene, engineered polypropylene copolymer, stainless steel, bronze, and PVC or CPVC.

## 2.6 SAFETY

2.6.1 The grinder pump station shall be free from electrical and fire hazards as required in a residential environment.

2.6.2 The grinder pump station shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low-pressure sewer system applications.

## 2.7 PRODUCT HANDLING

All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from time of shipment.

Factory assembled parts and components shall not be dismantled for shipment.

Finished surfaces of all exposed pump openings shall be protected.

After hydrostatic or other tests have been completed, all trapped water shall be removed prior to shipment and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

Each box or package shall be properly marked to show its contents.

The manufacturer shall furnish and deliver assembled grinder pump stations to the contractor or owner. Simplex units, containing one grinder pump and all necessary parts and equipment, shall be installed in polyethylene or fiberglass reinforced polyester tanks for outside installations. All equipment shall be factory installed, except for externally mounted control panel, gravity sewer inlet hubs and pump assembly,

which are to be installed in the field. Each simplex or duplex grinder pump unit shall be complete, consisting of a basin, basin cover, grinder pump, quick disconnect rail system, check valve, junction box, start-stop level controls, motor high temperature shutoff, motor seal leak alarm, high water alarm, pump motor failure, alarm loss of power, all internal wiring terminating into the junction box, shutoff valve and discharge piping. In addition, an external alarm.

All packaged tank assemblies will include all the necessary equipment to make a complete turnkey system ready for installation except the grinder pump and control panel.

For ease of handling and storage, grinder pump and control panel shall ship mounted on wooden pallet.

Upon receipt of packaged tank assemblies, the contractor or owner will visually inspect to make certain the freight carrier has successfully transported the equipment with no damage. It is the responsibility of the contractor or owner to reject any or all damaged equipment prior to signing the delivery slip. FOB factory.

Handling and unloading the basin assemblies shall be the responsibility of the contractor or owner. Lifting devices such as chain is prohibited.

The basin assemblies, grinder pumps and control panels will be stored in a controlled environment to prevent weather conditions from damaging equipment. and pump control panel is to be provided for the unit.

## 2.8 LIMITED WARRANTY

- 2.8.1 The manufacturer shall provide a warranty on materials and workmanship for a period of twenty-four (24) months after notice of Owner's acceptance, but no grater than twenty-seven (27) months after receipt of shipment. The owner will return any equipment found defective to the manufacturer for inspection and validation of the defect. Defective equipment will be repaired or replaced at manufacturer's discretion and shipped back to owner at no charge.

## PART THREE – EXECUTION

### 3.1 FACTORY TESTING

- 3.1.1 Testing performed upon each pump shall include: (a) impeller, motor rating and electrical connections shall be checked for compliance with this specification; (b) each pump shall be run dry to establish correct rotation; (c) each pump shall be run submerged in water (at least for 5 minutes); (d) motor and cable insulation shall be tested for moisture content or insulation defects; and (e) pump performance test shall cover three (3) different points of operation on its curve,

with the maximum pressure not less than that required by the system design.

- 3.1.2 Each grinder pump appurtenances and controls which will be installed in the field, shall be 100% factory tested.
- 3.1.3 Each pump shall be tested in accordance with the latest test code of the Hydraulic Institute (H.I.) at the manufacturer to determine head vs. capacity and kilowatt draw required.
- 3.1.4 All control panels shall be shop assembled and factory tested prior to delivery to the site. Final as-built drawings shall be made to reflect all adjustments and modifications made to the systems after start-up has been completed satisfactorily. All equipment and devices shall be mounted, adjusted, calibrated and operated exactly as recommended by the manufacturer of each component.
- 3.1.5 Control switches, pilot lights, and other devices shall be grouped in a logical arrangement for ease of operation.
- 3.1.6 Control equipment shall be mounted to panel back plates with screws or bolts fastened into drilled and tapped holes. Nuts shall not be used. Panel face mountings shall be made by cutting holes exactly to manufacturer's instructions including keyways, etc. Engraved legend plates indicating function and operational instructions as applicable shall be mounted on all devices. All equipment shall be labeled and identified with designations which match the control wiring diagrams.

### 3.2 INSTALLATION

- 3.2.1 The grinder pump station and related components shall be installed in accordance with approved shop drawings and manufacturer's written instructions. The panel shall be wall mounted per drawings.

### 3.3 TRAINING & START UP SERVICES

- 3.3.1 The pump supplier and/or manufactures rep shall provide two (2) days of start-up instruction and training for the service personnel responsible for the long term maintenance and servicing of the grinder pumping system. The training shall address all aspects of installation, start-up, troubleshooting, operation, maintenance, and repair of the grinder units including all electrical components. The training sessions shall include complete review of installation, operation and maintenance manuals, as well as actual field instruction. The Training sessions shall be coordinated with the pump manufacturer, engineer and the authority's personnel. The training sessions shall be scheduled two (2) weeks in advance to allow for adequate notification to all parties involved in the start-up and training. Extended training can be arranged for an additional fee.



- 3.3.2 The contractor shall make certain that all the grinder pumps systems are ready for start up/activation prior to the notification and scheduling of such.
- 3.3.3 Prior to the arrival of the manufacturer's representative, the contractor is required to have the cover to the grinder pump station unbolted and ready for removal. Contractor must provide a minimum of 70 gallons of water supplied into the basin for start-up procedures.
- 3.3.4 Power will be supplied to the control panel and grinder pump system.
- 3.3.5 Upon completion of start-up testing, the contractor shall replace the cover to the grinder pump system and fasten securely to prevent any water infiltration.
- 3.3.6 Contractor shall be responsible for any personnel and/or material necessary for the manufacturer's representative to complete the start-up and testing phase of the project, including, but not limited to, water source at each station, labor personnel to remove and replace cover, etc.

**END OF SECTION**

PART ONE - GENERAL

1.1 DESCRIPTION OF WORK

- 1.1.1 Furnish one (1) new complete factory-built and tested submersible Grinder Pump Station, consisting of a two (2) FLYGT MP3127.890HT-262 grinder pump, or equal, 11 HP submersible electric motor, 230 volts, 3 phase, 60 hertz, 4-wire service, lifting chain or stainless-steel cable (the working load of the lifting system shall be 50% greater than the pump unit weight), with minimum of 30 feet of submersible cable (SUBCAB) suitable for submersible pump applications (the power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval), turnkey basin package, level control system, Nema 4X, or equal, fiberglass control panel, Nema 4X, or equal, junction box, stainless steel lifting chain, 3-inch plug & check valves and schedule 80 discharge pipe (2-inch).
- 1.1.2 Grinder pumps shall be specifically designed and intended for service in pressure sewer systems. All pumps supplied on the project for this service shall be of the same manufacturer.

1.2 DESCRIPTION OF SYSTEM

- 1.2.1 The new pump system shall consist of a 72-inch internal diameter fiberglass basin wet well with submersible wastewater grinder pump and alarm panel, and discharge connection and appurtenances.
- 1.2.2 All the equipment specified herein is intended to be engineered equipment for macerating and pumping all material in normal domestic wastewater.

1.3 QUALIFICATIONS

- 1.3.1 All of the equipment furnished herein shall be the product of a manufacturer experienced in the design and manufacture of grinder pumps designed for use in low pressure sewer collection systems. All parts shall be properly stamped for identification and location as shown in the Operation and Maintenance Manuals furnished. Nameplates giving the name of the manufacturer, the rated capacity, head speed and all other pertinent data shall be attached to each packaged pump station.
- 1.3.2 All equipment furnished under this Specification shall be new and unused, shall be the standard product of pump manufacturer having a successful record of manufacturing and servicing the equipment and systems specified herein.
- 1.3.3 All manufacturers must have been in the business of manufacturing grinder

pumps for a minimum of ten years. Manufacturer must demonstrate to the satisfaction of the Engineer that the proposed pumping equipment will meet system flows and heads required.

#### 1.4 SUBMITTALS

1.4.1 After receipt of notice to proceed, the manufacturer shall furnish the Engineer one (1) electronic set of shop drawings of all materials required to establish compliance with the specifications. Submittals shall include the following:

- (1) AutoCAD drawing illustrating details of fiberglass package pump station with discharge elevation, basin diameter and depth with side and top view.
- (2) Package station components, shut-off and ball, plug, check valves, discharge rail assembly, stainless steel lifting chain, Nema 4X junction box, 3 float level controls, float bracket, 8-inch Sch. 80 inlet flange, and 72-inch fiberglass basin with its corresponding cover.
- (3) MP3127, or equal, 11 HP, 230 volts, three phase grinder pump specification sheets with motor and performance curve. Pump motor monitoring device data. Electrical motor data.
- (4) Duplex Nema 4X stainless steel control panel, or equal, drawing, wire schematic and spare parts list. Individual electrical control panel components cut sheets.
- (5) Engineering report illustrating the hydraulic design analysis utilizing the MP3127, or equal, grinder pump hydraulic pump curve (pump performance curves).
- (6) Wet well elevation depth below ground surface.
- (7) Force main elevations as shown on the drawings.
- (8) Details of the simplex centrifugal pump.
- (9) Technical manuals.
- (10) Typical installation guides.
- (11) Parts list.
- (12) Printed warranty (and certified agreement to the conditions of warranty)
- (13) Furnish all submittals within 30 days of receipt of notice to proceed.

#### 1.5 OPERATING INSTRUCTIONS

- 1.5.1 Six (6) copies of an operating and maintenance manual for the grinder pump station shall be furnished to the Engineer prior to completion. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operating and maintenance personnel familiar and unfamiliar with such equipment.
- 1.5.2 A factory service technician or factory trained service technician, who has complete knowledge of proper operation and maintenance, shall be provided for one (1) day onsite to instruct representatives of the Owner on proper operation and maintenance. If there are difficulties in the operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the owner.

## PART TWO – PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

- 2.1.1 The pumps and equipment covered by this section are intended to be of robust designs and proven ability as manufactured by reputable firms having extensive experience in the production of such pumps and equipment. The pumps and equipment furnished shall be designed and constructed in accordance with the best practice and methods.
- 2.1.2 All parts shall be so designed and proportioned as to have liberal strength and stiffness and to be especially adapted for the work to be done. Ample room and facilities shall be provided for inspection, repairs and adjustment.
- 2.1.3 Brass or stainless-steel nameplates giving the name of the manufacturer, the rated capacity, head, speed, serial number, model number, horsepower, voltage, amperes and all other pertinent data shall be attached to each pump.

### 2.2 SUBMERSIBLE GRINDER PUMP STATION

#### 2.2.1 General

- (1) Furnish and install two (2) submersible grinder wastewater pump(s) Flygt model MP3127.890HT-262, or approved equal. Each pump shall be equipped with an 11 HP submersible electric motor, connected for operation on 230 volts, 3 phase, 60 hertz, 4-wire service, with 30 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. Required cable field length to be confirmed by Contractor before ordering.

#### 2.2.2 Operating conditions

Each pump shall have the following performance curve characteristics:

- (1) Primary Duty Point: 46.4 GPM @ 169-ft TDH
- (2) Secondary Performance Point: 53.7 GPM @ 164-ft TDH
- (3) Minimum Shut off Head: 190 ft
- (4) Impeller diameter: 170 mm
- (5) Motor RPM: 3495
- (6) Maximum Motor Rating: 11HP
- (7) Voltage/ phase: 230V/3PH
- (8) Discharge Connection: 2 inches
- (9) Manufacturer: Flygt or Approved Equal

### 2.2.3 Wiring and terminations

- (1) Pump power and float level control wiring shall be field installed by a certified electrician. All electrical cables penetrating or passing through the conduit flange of the pump station must be water-tight and sealed by the electrician prior to start up. Color coded 14/7 insulated wire for power cord, 18/2 insulation wire for float level sensors.
- (2) The pump power cable shall be connected directly into the Nema 4X junction box and spliced connected to the appropriate color-coded wire gage for proper terminal strip placement. If direct burial cable is utilized in lieu of conduit, a waterproof electrical connector certified to NEC will be required at the conduit. Direct burial cable must be factory approved prior to installation to assure proper wire / terminal strip placement.
- (3) All wires shall be run parallel to side walls of panels and/or in covered wiring troughs. Wiring passing across hinged areas shall be protected by abrasion resistant cabling material
- (4) All connections shall be made on mechanical compression type terminals whenever possible. When screw terminals must be used, wire ends shall be equipped with compression applied lugs. All connections for incoming and outgoing electrical wires in all panels and junction boxes shall be made on fully labeled terminal boards mounted inside the panel.
- (5) Wire ties and/or wire track shall be used to maintain panel wiring in neat bundles for maintenance and to prevent interference with operating devices. Each wire shall be number coded to match schematics. A schematic shall be permanently attached to the inside surface of the front door.

- (6) All ground connections shall be made with fork terminals and star washers to assure proper ground.
- (7) Terminal blocks with box type lugs shall be supplied to terminate all wiring for floats, heat sensors, and seal sensors for the pump, if required. The pump leads shall be terminated at box type terminal blocks.
- (8) Control voltage shall be 120 VAC and may be accomplished by the means of a transformer should the input voltage be unable to produce a 120 VAC signal. Control fuse(s) and an on-off switch/circuit breaker shall protect and isolate the control voltage from the line.
- (9) Wiring shall be done in accordance with numbered per drawing attached to enclosure door.

#### 2.2.4 Check Valve

Pump discharge pipe shall be equipped with a factory-installed gravity operated ball check valve. The valve will provide a fully ported passageway when open and shall introduce a friction loss of less than six inches of water at maximum rated flow. Working parts shall be made of heavy duty cast iron 300 series stainless steel and non-wicking fabric reinforced neoprene flap to ensure corrosion resistance, repeatability and dimensional stability.

#### 2.2.5 Redundant Check Valve

- (1) Each basin package will require a redundant check valve for installation provided by the contractor in the service lateral between the grinder pump station and the low pressure main. Valves shall be 3.0-inch NPT and only require ½ pound of backpressure for complete closure.
- (2) Redundant check valve will be identified on a separate line item bid sheet.

#### 2.2.6 Pump Controller

- (1) *The pump controller shall be model PC3000X as manufactured by Primex Controls, or approved equal.* Thirty-two (32) character alpha-numerical LCD for level, status and setpoint. Alternation selection switch on front panel to run alternation. Simplex menu structure for easy display/modification of setpoints. Built-in ETMs for all pumps. 4-20mA main sensor input with loop power supply for easy connection to most transducers. Pump seal fail and over temp inputs with indication. Scalable 4-20mA level output transmitter. Built-in single float backup system. Three auxiliary inputs. Built-in horn relay with input for external mute button. Relay outputs for both high- and low-level alarms. Individually selectable setpoints for up to three pumps. All inputs are filtered and transient protected. Built-in software, no programming required.

- (2) *Enclosure.* Nema 4X Stainless Steel enclosures shall be 304 type, and shall include a three-point latch and shall be provided with an inner door swing panel. The enclosure shall have provisions for padlocking. A nameplate shall be permanently affixed to the panel and include the voltage, phase, hertz, pump full load ampere rating, and pump horsepower rating. A warning label stating the power should be disconnected before servicing shall appear on the panel. Pilot devices, pump controller, breakers etc. shall be mounted on the enclosure door for indoor rated enclosures (Nema 12) and on the inner door swing panel for outdoor rated (Nema 4 or 4x) enclosures.
- (3) Alternation selection switch on front panel to run alternation.
- (4) *Pump Breakers – Schneider Electric.* QOU series breakers shall be used for 120/208/230V applications less than 100A. H Frame HDL breakers shall be used for all 460V applications or 230V applications greater than 100A. Pump Breakers shall be operable through the enclosure door on indoor rated enclosures or through the inner door swing panel on outdoor rated enclosures.
- (5) *Branch Circuit Breakers – Schneider Electric.* QOU series of Multi-9 C60 series breakers shall be used for branch circuit protection. Breakers shall be operable through the enclosure door on indoor rated enclosures or through the inner door swing panel on outdoor rated enclosures.
- (6) *Surge Protection – Schneider Electric.* Control Panel should be provided with Surge Protection wired to the incoming power. Model SDSA1175 shall be used for single phase applications. Model SDSA3650 shall be used for three phase applications.
- (7) *Motor Starters – Schneider Electric.* Each Pump shall be provided with an IEC rated motor starter with overload protection sized for motor load. Starters shall include auxiliary contacts for indicating when the motor starter is energized and when the overload relay has tripped. An overload reset mechanism shall be provided for manually resetting motor overload conditions. Reset mechanism shall be operable through the enclosure door on indoor rated enclosures or through the inner door swing panel on outdoor rated enclosures.
- (8) *Terminal Blocks – Phoenix.* Phoenix UT Series terminals shall be provided for all field connections including floats, pumps, and alarm circuits. Terminals shall be mounted to din rail on 45-degree angled brackets.
- (9) *Relays – Schneider Electric.* Relays shall be RXM series 4 Pole, 6A rated, with LED indicator, manual position indicator and a test switch. Model RXM4AB2F7 for 120V coils. Model RXM4AB2BD for 24VDC coils. Relay bases shall be Model RXZE2M114M.

- (10) *Time Delay Relays – Schneider Electric and Macromatic.* On Delay relays shall be Schneider Electric REXL series 4 pole with LED indicator adjustable from 0.1s-100h. Off Delay relays shall be Macromatic TE-8812U series 2 pole with LED indicator adjustable from 100ms-10days.
- (11) *Pilot Devices – Schneider Electric.* All selector switches and lights shall be Schneider Electric XB4 series and 22mm in size. All pilot devices shall be mounted to the enclosure door for indoor rated enclosures or mounted to the inner door swing panel for outdoor rated enclosures. All pilot devices shall be clearly labeled with engraved plates that match the control wiring diagrams. All pilot lights shall be rated 120V and include LED type bulbs. Green Pilot lights shall be used to indicate pump running signals. Red pilot lights shall be provided to indicate level alarms or pump failures.
- (12) *Elapsed Time Meters – ENM.* Each pump shall be provided with an elapsed time meter for tracking run times of the pumps. Elapsed Time Meters shall be ENM model T50B2.
- (13) *Alarm Beacon – Ingram Products.* Alarm Beacon shall be Ingram Products Model SBN120ACR. Alarm Beacon shall be mounted to the top or side of the enclosure so it is clearly visible. Alarm Beacon shall indicate and level alarms or pump failure conditions.
- (14) *Phase Monitor Relay – Macromatic.* A phase monitor relay shall be wired to the incoming power supply to prevent the pumps from operating in the event of undervoltage, overvoltage, and phase loss or phase reversal conditions. Phase Monitor shall be Macromatic Model PMPU with a 70169-D socket.
- (15) *Intrinsically Safe Barriers – Turck.* For sewerage applications or other applications where level sensors will be installed in a classified location intrinsically safe barriers shall be utilized for the level sensor connections. For float (contact closure) connections Turck Model IM1-22EX-R barriers shall be used. These barriers shall be two channel and include LED indicators.
- (16) *Power Supplies – IDEC or Phoenix.* For applications requiring 12V or 24V DC power power supplies rated for system load shall be provided. For standard applications IDEC series PS5R-V shall be used. For applications requiring battery back-up (UPS) operation Phoenix brand Mini DC or Trio-UPS shall be utilized. Batteries shall be as recommended by power supply manufacturer.
- (17) *Pump Protection Modules – Xylem or other.* Pump protection relays as recommended by the pump manufacturer shall be provided for each pump. Pump protection shall monitor the pump for motor overtemp and seal failure conditions. The relay shall include indicating LED's for



overtemp and seal failure. Motor overtemp conditions must prevent the pump from operating. Pump protection relays shall be mounted through the enclosure door for indoor enclosures or through the inner door swing panel for outdoor enclosures. When it is not possible to mount the pump protections relays through the door or the relay does not provide status indicating LED's pilot lights shall be provided to indicate motor overtemp and seal failure conditions.

#### 2.2.7 Liquid Level Detection

- (1) Level detection for controlling pump and alarm operation shall be accomplished by use of a four mechanical float switches. Switches utilized in the system shall be hermetically sealed in a submersible watertight protective housing with a weight attachment.
- (2) Floats shall be Primex Kwikswitch Series, or approved equal. Alternates will not be accepted. Each Kwikswitch manifold will include four quick release connections to accommodate up to four KwikSwitch floats. When the quantity of floats exceeds the four ports on a KwikSwitch manifold additional manifolds shall be supplied to accommodate the application.
  - i. KwikSwitch floats are available in normally open and normally closed configurations.
  - ii. Sealing plugs for unused KwikSwitch ports that provide CSA certified submergence rating of not less than 6 feet for 72 hours.
  - iii. The contractor shall install the and connect the float connection systems including 4 port manifold(s), matching Kwikswitch quick release floats, and stainless-steel mounting bracket.
  - iv. The Kwikswitch manifold shall be provided with a single multi-conductor shielded cable with not less than 50 ft.
  - v. The Kwikswitch floats shall be supplied with a minimum cable length of 50 ft.
- (3) Mechanical switch shall be guaranteed by the manufacturer to meet UL approval for submersion.
- (4) The level control shall be suspended by a float bracket and easily adjustable for proper height requirements in the field.

#### 2.2.8 Vent Assembly

A 4-inch wetwell vent assembly with Schedule 40 PVC pipe and fittings and a steel vent with bronze screen and powder coat finished shall be furnished. The vent assembly shall be designed for installation through the sump cover.

### 2.2.9 Shut-Off Valve

The pump discharge pipe connection shall be equipped with a factory installed manual gate valve. Gate valve shall be fully ported, constructed of bronze with stainless steel ball, stainless steel stem and hardware, and Teflon seats, with a minimum rated pressure of 150 PSI. An extension valve handle will be supplied for manual operation from top of basin secured with a stainless steel support bracket.

### 2.2.10 Anti-Siphon Valve

The pump shall be constructed for a positively primed, flooded suction. As added assurance that the pump cannot lose prime, even under negative head conditions in the discharge piping, provision for a PVC Anti-Siphon valve will be made available after the check valve.

### 2.2.11 Fiberglass prepackage, or approved equal

(1) General: The PumpCon duplex non-clog pump station shall be as described in these specifications and accompanying drawings, and shall consist of (but not be limited to), the following:

- i. Sump Basin
- ii. Sump Cover
- iii. Vent Assembly
- iv. Inlet Pipe Connection
- v. Guiderail Assemblies
- vi. Discharge Piping Assembly
- vii. Level Control Suspension Bracket
- viii. Conduit connections

All equipment shall be installed unless otherwise noted in these specifications to provide a single unit package when delivered to the job site.

(2) Sump Basin: The basin shall be watertight. The minimum design and manufacturing requirements for Filament wound Fiberglass Reinforced Plastic Sump Basins and Wetwells for use in sanitary and storm sewer applications.

- i. ASTM D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

- ii. ASTM D3753, Standard Specification for Glass-Fiber Reinforced Polyester Manholes and Wetwells.
- iii. AWWA C950, Fiberglass Pressure Pipe.
- iv. ASME RTP-1 MN3-321.
- v. Shell design shall be in accordance with the methods and formulas in AWWA C950 M-45. Design of flat bottoms shall account for both limiting stress and deflection. Design shall be based on industry standard lamination analysis for the glass reinforcement layers and resins system. Design shall determine cylinder and flat bottom thickness.
- vi. Laminate properties: The minimum flexural modulus in the circumferential direction shall be 2,000,000 PSI and in the longitudinal directions shall be 1,000,000 PSI.
- vii. Wall thickness shall vary with the basin/wetwell height. Calculated wall thickness shall be based on the following site assumed conditions: (a) Soil Modulus: 700 PSI and (b) Soil Density: 120 pounds per cubic foot (lb/ft<sup>3</sup>). Calculations shall employ a Lucher's safety factor of two (2).
- viii. Material:
  - Resin:* Resins used shall be commercial grade unsaturated polyester type, suitable for the intended service as indicated by usage history or resin manufacturer's recommendation.
  - Cure system:* Resin promotion and catalyst system used shall follow resin manufacturer's guidelines.
  - Fillers and Additives:* No fillers or resin extenders of any type shall be utilized. A maximum of two percent by weight of any commercial grade thixotropic agent may be added to resins for the purpose of viscosity control.
  - Reinforcing materials:* Reinforcing material shall be commercial grade "E" type glass fibers in the form of chopped strand mat, chopped roving woven roving or continuous roving. Uni-directional glass shall be used in addition to any other glass used. Glass fibers shall be treated with a coupling agent that facilitates bonding between the reinforcement and the resin
- ix. Laminate:

*General:* Basin laminates shall consist of three layers (inner surface,

interior layer and structural layer). The tank manufacturer will provide calculations verifying acceptable wall stress/thickness upon request.

*Inner surface:* The inner surface shall consist of resin rich layer with no exposed fibers.

*Interior layer:* The interior layer shall consist of a resin rich reinforced layer with a nominal fiber content of 30 percent. Reinforcements shall be chopped strand mat or chopped roving.

*Structural layer:* The structural layer shall be chop-hoop filament wound consisting of chopped strand and continuous roving reinforcement oriented in the hoop direction. As required, uni-directional roving shall be incorporated into this layer to enhance longitudinal properties. The exterior surface shall be relatively smooth with no exposed fibers or sharp projections. Nominal fiber content on the structural layer shall be a minimum of 62 percent.

x. Appurtenances:

*Top flange:* The basin shall have a top flange that is 3 inches larger in diameter than the interior of the tank.

*Bottom:* The bottom of the wet well shall be built to withstand full exterior water column with a maximum deflection of 3/8 inch.

*Bottom anti-flotation flange:* The bottom anti-float flange shall be a minimum of 3 inch larger in diameter than the wetwell and be constructed to withstand the maximum uplifting force that could be exerted with an empty well and full water column outside the tank.

*Basin/wetwell:* Shall be designed to withstand H-20 traffic load, when properly installed.

*Cover attachment:* Stainless steel threaded inserts shall be installed in the top flange of the basin/wetwell to accommodate attachment of covers. The inserts shall be 3/8-inch diameter in a 6-bolt pattern, 60 degrees apart and secured using polyester resin to permanently hold in place.

*Lifting lugs:* Three (3) epoxy coated lifting lugs, strategically located on the wetwell shall be supplied to assist in handing and setting of the wetwell.

xi. Quality Assurance:

*Visual acceptance:* The inner surface shall be free of exposed fibers, crazing and delaminations. No Blisters larger than 1/2 inch or

wrinkles more than 1/8 inch in depth will be allowed.

*Laminate cure:* Laminate cure shall be indicated by means of Barcol hardness measured in accordance with ASTM D2583. The average Barcol hardness shall not be less than 90 percent of the resin manufacturer's recommendation for clear resin castings.

*Workmanship:* All workmanship and materials throughout shall be of the highest quality available.

- (3) Sump Cover: The sump cover shall be fabricated of ¼-inch aluminum 6061 treadplate material. Hinged hatch doors shall be supplied for wetwell and valve vault access. Lifting handles, hatch door hold open devices, 4-inch vent connection, padlock provisions and stainless steel hinges shall be provided. The cover shall be secured to the basin with stainless steel bolts.
- (4) Vent Assembly: A 4-inch wetwell vent assembly with schedule 40 PVC pipe and fittings and a steel vent with bronze screen and powder coat finished shall be furnished. The vent assembly shall be designed for installation through the sump cover.
- (5) Inlet Pipe Connection: A bolt-on, cast iron, caulking type inlet hub for the 8-inch inlet pipe shall be furnished. The inlet hub shall be shipped loose for location and installation in the field.
- (6) Guiderail Assembly: The guiderail assembly shall consist of two (2) pieces of 2-inch Schedule 40 304 stainless steel pipes, per pump. The guiderails shall be secured in the wetwell by attaching to a base disconnect located on the floor of the wetwell and the upper guiderail brackets, bolted to the hatch cover.
- (7) Discharge Piping Assembly: The discharge piping shall consist of Schedule 80 PVC pipe and fittings and brass swing check valves and brass gate valves. The valves shall be located in the valve vault. The discharge piping shall terminate at valve vault wall with a common female NPT connection. Rubber ring gaskets shall be installed between each flanged connection and 304 stainless steel flange nuts and bolts shall be used.
- (8) Level Control Suspension Bracket: A bracket assembly shall be furnished for the suspension of up to six level control cords. Construction shall be of 304 stainless steel material with stainless steel mounting hardware.
- (9) Conduit Connection: Three (3) 2-inch bolt-on conduit connections shall be installed on the station. The conduit connections shall consist of an aluminum coupling with an aluminum mounting plate. Stainless steel hardware shall be used for attaching the conduit connection to the basin

wall.

- (10) Painting: All internal metal parts that are not brass, galvanized steel or stainless steel shall be painted with coal-tar epoxy paint to resist corrosion, unless otherwise noted.

## 2.3 PUMPS

### 2.3.1 Design

- (1) Each grinder pump shall be a heavy-duty pump used as a grinder. Each grinder pump shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects", such as paper, wood, plastic, glass, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 3-inch diameter Sch. 80 discharge piping. The stationary cutter and rotary cutter shall consist of hardened stainless steel.
- (2) The cutter materials shall provide maximum corrosion and abrasion resistance. The remaining portion of the grinder pumps, with the exception of seal materials and wet end, shall be similar to the heavy-duty pumps used in larger pump stations for daily operation.
- (3) The grinder pump shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. No portion of the pump shall bear directly on the sump floor.
- (4) Each pump shall be equipped with an 11HP, submersible electric motor connected for operation on 230 volts, 3 phase, 60 hertz, and 3 wire service with 30 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval.
- (5) The pump shall be supplied with a mating cast iron 1<sup>15/16</sup>-inch discharge connection and 51.3 GPM against a rated total dynamic head of 166 feet (Primary Duty Point) and 58.4 GPM at 161 feet (Secondary Performance Point). Each pump shall be fitted with 20 feet of stainless-steel lifting chain. The working load of the lifting system shall be 50% greater than the pump unit weight.
- (6) Furnish with each submersible pump one complete Flygt Pump Lift<sup>TM</sup> system or approved equal. The system shall consist of 33 ft of Nylon guide rope, short length of high tensile strength proof-tested chain and forged steel Grip-Eye for use with a mechanical lifting device (furnished by others). System shall be appropriately sized for weight of pump to be lifted.

- (7) *Optional mix-flush valve.* One pump in each sump shall be equipped with an automatically operating valve that will provide a mixing action within the sump at the start-up of the pumping cycle. This valve shall be mounted directly on the pump volute and shall direct a portion of the pumpage into the sump to flush and re-suspend solids and grease by the turbulent action of its-discharge. The turbulent action caused by the flow shall also provide some sump aeration benefits. The valve shall be mounted on the pump volute so that it can be removed from the sump along with the pump during normal and routine maintenance checks and shall be positioned on the volute to provide for non-clogging operation. The valve shall be equipped with an adjustable, wear-resistant discharge nozzle which shall be used to direct flow from the valve to optimize mixing action within the sump. The valve shall not require any external power source or control to operate, neither electric nor pneumatic. The use of the external power source is not acceptable. The valve shall be suitable for use in Class I, Division 1 hazardous locations. The valve shall open at the beginning of each pumping cycle and shall automatically close during pump operation after a pre-selected time of operation. The valve shall operate automatically by differential pressure across the valve and shall be actuated through a self-contained hydraulic system which uses an environmentally safe fluid. A method of adjusting the valve operating time shall be provided.

### 2.3.2 Performance

In order to ensure proper operation under all conditions, pump must provide, without overheating in continuous operation, the maximum head condition required by the system. Pump must also be capable of operating at zero or negative heads without damage to the pump.

### 2.3.3 Construction

- (1) Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. The lifting handle shall be of stainless steel. All exposed nuts or bolts shall be AISI type 316 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
- (2) Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
- (3) Rectangular cross sectioned gaskets requiring specific torque limits to

achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

#### 2.3.4 Cable Entry System

The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

#### 2.3.5 Electric submersible Motor

- (1) The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of no less than 30 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. The motor and the pump shall be produced by the same manufacturer.
- (2) The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to



exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting current and no-load characteristics.

- (3) The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

### 2.3.6 Bearings

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two-row angular contact bearing to compensate for axial thrust and radial forces. Sleeve or single row lower bearings are not acceptable. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

### 2.3.7 Mechanical Seal (2x), Pump Shaft, Impeller, Volute, Protection, MiniCAS, Explosion proof

- (1) Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, corrosion and abrasion resistant tungsten-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, corrosion and abrasion resistant tungsten-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.
- (2) The following seal types shall not be considered acceptable or equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to

effect sealing shall be used. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load. Where a seal cavity is present in the seal chamber, the area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action. Seal lubricant shall be non-hazardous.

- (3) Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. If a shaft material of lower quality than stainless steel – ASTM A479 S43100-T is used, a shaft sleeve of stainless steel – ASTM A479 S43100-T is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided in the oil housing and above. Therefore, the use of stainless-steel sleeves will not be considered equal to stainless steel shafts.
- (4) The impeller(s) shall be of grey cast iron, Class 35B, dynamically balanced, single shrouded design having a long throughlet without acute turns. The impellers shall be capable of handling fine slurry from the special cutters. Impeller(s) shall be taper collet fitted and retained with an Allen head bolt. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.
- (5) Pump volute(s) shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any media that may enter the impeller. Minimum inlet and discharge size shall be as specified.
- (6) All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125°C (260°F), the thermal switches shall open, stop the motor and activate an alarm. A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will send an alarm and, if desired, stop the motor. **USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.** The thermal switches and FLS shall be connected to a MiniCAS (Control and Status) monitoring unit. The Mini CAS is designed to be mounted in any control panel.
- (7) Furnish and install one Flygt MiniCAS (Mini Control and Status) module to

monitor the temperature and leakage detectors installed in each Flygt pump. The MiniCAS shall be capable of monitoring the thermal switches embedded in the stator end coils, the FLS (float switch type) float leakage sensor. The MiniCAS shall monitor both the series connected thermal switches and leakage sensor by outputting 12 VDC on a single two wire circuit. The MiniCAS circuitry shall operate on the current sensing principle whereby a change in temperature or leakage condition shall change the resistance of the associated sensor and thus alter the current in the sensing circuit. The MiniCAS shall contain two sets of form C dry contacts, one for over-temperature and one for leakage. The dry contacts shall change status upon occurrence of an over temperature or leakage condition so as to indicate that condition to other control components in the pump control panel. In the case of an over-temperature, and in keeping with Flygt's warranty policy, the over-temperature dry contacts shall be used to trip the pump off line. The MiniCAS shall be designed to be plugged into a standard 11-pin circular socket. Detailed technical data and wiring connections shall be found in the MiniCAS Manual.

- (8) Explosion proof pumps: The pump system including the pump, motor and power cable shall be approved for use in areas classified as hazardous locations in accordance with the NEC Class I, Div. 1, Group C and D service as determined and approved by a U.S. nationally recognized testing laboratory (U.L., FM, CSA) at the time of the bidding of the project. As required by Factory Mutual (FM) the motor shall be capable of operating in pumped media up to 104°F. Motor thermal switches shall monitor and protect the motor from excessive temperature. An internal Float Switch shall be available, in the motor chamber. Service of explosion-proof submersible units shall be performed by qualified FM experienced personnel. The pump manufacturer must provide training schools to qualify personnel in the proper service and repair of explosion-proof pump.

## 2.4 AUTOMATIC CONTROL / ALARM PANEL

### 2.4.1 General

The Control system shall include all equipment, devices, wiring, and incidental materials to operate the system and display or relay information in accordance with these specifications. All circuits and devices for protection of installed equipment shall be included in the lump sum bid. The contractor shall furnish a Duplex, 11 HP, 230 Volt, 3 Phase control panel with transducer primary operation and two float back-up operation manufactured by a UL508A and UL698A certified panel shop and shall bear the UL698A label. All components shall be UL listed including those supplied by the pump manufacturer and the control panel shall house all necessary controls including circuit breakers, motor starting components, and other equipment specified herein. The panel shall be built to meet NEMA4X ratings and shall in all respects conform to the National Electric Code and all other state and local codes

which may apply.

The panel shall have a formed aluminum switch mounting plate. All control switches and indicator pilot lights shall be mounted on the switch mounting plate.

All conduit entrances shall be made in a NEC approved manner. The conduits to the wet well shall have approved seal-off fittings installed and properly sealed to protect the control panel from adverse damage from the wet well.

All components shall be securely mounted to the back plate with plated machine screws through machine thread tapped holes in the back plate. The screws shall be of adequate size for the device being secured.

Alarm panel shall be equipped with an automatic dialer programmed to the police department.

#### 2.4.2 References

- i. ANSI®/NFPA® 70 – National Electrical Code® (NEC®)
- ii. IEC 61000 – Electromagnetic Compatibility
- iii. NEMA 250 – Enclosures for Electrical Equipment
- iv. NEMA ICS7 – Industrial Control and Systems Adjustable Speed Drives
- v. UL® 50 – Enclosures for Electrical Equipment
- vi. UL 98 – Disconnect Switches
- vii. UL 507 – Electric Fans
- viii. UL 508 – Industrial Control Equipment
- ix. UL 508C – Power Conversion Equipment
- x. UL 698A – Circuit extension into hazardous locations
- xi. UL 991 – Safety Tests
- xii. IEEE-519 – Harmonic levels

#### 2.4.3 System Description – Wastewater Pumping Station

- (1) The control panel shall utilize standard “off the shelf” equipment. Job specific, “one-of-a-kind” customized software and hardware compartments will not be accepted. A standard system is defined, as one, which has been published in literature, is available at the time of bid, with fully tested hardware and software, such that no development must be done beyond

system configuration.

- (2) The control panel shall provide both manual and automatic operation of the pumps.
- (3) Each Pump shall be provided with a Hand-Off-Auto switch, run light and elapsed time meter.
- (4) Each Pump shall be provided with a motor protection relay as recommended by the pump manufacturer to monitor the pumps for motor overtemp and seal fail conditions.
- (5) A phase monitor shall be provided to monitor the incoming power to the pump station and prevent the pump from operating when power is outside its normal range or has lost a phase or a phase reversal has occurred.
- (6) A back-up active indicating light and a back-up reset pushbutton shall be provided to allow the system to be returned to PC3000 operation.
- (7) Dry alarm contacts for remote monitoring level alarms, pump failures, back-up active, and the status of the phase monitor relay shall be provided.
- (8) Primex Kwikswitch connection system shall be provided for float connection(s) in wet well. A four port manifolds shall be provided to accommodate the two float connections required for this project. Sealing plugs shall be provided for the unused ports on the manifold.
- (9) Pumping station shall be equipped with receptacle and transfer switch for portable generator.

#### 2.4.4 Submittals

Product Data: Manufacturing data sheets for all components indicating pertinent data and identifying each component by item number and nomenclature as indicated on the drawings and in the specifications. Designation as listed in the bill of material shall be clearly indicated on the data sheet. If multiple products or options are shown on the same sheet, Contractor shall clearly indicate which products and options are intended for the item being provided.

#### 2.4.5 Substitutions

The Engineer will consider proposals for substitution of materials, equipment, methods and services only when proposals are accompanied by full and technical submittal data and all other information required by the Engineer for the proposed substitution. Substitution of materials, equipment, methods and/or services is not allowed unless such substitution has been specifically approved by the Engineer.

#### 2.4.6 Quality Assurance

All control equipment must conform to UL 508A and NEC Standards.

#### 2.4.7 Warranty

Twelve (12) months from date of manufacture. The warranty shall apply to being free to defects in material and workmanship.

### 2.5 SPARE PARTS

2.5.1 A complete set of manufacturer's recommended spare parts shall be provided for each group of pumps operating in the system.

2.5.2 All spare parts shall be properly protected for long periods of storage and packed in containers which are clearly identified with indelible markings as to the contents.

### 2.6 CORROSION PROTECTION

2.6.1 All materials exposed to wastewater shall have inherent corrosion protection: i.e., coated cast iron, fiberglass, polyethylene, engineered polypropylene copolymer, stainless steel, bronze, and PVC or CPVC.

### 2.7 SAFETY

2.7.1 The grinder pump station shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the grinder pump and panel shall be listed by Underwriters Laboratories.

2.7.2 The grinder pump station shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low-pressure sewer system applications.

### 2.8 PRODUCT HANDLING

2.8.1 All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from time of shipment.

2.8.2 Factory assembled parts and components shall not be dismantled for shipment.

2.8.3 Finished surfaces of all exposed pump openings shall be protected.

2.8.4 After hydrostatic or other tests have been completed, all trapped water shall be removed prior to shipment and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

2.8.5 Each box or package shall be properly marked to show its contents.

## 2.9 LIMITED WARRANTY

2.9.1 The manufacturer shall provide a warranty on materials and workmanship for a period of twenty-four (24) months after notice of owner's acceptance, but no greater than twenty-seven (27) months after receipt of shipment. The owner will return any equipment found defective to the manufacturer for inspection and validation of the defect. Defective equipment will be repaired or replaced at manufacturer's discretion and shipped back to owner at no charge.

## PART THREE – EXECUTION

### 3.1 FACTORY TESTING

3.1.1 Testing performed upon each pump shall include: (a) impeller, motor rating and electrical connections shall be checked for compliance with this specification; (b) each pump shall be run dry to establish correct rotation; (c) each pump shall be run submerged in water (at least for 5 minutes); (d) motor and cable insulation shall be tested for moisture content or insulation defects; and (e) pump performance test shall cover three (3) different points of operation on its curve, with the maximum pressure not less than that required by the system design.

3.1.2 Each grinder pump appurtenances and controls which will be installed in the field, shall be 100% factory tested.

3.1.3 Each pump shall be tested in accordance with the latest test code of the Hydraulic Institute (H.I.) at the manufacturer to determine head vs. capacity and kilowatt draw required.

3.1.4 All control panels shall be shop assembled and factory tested prior to delivery to the site. Final as-built drawings shall be made to reflect all adjustments and modifications made to the systems after start-up has been completed satisfactorily. All equipment and devices shall be mounted, adjusted, calibrated and operated exactly as recommended by the manufacturer of each component.

3.1.5 Control switches, pilot lights, and other devices shall be grouped in a logical arrangement for ease of operation.

3.1.6 Control equipment shall be mounted to panel back plates with screws or bolts fastened into drilled and tapped holes. Nuts shall not be used. Panel face mountings shall be made by cutting holes exactly to manufacturer's instructions including keyways, etc. Engraved legend plates indicating function and operational instructions as applicable shall be mounted on all devices. All equipment shall be labeled and identified with designations which match the control wiring diagrams.

### 3.2 INSTALLATION

- 3.2.1 The grinder pump station and related components shall be installed in accordance with approved shop drawings and manufacturer's written instructions. The panel shall be wall mounted per drawings.

### 3.3 TRAINING & START UP SERVICES

- 3.3.1 Conduct one (1) operation and maintenance seminar on site for the benefit of Owner(s) and operating personnel. Owner to provide building facilities for conducting seminar. The grinder pump station exactly as furnished for the project including all appurtenances and product handling, shall be provided and demonstrated. Seminar time and date will be mutually agreed upon between the owner and manufacturer.
- 3.3.2 An authorized service technician will perform start up on the residential grinder pump station. Start up procedure is to be conducted and scheduled between the engineer, authorized service technician and owner of maintaining the pressure sewer system.

**END OF SECTION**



PART ONE - GENERAL

1.1 DESCRIPTION

1.1.1 Work Included: A temporary bypass pumping system shall be established for the duration of the replacement of the sewer pipe. The system shall include all but not necessarily be limited to:

- (1) Pumping System,
- (2) Controls,
- (3) Spare Pump,
- (4) Piping, Valves, and Appurtenances, and
- (5) Standby Generator Set.

1.1.2 Related Work Described Elsewhere: This includes but is not limited to the following:

Pipe and Pipe Fittings                      Section 15076

1.2 QUALITY ASSURANCE

1.2.1 Standards:

- (1) Comply with standards specified herein as listed in the General Conditions of the Contract.
- (2) Comply with the Hydraulic Institute, OSHA, National Electric Code, ASTM, AA, NEC, ANSI and all other applicable Federal, State and Municipal codes including revisions to date of contract.
- (3) In all cases where a device or part of the equipment is referred to in this Section by a singular number (such as "motor"), it is intended that such references shall apply to as many such devices as are required to complete the installation.

1.2.2 Qualifications of Manufacturer: Products used in the work of this section shall be produced by manufacturers who are regularly engaged in the manufacture and/or supply of similar items for at least five (5) years and which have a history of successful production, acceptable to the Engineer.

1.3 SUBMITTALS

1.3.1 General: Submit shop drawings in accordance with Section 01340, SUBMITTALS.

The Contractor shall submit a shop drawing outlining the operation and maintenance of the bypass pumping system to the Engineer.

1.3.2 Product Data:

- (1) Manufacturer's specifications and other data required to demonstrate compliance with the specific requirements.
- (2) A complete materials list showing all items to be furnished and installed under this Section.
- (3) Complete shop drawings of all work of this Section, showing dimensions and locations of all items, including supporting structure and clearance requirements.

Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the Work or in the work of any other Contractor.

1.4 PRODUCT HANDLING

1.4.1 Protection: Use all means necessary to protect materials of this section before, during and after installation and to protect installed work and materials of all other trades.

1.4.2 Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

1.5 OPERATING COST

The Contractor shall include in the bid price for this item all operation, maintenance and utility costs for operating and maintaining the Temporary Bypass Pumping System.

PART TWO - PRODUCTS

2.1 BYPASS PUMPING SYSTEM

2.1.1 General: The bypass pumping system shall include all temporary piping and fittings, as well as continuous maintenance and protection of the pumping system as required or as directed by the Engineer.

The pumping system shall be capable of operating in a hazardous location conforming to the requirements of the National Electrical Code, Group I, Division D, Class 1 location.

## Temporary Bypass Pumping System

The following design criteria is given only as an indication of the general design requirements, quality of materials and workmanship to be used. An equal temporary bypass pumping design approved by the Engineer shall be acceptable in accordance with the Contract Drawings and Specifications.

- 2.1.2 Design: Prior to the replacement of the existing sanitary sewer pipe, the Contractor shall establish and set in place a bypass pumping system. The bypass pumping system must be capable of bypassing sewage flow around each reach of the sewer line in which the Work is being performed. The bypass pumping system must be capable of handling the normal and wet weather flow of the sewer line without causing or allowing sewage flow upstream of the pumping location to surcharge in manholes or building sewer connections.

Pumps shall be totally submersible electric motor sewage pumps. The pumps shall be capable of handling raw and unscreened sewage and scum up to 5 percent solids content. All openings shall be large enough to permit passage of a solid sphere 3 inches in diameter.

Contractor shall submit bypass pumping plan for review by Engineer.

Each pump shall be fitted with sufficient lifting cable of adequate strength to permit raising and lowering the pump.

- 2.1.3 Flexible Connections: Flexible hose shall be acceptable for the temporary bypass pumping discharge, for a minimum of 5 feet. The flexible hose shall be of a type suitable for hard use with puncture resistant construction capable of handling the bypass pumping service.
- 2.1.4 Temporary Pipe Fittings: Pipe Fittings shall include rigid conduit suitable for hard use capable of handling the bypass pumping service, as directed by the Engineer.
- 2.1.5 Pump Motor Cable: Installed, shall be suitable for submersible pump application with P122-MSHA approval and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors.

## 2.2 EXTRA STOCK

- 2.2.1 Availability: Prior to the operation of the temporary pumping system, the Contractor shall provide a standby pumping assembly, ready for continuous service, located at the site. The pumping assembly shall be accessible at all times.
- 2.2.2 Spare Parts: Spare parts, tools and accessories, as recommended by the manufacturer, shall be available at the site.

## 2.3 PORTABLE HOIST

- 2.3.1 General: Complete assembly shall be provided with the capability of lifting 1 (one) submersible pumping assembly from a flooded chamber to the ground

surface with a 2.0 factor of safety in terms of safe load. The hoist shall include the following attributes:

- (1) Winch
- (2) Boom
- (3) Static Loop
- (4) Lifting Hook

### 2.4 CONTROLS

- 2.4.1 Liquid Level Sensor: Furnish and install liquid level sensors, as required. Level sensors shall be non-floating, displacement type. Level sensors shall be rated for operation at milliwatt levels.

All alarms shall be discrete and audio-visual. The temporary pumping facility shall be provided with an automatic restart in the event of power interruption.

### 2.5 SOURCE OF POWER

A generator set, available on a continuous basis, shall provide the source of power to the temporary pumps and lighting in the event of a power interruption. Site lighting shall provide a minimum of 30-ft candles for a 50-ft radius from the upstream manhole.

## PART THREE - EXECUTION

### 3.1 EFFLUENT DISCHARGE

- 3.1.1 General: Bypass pumping must be provided with effluent to be discharged to the existing sewer downstream of the work area without disrupting the normal operation of the sewage system. The bypass pumping system shall utilize plugs, pumps, hose, pipe, and controls. It will be necessary to establish and operate the bypass pumping system at several locations in a progressive operation along the sewer line. Bypass pumping after daily construction activities end for the day will be not be required. Before the end of daily construction activities, the sanitary sewer line shall be returned to its normal operating sequence.

All pump controls must be made accessible to the Borough Department of Public Works representatives.

### 3.2 BYPASS PUMPING SCHEDULE

The Contractor shall provide the Engineer with schedule outlining the operation and maintenance of the bypass pumping system under all conditions during sewer rehabilitation work. The schedule or plan shall be submitted to the Engineer, for approval, a minimum of two (2) weeks prior to commencement of rehabilitation work.

**END OF SECTION**

PART ONE - GENERAL

1.1 DESCRIPTION

1.1.1 Work Included: Under this section the Contractor shall furnish all labor, equipment and materials necessary to install, test and place into satisfactory service, all piping, fittings and accessories required for complete piping works and ready for use as shown on the Contract Drawings and as specified herein.

1.1.2 Related Work Described Elsewhere:

Select Fill and Foundation Material	Section 02200
Excavation. Backfilling and Compaction	Section 02221
Temporary Bypass Pumping System	Section 11305

1.2 QUALITY ASSURANCE

1.2.1 Standards

- (1) Comply with ANSI, OSHA, ASTM, AWWA and all applicable Federal, State and Municipal codes, including revisions to date of contract.
- (2) In all cases where an item of equipment, or part thereof, is referred to in this section by a singular number (such as "gasket"), it is intended that such references shall apply to as many parts as are required to complete the installation.

1.3 SUBMITTALS

1.3.1 General: Submit shop drawings in accordance with Section 01340, SUBMITTALS.

1.3.2 Product Data: For pipe, pipe fittings and appurtenances, the Contractor shall furnish to the Engineer, at the time of shop drawing submission, certified records of physical, chemical and other pertinent tests and/or certified statements from the manufacturer that the materials have been manufactured and tested in conformity with the specifications. Where such a small quantity of material is required as to make physical testing and chemical analysis impractical, a certified analysis of similar materials which were concurrently produced, may at the discretion of the Engineer, be considered as the basis for acceptance of such materials.

## 1.4 PRODUCT HANDLING

1.4.1 Pipe Identification: All pipe units shall be identified as to the following:

- (1) Pipe class
- (2) Date of manufacture
- (3) Manufacturer's name or logo
- (4) Inside pipe diameter
- (5) Pipe material

1.4.2 Delivery and Storage: The Contractor is responsible for storing any equipment the Owner furnishes from the time the Owner delivers.

1.4.3 Protection: The Contractor shall use all means necessary to protect the materials of this section, before, during and after installation and to protect installed work and materials of all other trades.

1.4.4 Replacement: In the event of damage, the Contractor shall make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

## PART TWO - PRODUCTS

### 2.1 DESIGN

2.1.1 General: The names of manufacturers and specific catalog numbers are given only as an indication of the quality of materials and workmanship to be used. Equal products by other manufacturers approved by the Engineer shall be acceptable.

### 2.3 PLASTIC POLYVINYL CHLORIDE PIPE AND FITTING

2.3.1 PVC Gravity Sewer Pipe: Plastic polyvinyl chloride pipes shall be used for all sewage piping. Plastic Pipe shall be in conformance with ANSI/ASTM D 3034, and ASTM F679.

- (1) All pipe shall be made from quality PVC resin, compounded to provide physical and mechanical properties that equal or exceed cell class 12454 or 12364 as defined in ASTM D1784.
- (2) All fittings and accessories shall be from the same manufacturer as pipe.
- (3) PVC SDR 35 pipe shall be delivered in banded pallet loads only, and unbanded immediately prior to installation only. Maximum length of pipe sections shall be 14 feet.
- (4) Gaskets shall provide a tight, flexible seal that resists rolling during installation. Joints shall meet or exceed ASTM D3212 for joint tightness.

- (5) The pipe shall be colored green for in-ground identification as sewer pipe. Pipe shall be Model Ring-Tite PVC Sewer Pipe as manufactured by JM Eagle or equal. Gaskets shall be by Rieber Gaskets as manufactured by JM Eagle or equal.

2.3.2 PVC Force Main: Plastic polyvinyl chloride pipes shall be used for force main. Plastic Pipe shall be in conformance with ASTM D 2241.

- (1) All pipe shall be made from quality PVC resin, compounded to provide physical and mechanical properties that equal or exceed cell class 12454 or 12364 as defined in ASTM D1784.
- (2) All fittings and accessories shall be from the same manufacturer as pipe.
- (3) PVC SDR 21 pipe shall be delivered in banded pallet loads only, and unbanded immediately prior to installation only. Maximum length of pipe sections shall be 14 feet.
- (4) Gaskets shall provide a tight, flexible seal that resists rolling during installation. Joints shall meet or exceed ASTM D3139 for joint tightness.
- (5) The pipe shall be colored green for in-ground identification as sewer pipe. Pipe shall be I.P.S. Pressure PVC as manufactured by JM Eagle or equal. Gaskets shall be by Rieber Gaskets as manufactured by JM Eagle or equal.
- (6) Magnetic tape 6" above the centerline of the pipe shall be installed for location of force main.

## 2.5 CONCRETE SUPPORTS AND ENCASEMENTS

2.5.1 General: The Contractor shall furnish all labor, equipment, and materials, necessary to excavate for, furnish, form, place, grade, and rod complete, all concrete required for supports, encasements and other purposes as ordered by the Engineer or as shown on the Contract Drawings.

Concrete encasements shall be provided at all locations where the sanitary sewer conflicts with an existing sanitary or storm sewer and must cross under that utility, as shown on the Contract Drawings or as directed by the Engineer.

2.5.2 Portland Cement: Portland cement and aggregates shall conform to ASTM C 150, Type I and C 33 respectively.

2.5.3 Water: Water for mixing concrete and mortar shall be taken from an approved source and shall be clear and free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substances.

2.5.4 Ready-Mix Concrete: Ready-mixed concrete shall conform to the requirements of ASTM Designation C 94, and shall be secured from an approved dealer having

adequate equipment for proportioning, mixing, rigidly controlling, and delivering concrete in the quantities required for the work. The Engineer shall have the right to inspect at all times the plant and processes of the dealer. Thirty days (30) in advance of the contemplated use of ready-mixed concrete, the Contractor shall submit to the Engineer for approval, the name and qualifications of the dealer from which he proposes to secure ready-mixed concrete.

## 2.6 STAINLESS STEEL PIPE

2.6.1 General: Where shown on the drawings or where required, stainless steel carrier pipe shall be provided. The Contractor shall furnish all labor, equipment and materials necessary or required for stainless steel carrier pipes. Carrier pipe shall meet all AREMA Specifications.

2.6.2 Requirements: Steel pipe casing shall be manufactured from steel conforming to ASTM Grade 2 as amended to date, with a minimum yield strength of 35,000 psi before cold forming.

Pipe may be straight seam or spiral welded. A protective coat will not be required. Spacers for installation of the carrier pipe shall be installed by the Contractor.

Insulation in the casing shall be used for stream crossings or when areas where pipe cover is less than 4 feet from bottom of stream or grade.

Actual thicknesses shall be determined by the casing installer based on an evaluation of the required jacking forces. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to the Owner.

2.6.3 Casing Spacers: Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch thick, also having a hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float in the casing. Casing spacers shall be Cascade Waterworks Manufacturing Company or Advanced Products and Systems, Inc., or equivalent.

Insulated spacers shall be used for stream crossings or when areas where pipe cover is less than 4 feet from bottom of stream or grade.

## PART THREE - EXECUTION

### 3.1 INSPECTION

Examine the areas and conditions under which work of this section shall be installed. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.



## 3.2 INSTALLATION

### 3.2.1 Buried Pipe: All buried pipe shall also be installed in accordance with Section 02221, EXCAVATION, BACKFILLING AND COMPACTING.

After installation and testing have been completed, all lines shall be flushed clean.

### 3.2.2 Handling of Pipe: Proper and suitable tools and appliances for the safe and convenient handling and laying of all pipes and fittings shall be used. Care shall be taken to prevent the pipe coating from being damaged, particularly on the inside of the pipes and fittings and any damage shall be remedied as directed. No pipe and/or fittings shall be laid which are known to be defective. If any defective pipe is discovered after having being laid, it shall be removed and replaced with sound pipe or fitting in a satisfactory manner by the Contractor at his own expense.

All pipe shall be laid to proper line and grade. Open ends of pipe shall be kept plugged with a bulkhead during construction.

### 3.2.3 Laying of Pipe: The pipe shall be carefully laid at a constant slope that will match the existing invert elevation.

Straight runs (not with bends) of sewer line pipes and laterals over 50 feet in length shall be laid to line and grade by the use of **lasers only**. Such laser equipment shall be furnished by the Contractor and operated by competent personnel. Equipment and operating procedures shall be subject to the approval of the Engineer.

Pipe must be constructed in dry trenches only. The Contractor shall be required to keep all excavations for trenches or other structures in this contract free from water at all times during the construction of the work therein.

Pipe laying in general shall start at the downstream end and progress upstream with bell or groove ends placed upstream. If, however, due to restrictions imposed by land acquisition and/or other construction activities, construction may be done in sections as approved by the Engineer.

The pipe shall be evenly bedded as shown on the Contract Drawings except for the bell under which a recess shall be excavated to a sufficient depth to relieve it of any load and to allow ample space for making the joint. In case the bed trimmed in the bottom of the trench is too low, earth must be placed in the bottom and thoroughly rammed and new bed trimmed for the pipe. It is forbidden to raise the grade of the pipe by ramming earth beneath it. When the pipe has been bedded satisfactorily and the joint made, the recess around the bell shall be

refilled and tamped on each side of the pipe to hold it securely in place, care being taken not to disturb the position of the pipe during this process.

Where pipe is supported by concrete, before the concrete is set, the pipe shall be evenly bedded therein, so as to have a uniform support for its entire length, and the remainder of the concrete shall be immediately deposited and carefully tamped in such a manner as to avoid changing the position of the pipe.

Each pipe shall be laid so as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required line and grade.

3.2.4 Rock Subgrade: Ledge rock, hard pan, cobbles, boulders or stones larger than 1½ inches shall be removed from the trench bottom to permit a minimum bedding thickness under the pipe as shown ordered or required.

3.2.5 Cleaning Pipe: The inside of all pipe and fittings shall be cleaned by thoroughly blowing out with air to remove slag, dirt and other sediment, as well as other foreign materials, before being installed. During installation, sufficient care shall be exercised to prevent foreign matter from entering the lines. Use temporary closures during construction to protect open ends of pipe.

After installation and testing have been completed, all lines shall be flushed clean.

3.2.6 Line and Grade: The Contractor shall establish the bench mark and position of control point as shown on the Contract Drawings. The Contractor shall furnish all horizontal and vertical measurement from this control point including inverts and grade.

3.2.7 Cutting of Pipe: Whenever pipe requires cutting, it shall be done with an approved pipe cutter in such a manner as to leave a smooth end at right angles to the axis of the pipe; cutting by hammer and cold chisel shall not be permitted. When a piece of pipe is cut, no direct compensation shall be made for the portion cut off and not used in the line.

3.2.8 Sequence of Work: Excavation, cleaning, laying, jointing and backfilling of buried pipe shall be performed as promptly as possible upon completion of the previous operation. In no case shall pipe be left in the trench overnight without completing jointing. Trenches shall be partially backfilled or protected immediately after pipes are laid and joints inspected by the Engineer, unless other protection of the pipeline is directed. This partial backfilling does not imply approval of the buried pipe nor does it relieve the Contractor of the responsibility of locating to repair or replace defective work subsequent to testing. Normally, partial backfilling shall not follow jointing and final alignment of pipe by more than three lengths of pipe. The completed pipe line shall never be left exposed in the trench unnecessarily. Each day at the close of work at all times when laying is not in progress, the

exposed end of the pipe line in the trench shall be closed by the use of an approved head or barrier of wood or metals. If at any time it becomes necessary to cover the end of an uncompleted pipe line with backfill, the end of the pipe shall be closed using a mechanical joint plug for pipe.

- 3.2.9 Pipe Caps and Plugs: All caps and plugs shall be thrust, braced, staked, anchored, wired on or otherwise secured to the pipe to prevent leakage under the maximum anticipated thrust from internal abnormal operating conditions or test pressures from water or air.

- 3.2.10 Service Connections: The Contractor shall be responsible for determining the location of all existing connections and reconnecting the same to the new sewer.

The Contractor shall connect existing sewers to the new sewer or provide for future connections as indicated on the Contract Drawings or as ordered by the Engineer. Since, the number of connections required and their exact locations cannot be fully determined in advance, the actual number and exact locations shall be determined in the field as the work progresses.

Connections shall be of the type and size specified and laid to the grade and to the points shown on the Contract Drawings, as required to serve an existing house/building, or as ordered by the Engineer. Connections shall not be laid on a grade flatter than one percent.

Unless otherwise directed, the entire lateral trench shall be excavated to the required grade before any pipe is laid therein to confirm setting of the lateral at the required invert elevations without conflict, or to allow for grade adjustment.

Care shall be taken to make smooth, closefitting joints. Pipes shall be trimmed or extra bends used (when ordered) for this purpose. All requirements for laying, as described elsewhere herein, shall be observed in laying capped laterals, insofar as those requirements apply. All capped laterals shall terminate with a "bell" end which shall be closed with a cap/plug before being placed in the trench and marked, as described elsewhere herein.

### 3.3 CONCRETE

- 3.3.1 General: Concrete shall not be placed before forms, embedded materials, and reinforcement are securely fastened in position, and these and all other preliminary work have been inspected and approved. If chutes are not used, they shall be of metal or metal lined. Concrete shall not, under any circumstances, be permitted to be placed using aluminum pipe, aluminum chutes or aluminum lined chutes.

### 3.4 INSPECTION AND TESTING

3.4.1 General: Upon completion of the installation and backfilling portions of the sanitary sewer, the pipe shall be inspected by one or several of the methods subsequently described. This inspection and testing shall be undertaken as the work progresses. The Engineer shall be notified in advance of such inspection and testing and the Contractor shall provide all facilities, materials, equipment, and labor required for such testing. Such inspection and testing shall be a prerequisite for acceptance of all work.

3.4.2 Visual Inspection: An inspection of the interior of the Sanitary Sewer Pipe by direct visual Inspection shall be made for all pipe installed from manhole to manhole. Any lights, equipment, or labor necessary for such inspection shall be provided by the Contractor.

Any foreign material found in the interior of the sewer, any dirt, debris or other objects shall be removed by the Contractor. Visible defects such as broken pipe sections, improperly installed gaskets, projecting connections, cracks, visible leaks or other defects shall be noted, corrected and the pipe reinspected.

3.4.3 Allowable Infiltration and Exfiltration Rates: Infiltration and/or exfiltration rates shall not exceed the following rates for the types of pipes listed:

Type of Pipe	Infiltration/Exfiltration Rate (gal./mile/inch diam./24 hrs.)
D.I.P.	50
R.C.P	50
PVC	50

These requirements will be net for every section (between manholes) of pipe; it is not a cumulative average over several sections of pipe.

Infiltration/Exfiltration rates shall be determined on the main sewer and shall be within the allowable rates for the pipe as specified above prior to the installation of any laterals. All Wyes, Tees, and other fittings in the main sewer line shall be adequately capped or plugged to withstand the maximum anticipated head during exfiltration testing to prevent debris, groundwater, etc. from entering during infiltration testing. Any caps or plugs which "Blow-out" or leak shall be replaced as often as necessary by the Contractor at no addition cost to the Owner until the main sewer passes the infiltration/exfiltration test.

The first section of pipe (between two manholes) laid by each pipe crew will immediately be tested upon completion in order to check workmanship. The Engineer may call for infiltration or exfiltration tests at any time on the section of pipe.

3.4.4 Exfiltration Testing: Where so required by the Engineer, after laying and jointing, Sanitary Sewer Pipe shall be tested for leakage by internal water pressure. For this purpose, the Contractor shall furnish and install suitable temporary plugs or

stoppers at appropriate intervals along the line, together with suitable riser pipes where manholes cannot be used, through which the pipe line under test may be filled and the required water head applied to the section under test. In general, such tests will be made on sections extending from manhole to manhole, but sections or other lengths will be tested if conditions make that advisable. When the test is to be made, the Engineer shall be notified in advance, the pipe and manhole (or riser) filled with water to a level 5 feet above the highest point of the crown of the sewer tested or the groundwater level, whichever is greater, and allowed to stand subject to that head for not less than 4 hours, unless otherwise specified, during which time the rate of exfiltration shall be recorded by measuring the volume of water used in restoring the water level in the manhole (or riser) to its original level. The general level shall be maintained at all times during the test.

- 3.4.5 Infiltration Testing: If so directed by the Engineer, the sewer shall be tested for infiltration of groundwater at such time or times as the groundwater level is high and after the trench has been backfilled and compacted. The groundwater leakage into the pipe will be measured by the Engineer at such point or points as he may direct, preferably as near the lower end of the section of sewer under test as practicable. The Contractor shall provide or construct suitably calibrated weirs, provide and set temporary stoppers with small pipes from which the flow of water may be measured, or other means of measurement as shall be required, and shall do pumping as shall be necessary to enable the test to be properly made and furnish labor to assist the Engineer, all without additional expense to the Owner.

Infiltration testing will be permitted only where the existing groundwater level can be shown to be at least two (2) feet above the highest point of the crown of the sewer being tested. Otherwise, exfiltration testing, as previously described, shall be required. The existing groundwater level shall be determined by direct measurement via an observation well pipe placed in the trench prior to backfilling. The lower end of the observation pipe shall be embedded in the foundation stone used for sewer bedding at approximately the sewer invert elevation, or lower, and the upper end at or above the finished grade. Pipe so installed for dewatering purposes may be used for this purpose. Observation pipes shall be installed by the Contractor at no additional cost to the Owner in locations adjacent to manholes where ordered by the Engineer. They shall be removed upon acceptance of infiltration/exfiltration tests.

- 3.4.6 Test by Sections: After any such section has been tested, the Engineer may, at his discretion, permit capped connections to be made with this section of sewers by other parties; said sections may not be put in service until all sewers contemplated under this Contract have been completed and tested unless specifically waived by the Owner.

- 3.4.7 General: The phrase “per miles of Pipes” shall refer to the total length of the main sewer, measured through manholes, plus the lengths of all connections, laterals and branches.

The maximum allowable infiltration/exfiltration rate shall be as specified previously in these Specifications. Any sewers not in compliance with these requirements shall be corrected by the Contractor until such time as these rates can be met or approved by the Engineer. Such corrections as necessary shall be made by the Contractor at no additional cost to the Owner.

Temporary stoppers and testing facilities will be removed after this work has been completed and sewer restored in good order.

Should the section of pipeline fail to pass the infiltration/exfiltration test, the Engineer will require the Contractor to inspect the line (including closed circuit TV) to isolate the source of leakage and correct the same. No separate payment will be made for such inspection or corrective measures, the cost thereof being included in the unit cost bid for the various classes and sizes of sanitary sewers.

After such corrective work has been completed, measurements of the flow shall again be made. If the flow still exceeds the allowable rates, further corrective measures shall be taken and continued by the Contractor to reduce the infiltration until it shall, by measurement, be less than the allowable rate.

- 3.4.8 Testing For Plastic Pipe:

The Contractor shall submit the testing plan for approval. In general, the leak testing shall comply with Performance Pipe Technical Note 802.

**END OF SECTION**

PART ONE - GENERAL

1.1 DESCRIPTION

1.1.1 Work Included: Under this section, the Contractor shall provide all labor, equipment and materials necessary to furnish, install and test all valves required to complete the entire piping systems as shown on the Contract Drawings and as specified herein.

1.1.2 Related Work Described Elsewhere:

Pipe and Pipe Fittings

Section 15076

1.2 QUALITY ASSURANCE

1.2.1 Standards:

- (1) Comply with standards specified herein as listed in the General Conditions of the Contract.
- (2) Comply with ANSI, ASTM, National Electric and all other applicable Federal, State and Municipal codes including revisions to date of Contract.
- (3) In all cases where a device or part of the equipment is referred to in this Section in the singular (such as "valve"), it is intended that such references shall apply to as many such devices as are required to complete the installation.

1.2.2 Qualifications of Manufacturer: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Engineer.

1.3 SUBMITTALS

1.3.1 General: Submit shop drawings in accordance with Section 01340, SUBMITTALS.

1.3.2 Product Data:

- (1) Manufacturer's specification and other data required to demonstrate compliance with the specific requirements. Such submittals shall include certified records of physical, chemical, and other pertinent tests and/or

certified statements from the manufacturer that the materials have been manufactured and tested in conformity with the specifications.

- (2) A completed materials list showing all items to be furnished and installed under this Section.
- (3) Complete Shop Drawings of all work of this Section, showing dimensions and locations of all items.

## 1.4 PRODUCT HANDLING

1.4.1 Protection: Use all means necessary to protect materials of this Section before, during and after installation and to protect installed work and materials of all other trades.

1.4.2 Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

1.4.3 Valve Identification: Cast markings shall appear on each valve, identifying the following:

- (1) Manufacturer's name or mark.
- (2) Size of valve (pipe size).
- (3) Working pressure.
- (4) Year of valve manufacturer.
- (5) Flow direction arrow (required for swing check valves, rate of flow valve, plug valves, pressure reducing valves and pressure relief valves only).

## PART TWO - PRODUCTS

### 2.1 GENERAL

2.1.1 Design: It is based on the use of products specified. Where used, the names of manufacturers and specific catalog numbers are given only as an indication of the quality of the materials and workmanship to be used. Equal products by other manufacturers approved by the Engineer will be acceptable in accordance with the General Conditions of the Contract.

### 2.2 VALVES

2.2.1 Air Release Valve: An air release valve shall be provided in the air release Manhole on the Pump Station force main as shown on the drawings.

The assembly shall be tested as a unit to insure there are no leaking joints.



The Air Release Valve shall be equal in all respects to GA Industries Fig. 925 and shall be 2-inch (Chapel Hill force main) and 3-inch (Oakwood Knolls and Lakeside Blvd force mains) NPT size. Outlet connection shall be 1/2-inch NPT. All internal metal parts components shall be stainless steel. The body and cover shall be of cast iron conforming to ASTM A126 Class B.

When specified, the Air Release Valve shall be supplied with "Flushing Attachments" to allow periodic flushing of sediment, grease and solids. Attachments consist of: bronze shot-off valve, quick-connect couplings (to allow connection to a clean water sources), and a minimum of 5 feet of rubber hose.

The Air Release Valve shall be as manufactured by GA Industries, Inc. their Figure 925.

2.2.2 Blow off Assembly: The Blowoff Assembly shall be constructed in accordance with the details shown and shall include but not limited to the following:

- (1) Ductile iron piping, including reducers and transition couplings.
- (2) 4- inch ball valves and appurtenances, as shown. Each ball valve shall be provided with a stainless steel extension stem to extend within 6 in. of grade, and a two in. square operating nut. Valves shall open by turning counterclockwise. The operating nut shall be marked with an arrow in the direction of opening, and the word "OPEN".
- (3) Cast iron valve boxes for the blowoff assembly shall be of the adjustable type, of the required length, with locking type covers, and shall be Muller Co., Cat. No. H-10306; or equal. The raised letter "S" shall be cast on each cover. A stem support shall be provided near the top of the valve box.

2.2.3 Electromagnetic Flow Meter: The electromagnetic meter shall be Badger Meter model number M2000, or equivalent. Meters shall be 3 inches and have a temperature range up to 302 degrees Fahrenheit. The meters shall be able to read a range of flow from 0.10 to 39.4 ft/sec. The accuracy of the meters shall be +/- 0.2%.

### PART THREE - EXECUTION

#### 3.1 INSPECTION

Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until all unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- 3.2.1 General: The installation procedures for valves shall be the same as for joining pipes with the same end connections. Such procedures are identified in Section 15076, PIPE AND PIPE FITTINGS.
- 3.2.2 Cleaning Valves: The inside of all valves shall be cleaned by brushing and by thoroughly blowing out with air to remove slag, dirt and other sediment, as well as other foreign materials, before being installed. During installation, sufficient care shall be exercised to prevent foreign matter from entering the valves.
- 3.2.3 Handling of Valves: Proper and suitable equipment shall be used for the safe and convenient handling and laying of all valves. Care shall be taken to prevent the valve coating from being damaged, particularly on the inside of the pipes and fittings and any damage shall be remedied as directed. No valve shall be laid which are known to be defective. If any defective valve is discovered after having been laid, it shall be removed and replaced with sound valve in a satisfactory manner by the Contractor at his own expense.

All valves shall be laid to proper alignment. Open ends of valves shall be kept plugged with a bulkhead during construction.

### 3.3 FIELD TESTING

Valves shall be field tested as an integral part of the pipeline. Pipe lines including valves shall be tested as described in Section 15076, PIPE AND PIPE FITTINGS.

In addition to the above field testing, each valve shall be factory tested by the manufacturer. Factory tests shall consist of shop leakage and performance tests and hydrostatic test as described in AWWA Standard C600, latest date. The manufacturer shall certify in writing to the Engineer that the valve has successfully passed all tests.

**END OF SECTION**

## PART 1 - GENERAL

### 1.01 APPLICATION

A. This Section applies to all sections of Division 16 of this project, except as specified otherwise in the individual sections.

### 1.02 SCOPE OF WORK

A. This specification and accompanying drawings are intended to illustrate the nature of work to be performed in a diagrammatic manner. All labor, material, and equipment necessary for a complete electrical installation shall be included by the Contractor in the submission of his bid.

B. Appliances, materials or equipment obviously a part of the system necessary for its satisfactory operation, although not specifically mentioned herein or indicated on the drawings shall be provided by this Contractor without extra cost to the Owner

C. Material and equipment mentioned and described in this specification shall be supplied complete in all details. Contractors bidding on this project shall insure themselves that the quotations that they use for equipment have been quoted in accordance with the specifications and the drawings. Errors by manufacturer's representatives shall not relieve the Contractor, to provide the proper equipment of the obligation.

D. Without intending to limit or restrict the volume of work provided by this section of the contract documents, the work is to generally comprise of the following.

1. Installation of a complete electrical system as shown on contract drawings,
2. Demolition of existing Water Treatment equipment and all necessary materials as shown on contract drawings,
3. Furnish and install new Service Entrance Panels, Wire & Conduit, Generators, Automatic Transfer Switches, and all necessary material and equipment for a complete and operating systems.

### 1.03 LAWS, PERMITS, AND REGULATIONS

A. Obtain and pay for all licenses, certificates and permits required by law, State County, and all Authorities having jurisdiction. Comply with the rules and requirements of the National Board of Fire Underwriters and the National Electric Code currently adopted edition by NJ DCA and with all governing laws, orders,

regulations, and building codes. Any deviation shall be reported to the Owner or its representative in writing, for approval.

B. Certificates of approval from the above authorities shall be delivered to the Owner before final payment may be made. This Contractor shall pay the necessary fees for all inspections and certificates.

#### 1.04 CODES, LISTINGS AND STANDARDS:

A. All electrical work covered by the Contract Documents shall conform to the National Electrical Code (NFPA-70), State of New Jersey Uniform Construction Code, ICC Building and Mechanical codes, NFPA and all referenced Codes. Comply with the applicable requirements of the Occupational Safety And Health Act (OSHA).

B. All equipment and materials for which Underwriters' Laboratories, Inc. provides product listing service shall be Underwriter Laboratories' approved and bear the U.L. Label.

C. Equipment and materials wherever applicable shall conform to the following standards:

1. Federal Specifications (Fed. Spec.).
2. Illuminating Engineering Society (IES).
3. National Electrical Manufacturers Association (NEMA).
4. Institute of Electrical and Electronic Engineers (IEEE).
5. American National Standards Institute (ANSI).
6. Insulated Cable Engineers Associations (ICEA).

#### 1.05 PROTECTION OF WORK AND MATERIALS

A. This Contractor shall be responsible for the proper care and protection of all portions of materials delivered and work prepared by him until completion and acceptance of the work and the issue of certificates in final payment.

#### 1.06 MATERIALS AND WORKMANSHIP

A. All materials shall be new, recently manufactured and of the best quality.

B. All work shall be performed in a first-class, neat and workman-like manner by mechanics skilled in their trades.

C. Where the words "provide" and "supply" are used in the specifications or on the drawings, they shall be understood to mean the complete work in connection therewith, that is, furnishing, installing, testing, connecting, and warranties of the items specified.

#### 1.07 SHOP DRAWINGS AND SUBMITTALS

A. After contract award, this Contractor shall submit all shop drawings for approval within two (2) weeks.

B. Submittals shall be provided for all electrical equipment and material.

#### 1.08 PERFORMANCE OF EQUIPMENT

A. All materials, equipment, and appurtenances of any kind shown on the drawings, hereinafter specified, or required for the completion of the work in accordance with the intent of these specifications, shall be completely satisfactory and acceptable as regards operation, performance and capacity.

B. No acceptance, written or verbal, of any drawings, descriptive data or samples of such material, equipment and/or appurtenances shall relieve the Contractor of his responsibility to turn over the complete emergency generator installation to the Owner in perfect working order and in complete conformance with the drawings and specifications at the completion of the work.

C. Operation, capacity or performance of which does not comply with the requirements of the drawings or specifications, or which is damaged prior to acceptance by the Owner will be held to be defective material and shall be removed and replaced with proper and acceptable materials, equipment and/or appurtenances, or put in proper working order, satisfactory to the Engineer without additional cost to the Owner.

D. All moving parts of equipment and appurtenances, shall be properly lubricated by the Contractor and shall be started up and tested by him.

E. All equipment shall operate without objectionable noise or vibration as determined by the Engineer. If such objectionable noise or vibration should be produced and transmitted to occupied portions of the building by apparatus, piping, ducts or other parts of the work, any necessary changes, as approved, shall be made without cost to the Owner.

#### 1.09 DELIVERY AND STORAGE

A. Equipment and materials shall be properly stored, adequately protected and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the

manufacturer's recommendations and as approved by the Engineer. Electrical conduit shall be stored to provide protection from the weather and accidental damage. Cables shall be sealed, stored and handled carefully to avoid damage to the outer covering or insulation and damage from moisture and weather. Outdoor storage of cable will not be permitted. Damaged or defective items, in the opinion of the Owner's representative, shall be replaced with new items at no additional cost to the Owner.

#### 1.10 CATALOGED PRODUCTS

A. Materials and equipment shall be the cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest standard design that complies with the specification requirements.

#### 1.11 MANUFACTURER'S RECOMMENDATION

A. Where installation procedures are specified to comply with the recommendations of the manufacturer of the material or equipment being installed, printed copies of these recommendations shall be furnished to the Owner prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

#### 1.12 MECHANICAL REQUIREMENTS

A. Conduit and cables as indicated on the drawings/specifications for mechanical equipment, supplied by others, shall be included under this division.

#### 1.13 COORDINATION

A. Electrical work shall be coordinated with Owner's representative and other trades involved in the construction project. Electrical components of mechanical equipment, such as motors, motor starters, control or pushbuttons stations, floats or pressure devices and other devices functioning to control mechanical equipment which are not explicitly shown on the contract drawings but specified in the appropriate sections shall be installed and wired under Division 16 work. All work shall be carefully laid out in advance, coordinating electrical features with architectural, structural and mechanical features of construction.

#### 1.14 COORDINATION WITH UTILITIES AND OWNER:

A. Contractor shall contact the local Utility Companies and arrange for the installation of all utilities. Contractor shall comply with all local Power Company requirements.

B. Contractor shall contact the local Telephone Company and arrange for the installation of a voice grade line suitable for use with the remote alarm dialer.

## 1.15 ENCLOSURES

A. Furnish NEMA enclosures to suit location classification, unless otherwise shown on the drawings, or referenced in the specifications. The outdoor area shall be considered as requiring NEMA 3R rated equipment.

## 1.16 DEMOLITION

A. The Contractor shall remove any and all obsolete, unused or unnecessary electric items such as conduit, boxes, fittings, wire, lighting fixtures, etc. Any such items intended for such removal shall be completely verified and approved by the Owner and Engineer.

B. Any existing electrical equipment that must be relocated to accommodate new work may be accomplished by the Contractor, provided it is done so at no additional expense to the Owner and written permission has been obtained from the Owner and Engineer.

C. All electrical items removed shall remain the property of the Owner, but shall be legally disposed of, if so directed by the Owner and Engineer. Items so directed shall be removed from the premises by the Contractor at his expense.

## PART 2 - PRODUCTS

### 2.01 MATERIALS AND EQUIPMENT

A. All materials, equipment, and devices shall, as a minimum, meet the requirements of UL where UL Standards are established for those items, and the requirements of NFPA 70. All items shall be new unless specified or indicated otherwise.

### 2.02 CONDUITS AND FITTINGS

See section 16111

### 2.03 OUTLET BOXES AND COVERS

A. Outlet boxes and covers shall be cadmium- or zinc-coated if of ferrous metal and shall conform to UL 514

B. Cabinets, junction boxes, and pull boxes (with volume greater than 100 cubic inches) shall conform to UL 50.

### 2.04 WIRES AND CABLES

A. Wires and cables shall meet the applicable requirements of NFPA 70 and UL for the type of insulation, jacket, and conductor specified or indicated. Wires and cables

manufactured more than 12 months prior to date of delivery to the site shall not be used.

## 2.05 CONDUCTORS

A. Unless indicated otherwise, conductor sizes shown are based on copper, and all conductors indicated shall be copper.

## 2.06 EQUIPMENT MANUFACTURER REQUIREMENTS

A. Where Contractor provides equipment, whose manufacturer requires copper conductors at the terminations, or requires that only copper conductors be provided between components of equipment, it shall be the Contractor's responsibility to provide copper conductors, or all necessary splices, splice boxes, and other work required to satisfy manufacturer's requirements.

## 2.07 MINIMUM CONDUCTOR SIZES

A. Minimum size for branch circuits shall be No. 12 AWG; for Class 1 remote control and signal circuits, No. 14 AWG; and for Class 2 low-energy remote control and signal circuits, No. 16 AWG.

B. Provide for all service, feeder, branch, control, and signaling circuit conductors. Color shall be as listed below, green for grounding conductors. Where neutrals of more than one system are installed in same raceway or box, the neutrals shall be indicated with a colored (not green) stripe in addition to the base neutral color listed below. The color of the under-grounded conductors in different voltage systems shall be as follows:

3-phase systems	120/208 volts	277/480 volts
phase A:	black	yellow
phase B:	red	brown
phase C:	blue	orange
neutral:	white	grey

3-phase      240 volt delta with 120 volt center tap

high leg	orange
phase B:	black
phase C:	blue

1-phase systems	120/240 volts
Phase A:	black
Phase B:	blue
neutral:	white



## 2.08 INSULATION

A. Unless specified or indicated otherwise, or required to be otherwise by NFPA 70, all power wires shall be 600 volt, type THHN-2, THWN or XHHW-2, except that grounding wire may be type TW; remote control and signal circuits shall be type TW, THW or TF.

## 2.09 SPLICES AND TERMINATION COMPONENTS

A. Splices and termination components shall conform to UL 486A and UL 486B, as applicable for wire connectors, and UL 510 for insulating tapes. Connectors for wires No. 10 AWG and smaller shall be insulated pressure-type in accordance with UL 486A or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

## 2.10 SWITCHES

A. Switches serving as motor-disconnect means shall be horsepower rated. Provide heavy duty type switches where indicated, where switches are rated higher than 208 volts, and for double throw switches. Fused switches shall utilize Class R fuseholders and fuses, unless indicated otherwise.

## 2.11 FUSES

A. Provide a complete set of fuses for each fusible switch. Time-current characteristics curves of fuses serving motors or connected in series with circuit breakers or other circuit protective devices shall be coordinated for proper operation; submit coordination data for approval. Fuses shall have a voltage rating not less than the circuit voltage.

1. Fuses shall conform to UL 198C, Class J for 0 to 600 Amps and Class L for 601 to 6000 Amps.

## 2.12 MOTORS

A. Motors shall be NEMA MG1, except sealed (hermetic type) motor compressors shall meet UL 984. Determine specific motor characteristics to insure provision of correctly sized starters and overload heaters. Motors shall be designed to operate at full capacity with a voltage variation of plus or minus 10 percent of the motor voltage rating.

## 2.13 PANELBOARDS

A. Panelboards for use as service disconnecting means shall additionally conform to UL 869. Panelboards shall be circuit breaker equipped. Design shall be such that any

individual breaker can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as a means of obtaining clearances as required by UL. Where "spare" is indicated, make provisions for the future installation of a breaker sized as indicated. All panelboards locks included in the project shall be keyed alike. Directories shall be typed to indicate load served by each circuit and mounted in a holder behind transparent protective covering.

## 2.14 PANELBOARD BUSES

A. Support bus bars on bases independent of the circuit breakers. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping. Provide an isolated neutral bus in each panel for connection of circuit neutral conductors. Provide a separate ground bus marked with a green stripe along its front and bonded to the steel cabinet for connecting grounding conductors. Buses shall be copper.

## 2.15 CIRCUIT BREAKERS

A. Circuit breakers shall be ambient compensated thermal magnetic type with interrupting capacity as indicated on construction drawings. Breaker terminals shall be UL listed as suitable for the type of conductor provided.

## 2.16 MULTIPOLE BREAKERS

A. Provide common-trip type with a single operating handle. Breaker design shall be such that an overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.

## 2.17 LIGHTING FIXTURES

A. Furnish and install light fixtures in accordance with the schedule and descriptions on the drawings. Light fixtures shall be constructed in accordance with applicable UL standards and shall be UL listed and labeled.

B. Fixtures shall be lamped after installation with new lamps in accordance with the schedule and descriptions on the drawings.

# PART 3 - EXECUTION

## 3.01 GENERAL REQUIREMENTS

A. Electrical installation shall conform to the requirements of NFPA 70, State and Local Codes, and to the requirements specified herein.

## 3.02 WIRING METHODS

A. Wiring method shall be insulated conductors installed in conduit, except where specifically indicated or specified otherwise, or required by NFPA 70 to be installed otherwise. An insulated equipment grounding conductor shall be provided in all feeder and branch circuits, including lighting circuits.

### 3.03 CONDUIT INSTALLATION

A. Keep conduit at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

### 3.04 CONDUIT SUPPORT

A. Support conduit by pipe straps, wall brackets, hangers or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts of expansion bolts on concrete or brick; by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. The load applied to fasteners shall not exceed one-fourth of the proof test load. Fasteners attached to concrete ceiling shall be vibration and shock resistant. Holes cut to a depth of more than 1-1/2-inches in reinforced concrete beams or to a depth of more than 3/4-inch in concrete joints shall not cut the main reinforcing bars. Fill holes that are not used.

B. Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with a hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of all observations.

C. Install pull wires in empty conduits in which wire is to be installed by others. The pull wire shall have not less than 200 pounds tensile strength. Leave not less than 36 inches of slack at each end of the pull wire.

D. Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70. Where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least a single locknut and bushing. Locknuts shall be tye type with sharp edges for digging into the wall of metal enclosures. Install bushings on the ends of conduits and provide insulating type where required by NFPA 70.

E. Flexible connections of short length shall be provided for equipment subject to vibration, noise transmission, or movement; and for all motors. Liquid-tight flexible

conduit shall be used in wet locations. A separate ground conductor shall be provided across flexible connections.

### 3.05 BOXES, OUTLETS, AND SUPPORTS

A. Provide boxes in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be of cast-metal hub type when located in normally wet locations, when surface mounted on outside of exterior surfaces or when exposed up to 7 feet above interior floors and walkways, and when installed in hazardous areas. Boxes in other locations shall be sheet steel. Each box shall have the volume required by NFPA 70 for the number of conductors enclosed in the box. Boxes for use in masonry block or tile walls shall be square-cornered tile-type, or standard boxes having square-cornered tile-type covers. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel work. Threaded studs driven in by power charge and provided with lockwashers and nuts or nail-type nylon anchors may be used in lieu of wood screws, expansion shield, or machine screws.

B. In open overhead spaces, cast boxes threaded to raceways need to be separately supported particularly where used for fixture support. Support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceway on opposite sides of the box and support the raceway with any approved type fasteners not more than 24 inches from the box. When penetrating reinforced-concrete members, avoid cutting any reinforcing steel.

C. Construct of not less than the minimum size required by NFPA 70 of code-gauge aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified above, Furnish boxes with screw-fastened covers. Where several feeders pass through a pull box, tag the feeders to indicate clearly the electrical characteristics, circuit number, and panel designation.

### 3.06 CONDUCTOR IDENTIFICATION

A. Provide conductor identification within each enclosure where a tap, splice, or termination is made. Identification shall be made with printed nylon cloth labels or with identification plates fastened by nylon cable ties, or printed heat-shrink type sleeves. Identify control circuit terminations.

### 3.07 SPLICES

A. Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller with an insulated pressure type connector. Make splices in conductors

No. 8 AWG and larger with a listed connector and cover with an insulation material equivalent to the conductor insulation.

### 3.08 COVERS AND DEVICE PLATES

- A. Install with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16-inch. The use of sectional type device plates will not be permitted. Plates installed in wet locations shall be gasketed.

### 3.09 GROUNDING AND BONDING

A. The entire electrical system shall be grounded in accordance with Article 250 of the National Electrical Code. Ground all exposed non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in non-metallic raceways, and neutral conductor or wiring systems. Make ground connection at the main service equipment and extend grounding conductor to the point of entrance of the metallic water service. Make connection to the water pipe by a suitable ground clamp or lug connection to a plugged Tee. If flanged pipes are encountered, make connection with the lug bolted to the street side of the flanged connection.

### 3.10 GROUNDING CONDUCTOR

A. Provide an insulated, green colored equipment grounding conductor in all feeder and branch circuits. This conductor shall be separate from the electrical system neutral conductor.

### 3.11 REPAIR OF EXISTING WORK

Lay out the work carefully in advance. Where cutting, channeling, chasing, or drilling of floors, walls partitions, not ceilings, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, do this work carefully. Repair any damage to buildings, piping, or equipment using mechanics of the trades involved.

### 3.12 TESTING

A. The Contractor shall provide all test equipment and personnel and submit written copies of all test results.

B. Test all 600-Volt wiring to verify that no short circuits or accidental grounds exist. Perform 25 insulation resistance tests on all wiring No. 6 AWG and larger using an instrument which applies a voltage of approximately 500 Volts to provide a direct reading of resistance; minimum resistance shall be 250,000 Ohms.

- C. Test the grounding system to assure continuity and that the resistance to ground is not excessive.
- D. Tests as required for all component parts of the complete installation shall be performed by the contractor to demonstrate the satisfactory functioning of all electrically operated equipment and wiring and the adequacy of the entire electrical system.
- E. Any equipment or materials furnished and/or installed under this contract which fails under tests shall be repaired or replaced and then retested until satisfactory results are obtained, entirely at the expense of the contractor. The contractor shall assume full responsibility for the proper functioning and quality of all electrical installations to the extent that any breakdowns, deficiencies or deteriorations caused by poor workmanship, inferior equipment furnished by the contractor, materials or method of installation shall be promptly remedied, replaced or repaired by the contractor.

**END OF SECTION**

**SECTION 16011**

**LABELING AND IDENTIFICATION**

**PART 1 - GENERAL**

**1.01 DESCRIPTION OF WORK:**

- A. Provide identification as specified herein for all indicated items.
- B. Work Included:
  - 1. Nameplates to identify disconnect switches, starting devices, control switches, pushbutton station, circuit breakers, pull boxes, junction boxes.
  - 2. Wire tags at each end of all feeders and control wiring, and feeder wires only in all junction and pull boxes.
  - 3. Labels for exposed conduits, conduits containing feeders, fire alarm and communications.
  - 4. "DANGER-HIGH-VOLTAGE" signs shall be securely mounted on the entry doors of all electrical rooms.

**1.02 SUBMITTALS**

- A. In accordance with the General and Special Conditions, the Contractor shall submit:
  - 1. Descriptive literature for materials specified.

**PART 2 - PRODUCTS**

**2.01 MATERIALS:**

- A. Nameplates:
  - 1. Nameplates shall be white core, black laminated plastic having engraved letters.
  - 2. Letter size and nomenclature shall be as directed by the Owner.
- B. Labels:
  - 1. Labels on feeder conduits shall consist of 3/4-inch high red stenciled letters on a green painted rectangular background. Nomenclature shall be as directed by the Owner.

## LABELING AND IDENTIFICATION

2. Labels on fire alarm conduits shall consist of "FA" stenciled in red letters on a white painted rectangular background.
  3. Labels on communication conduits shall be 2 blue bands, each 1-inch wide with 1 inch between them.
- C. Wire tags shall be of adhesive backed cloth material with printed identifying numbers and letters to be wrapped around the conductor in sequence to comprise the identification. Nomenclature shall be as directed by the Owner.
- D. Provide manufacturer's standard "DANGER" signs of baked enamel finish on 20 gage steel; of standard red, black and white graphics; 14 inches by 10 inches size except where 10 inches by 7 inches is the largest size which can be applied where needed, and except where larger size is needed for adequate vision.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. All surfaces to receive labels shall be carefully prepared in accordance with the manufacturer's instructions.

### 3.02 APPLICATION:

- A. Labels:
1. Labels shall be painted and stenciled on clean dry surfaces.
  2. All conduit systems shall require identification when exposed or concealed above accessible ceilings.
- B. Nameplates:
1. Nameplates shall be secured to painted surface with suitable oval head stainless steel screws.
  2. Nameplates shall be secured to unpainted surfaces with stainless steel mechanical fasteners or epoxy cement. Surface shall be properly cleaned before application.
- C. Danger Signs:
1. Danger signs shall be secured with oval head stainless steel screws.

## END OF SECTION



PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install conduit and fittings to form complete, coordinated and grounded raceway systems.

B. All conduits shall be as follows except as otherwise shown.

1. Rigid steel conduit for exposed conduit runs.
2. Intermediate metallic conduit for exposed conduit runs.
3. PVC coated rigid steel for exposed conduit runs in corrosive areas.
4. Schedule 40 PVC for concrete encased duct bank runs or for direct burial.
5. Schedule 80 PVC for outdoor use under parking lots, roadways and where exposed.
6. Rigid steel for conduit runs embedded in structural concrete slabs.

C. Coordination:

1. Conduit runs shown are diagrammatic.
2. Coordinate conduit installation with piping, ductwork, lighting fixtures and other systems and equipment and locate so as to avoid any interference.

C. Related Sections:

1. Section 16000

1.02 QUALITY ASSURANCE

A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:

1. NEC Article 344, Rigid Metal Conduit.
2. NEC Article 352, Rigid Nonmetallic Conduit.
3. UL Standard No. 6, Rigid Metal Electrical Conduit.
4. UL Standard No. 514, Electrical Outlet Boxes and Fittings.
5. UL Standard No. 651, Schedule 40 and 80 PVC Conduit.

6. UL Standard No. 886, Electrical Outlet Boxes and Fittings for Use in Hazardous Locations.
7. UL Standard 1242, Intermediate Metallic Conduit.
8. ANSI C80.1, Specification for Zinc Coated Rigid Steel Conduit.
9. ANSI C80.4, Specification for Fittings for Rigid Metal Conduit and Electrical Metallic Tubing.
10. NEMA TC2, Electrical Plastic Tubing, Conduit and Fittings.
11. NEMA TC3, PVC Fittings for Use with Rigid PVC Conduit and Tubing.

### 1.03 SUBMITTALS – SEE SECTION 01300

- A. Shop Drawings: Submit for approval the following:
  1. Manufacturer's catalog cuts and technical information for the conduit, fittings and supports proposed for use.
  2. Layout drawings showing proposed routing of exposed conduits, conduits embedded in structural concrete and conduits directly buried in earth. Drawings shall show locations of pull and junction boxes and all penetrations in walls and floor slabs.
- B. Record Drawings: Include the actual routing of exposed and concealed conduit runs on record drawings.

## PART 2 -PRODUCTS

### 2.01 MATERIALS

- A. Rigid Steel Conduit, Elbows and Couplings:
  1. All rigid galvanized conduit installed below grade or outdoors shall have all threads generously coated with Thomas & Betts "Kopr-Shield". In addition, all direct burial rigid galvanized conduit shall be thoroughly coated with Koppers bitumastic.
  2. Material: Rigid, heavy wall, mild steel, hot dip galvanized, smooth interior, tapered threads and carefully reamed ends; 3/4-inch NPS minimum size.
  3. Manufacturer: Provide rigid steel conduit and fittings of one of the following:
    - a. Allied Tube and Conduit Corporation.
    - b. Republic Steel Corporation.
    - c. Triangle PWC Incorporated.
    - d. Or equal.
- B. PVC Coated Rigid Steel Conduit, Elbows and Couplings:

1. Material: Rigid, heavy wall, mild steel, hot dip galvanized, smooth interior, tapered threads, carefully reamed ends, 3/4-inch NPS minimum size with a factory coating of 40 mil thick polyvinyl chloride.
2. Color: Color of coating shall be the same on all conduit and fittings.
3. Manufacturer: Provide PVC coated rigid steel conduit and fittings of one of the following:
  - a. Robroy Industries.
  - b. Republic Steel Corporation.
  - c. Or equal.

C. Intermediate Metallic Conduit, Elbows and Couplings:

1. Material: Rigid-type steel, work-hardened, hot-dip galvanized, smooth interior, tapered threads and carefully reamed ends; 3/4-inch NPS minimum size.
2. Couplings: Same as for rigid steel conduit.
3. Elbows: Factory formed of same material specification as for intermediate metallic conduit.
4. Manufacturers: Provide intermediate metallic conduit of one of the following:
  - a. Allied Tube and Conduit Corporation.
  - b. Republic Steel Corporation.
  - c. Or equal.

D. Electric Metallic Tubing (EMT) Conduit, Elbows and Couplings

1. Material: Conduit fittings shall be cast type of nonferrous metal thoroughly coated inside and outside with metallic zinc or cadmium after all machining has been completed. Covers shall be of the same material as the fittings to which they are attached and shall be screwed on with rubber or neoprene gaskets between the covers and fittings.
2. Manufacturer: Provide EMT conduit and fittings as manufactured by one of the following:
  - a. Bethlehem Steel Corp.
  - b. Youngstown Steel Corp.
  - c. The U.S. Steel Corp.; Republic Steel Corp.
  - d. Or equal.

E. PVC Conduit:

1. Material: Schedule 40 PVC plastic, NEMA Type EPC-40-PVD, 90°C rated, conforming to UL No. 651.
2. Manufacturer: Provide non-metallic conduit of one of the following:
  - a. Amoco Chemicals Corporation.
  - b. Carlon, Division of Indian Head, Incorporated.
  - c. Or equal.

3. Non-metallic Fittings: Form elbows, bodies, terminations, expansions and fasteners of same material and manufacturer as base conduit. Provide cement by same manufacturer as base conduit.
- F. Metallic Conduit Fittings and Outlet Boxes:
1. Material and Construction: Cast gray iron alloy, cast malleable iron bodies and covers. Outdoor units to be gasketed and watertight. Gaskets to be of an approved type designed for the purpose. Improvised gaskets are not acceptable. All units to be threaded type with five full threads. Material to conform to ANSI C80.4 and be listed by UL. Fittings and boxes on PVC coated conduit runs to have a factory-applied coating of 40 mil thick polyvinyl chloride. The use of "LB" fittings shall be avoided and type "LBD" fittings applied wherever the use of fittings is unavoidable.
  2. Manufacturer: Provide metallic conduit fittings and outlet boxes of one of the following:
    - a. Crouse-Hinds Company.
    - b. Appleton Electric Company.
    - c. Or equal.

## PART 3 – EXECUTION

### 3.01 INSTALLATION

- A. Exposed Conduit:
1. Install parallel or perpendicular to structural members or walls.
  2. Wherever possible, run in groups. Provide galvanized conduit racks of suitable width, length and height and arranged to suit field conditions. Provide support at every ten feet minimum.
  3. Install on structural members in protected locations.
  4. Locate clear of interferences.
  5. Maintain 12 inches from hot fluid lines and 1/4 inch from walls. Where it is impractical to maintain 12 inches of separation, the contractor shall insulate the source of high temperature as approved by the Engineer.
  6. Install vertical runs plumb. Unsecured drop length not to exceed 12 feet.
- B. Conduit Embedded in Concrete:
1. Separation: Three times outer diameter of larger conduit center to Center.
  2. Minimum Slab Thickness:
    - a. With no crisscrossing of conduit, three times outer diameter of conduit.

- b. With crisscrossing of conduits, four times outer diameter of larger conduit.
  3. Run conduit in center of slab.
  4. Before concrete is placed, make the necessary location measurements of the conduit to be embedded so that the information is available to prepare record drawings.
  5. Red indicating device shall be installed 6" above conduit or duct bank.
- C. PVC Conduit:
  1. Install in accordance with manufacturer's recommendations.
  2. Join sections in accordance with manufacturer's installation procedures for push-fit, bell and spigot type joints, if applicable or with manufacturer's recommended cement.
  3. During installation, provide expansion fittings for expansion and contraction to compensate for temperature variations. Expansion fittings shall be watertight and of the type suitable for direct burial.
  4. Make transition to intermediate or rigid steel conduit before making turn up to enclosures.
  5. Provide watertight expansion/deflection fittings at all wall and floor penetrations of all buildings and equipment concrete pads.
- D. Underground Conduits:
  1. Install individual underground conduits a minimum of 24 inches below grade unless otherwise indicated.
  2. Perform all excavation, bedding, backfilling and surface restoration including pavement replacement where required.
  3. Make conduit connections watertight.
  4. Protect metallic conduits from corrosion by one of the following means:
    - a. Provide three inches of concrete all around conduits.
    - b. Tape conduits with an all-weather polyvinyl chloride plastic tape with a high tack adhesive formulated to resist corrosion, Scotchwrap Brand 50 or equal.
    - c. Apply 2 coats of a bitumastic coating.
  5. Red indicating devise shall be installed above conduit or duct bank.
- E. Installation: Except as shown, the minimum size conduit permitted is 3/4 inch for exposed work and one inch for conduit encased in concrete or mortar.
- F. All bolts and hardware for fastening, etc., shall be cadmium plated.
- G. Conduits shall not contain the equivalent of four 90-degree bends without the use of a pull/junction box approved for the purpose and in accordance with National Electric Code.

- H. All conduit extending through the floor behind panels or into control centers or similar equipment shall extend a minimum of six inches above the floor elevations, with no couplings at floor elevations.
- I. Conduit installed in concrete or other masonry shall be so arranged that a minimum of three inches of covering is obtained. Spacing between conduits shall be sufficient to permit a complete filling with concrete or mortar without voids.
- J. Conduits passing through sleeves in interior walls and floors shall be tightly sealed with an NFPA approved fire rated caulk.
- K. Install in conformance with National Electrical Code (NFPA 70) requirements.
- L. Supports:
  - 1. Rigidly support conduits by clamps, hangers or Unistrut channels.
  - 2. Support single conduits by means of one-hole pipe clamps in combination with one-screw back plates, to raise conduits from the support surface. Support multiple runs of conduits on trapeze type hangers with steel horizontal members and threaded hanger rods, Kindorff or equal. Rods shall be not less than 3/8-inch diameter, and shall be cadmium coated.
  - 3. For PVC coated rigid steel conduit runs, supports and hardware shall be PVC coated or stainless steel.
  - 4. Conduit and/or conduit fittings shall not be welded together or to any steel structure; however, conduit supports may be welded to flanges of steel beams, columns, etc., in accordance with approved welding techniques and engineering practice.
- M. Fastenings: Fasten raceway systems rigidly and neatly to supporting structures by the following methods:
  - 1. To Wood: Wood screws.
  - 2. To Hollow Masonry Units: Toggle bolts.
  - 3. To Brick Masonry: Price expansion bolts, or equal.
  - 4. To Concrete: Phillips, Hilti Corporation or equal anchors.
  - 5. To Steel: Welded threaded studs, beam clamps or bolts with lockwashers or locknuts.
- N. Empty Conduits:
  - 1. Install nylon pull wire in each empty conduit and cap conduits not terminating in boxes with permanent fittings designed for the purpose.

2. Identify each empty conduit with a durable tag showing the conduit number indicated on the Drawings.
- O. Field Bends: Factory bent elbows or field bent elbows with approved tools may be used. Heating of conduit to facilitate bending is prohibited with the exception of PVC conduit where nonstandard bends are required. No indentations are allowed. Diameter of conduit shall not vary more than 15 percent at any bend.
- P. Joints:
1. Apply conductive compound to all joints before assembly.
  2. Make up joints tight and ground thoroughly.
  3. Use standard tapered pipe threads for conduit and fittings.
  4. Cut conduit ends square and ream to prevent damage to wire and cable.
  5. Use full threaded couplings. Split couplings not permitted.
  6. Use strap wrenches and vises to install conduit. Replace conduit with wrench marks.
  7. Apply zinc-rich paint to exposed threads and other areas of galvanized conduit system where the base metal is exposed.
  8. Approved conduit expansion joints shall be provided wherever conduit crosses a structural expansion joint, is attached between two separate structures, and wherever the conduit run is 100 ft or more in a single straight length.
- Q. Terminations:
1. Install insulated bushings on conduits entering boxes or cabinets, except threaded hub types.
  2. Provide locknuts on both inside and outside of enclosure for grounding.
  3. Bushings not to be used in lieu of locknuts.
  4. Connections from rigid conduit to motors, limit switches, solenoid valves, level controls, etc., shall be made with short lengths of liquid-tight flexible neoprene jacketed metal conduit. These lengths shall be provided with appropriate connectors with devices which will provide an excellent electrical connection between equipment and the rigid conduit for the flow of ground current.
- R. Moisture Protection:
1. Plug or cap conduit ends at time of installation to prevent entrance of moisture or foreign materials.
  2. Make underground and embedded conduit connections watertight.
  3. Thruwall Seals: Install for conduits passing through new exterior subsurface walls or base slabs of buildings and for conduits passing through existing exterior walls. For individual exposed conduits passing

through interior walls, install non-metallic sleeves to protect the conduit against action of alkaline substances, which may be present.

4. Drainage: Pay particular attention to drainage for conduit runs. Wherever possible, install conduit runs so as to drain to one end and away from buildings. Avoid pockets or depressions in conduit runs.

S. Corrosion Protection:

1. Conduit Curb:
  - a. In concrete slabs or floors, provide a two inch high curb extending two inches from the outer surface of the conduit penetrating the floor, to prevent corrosion.
  - b. Terminate conduit stub-ups in couplings, slightly above the finished concrete curb.
  - c. Paint the stub-up with Scotch-Clad Protective Coating #1706 or equal a minimum of 6 inches above and below the finished surface of the concrete.
2. Dissimilar Metals:
  - a. Take every action to prevent the occurrence of electrolytic action between dissimilar metals.
  - b. Do not use copper products in connection with aluminum work, and do not use aluminum in locations subject to drainage of copper compounds on the bare aluminum.
  - c. Back paint aluminum in contact with masonry or concrete with two coats of aluminum-pigmented bituminous paint.
3. PVC Coating: Field apply a 40 mil thick polyvinyl chloride coating to supports and fasteners for PVC coated conduit runs.

T. Reused Existing Conduits:

1. Pull rag swab through conduits to remove water and to clean conduit prior to installing new cable.
2. Repeat swabbing until all foreign material is removed.
3. Pull mandrel through conduit, if necessary, to remove obstructions.

- U. Core drill for individual conduits passing through existing concrete slabs. Obtain authorization from OWNER prior to core drilling. Seal spaces around conduit with epoxy grout. All cutting, channeling and drilling of holes through walls, floors, foundations, and ceilings, required for the correct installation of the electrical work, shall be done by and repaired by the Contractor. The cost of cutting and patching shall be included in the bid. All work shall be finish painted (prime coat and two (2) finish coats) to match the existing finishes. All incidental damage to existing wall, structures etc. shall be refinished to the satisfaction of the owner representative.



- V. The cutting of walls or floors for conduit shall be kept to a minimum. Where such cutting is absolutely necessary care shall be taken so as not to weaken the walls or floor involved. Beams or other structural supports shall not be cut under any condition, except as approved in writing by the Engineer.

### 3.02 HAZARDOUS LOCATIONS

- A. All conduit work in hazardous locations shall be performed in accordance with Article 500 of the National Electric Code, as shown on the contract drawings and as specified herein.
- B. Conduit entering/exiting any hazardous Class I Division II areas shall have seal fittings installed for the purpose at the barrier between the two areas. A sealing compound ("Chico") shall be poured into fitting(s) after all wiring has been installed and accounted for.
- C. Seal fittings shall also be installed at all devices, control stations, lighting fixtures, etc., which are not factory sealed and UL listed for hazardous locations.
- D. Flexible conduit, solenoid valves, control stations, fittings, junction boxes, etc. utilized in hazardous locations shall be UL listed for use in hazardous areas.
- E. Conduit sleeves/penetrations through floors and walls of hazardous areas shall be thoroughly sealed around the outside with non-shrink grout across the entire floor or wall thickness.

### 3.03 TELEPHONE CONDUITS

- A. Material and Installation: Telephone conduits shall be of material and size as required by the Telecommunications vendor. Each conduit shall be provided with a continuous 1/8 inch diameter nylon "fish line" pulled through for use by the Telephone Co.

### 3.04 TESTING

- A. Test conduits by pulling through each conduit a cylindrical mandrel not less than two pipe inside diameters long, having an outside diameter equal to 90 percent of the inside diameter of the conduit.
- B. Maintain a record, by number, of all conduits testing clear.

### 3.05 IDENTIFICATION

- A. Tag all conduits at the ends and in all intermediate boxes, chambers, handholes and other enclosures. Use durable tags securely fastend appropriate for the environment.

**END OF SECTION**

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Under this Section, the CONTRACTOR shall furnish and install all wires and cables for power and Local Area Networking (LAN) as required to complete the electrical installation.
- B. Each coil or reel of insulated wire and cable furnished shall bear a tag, containing the UL approval stamp (providing cable is of the class inspected by the said laboratory), name of manufacturer, trade designation, month and year of manufacture; and in no case shall be more than six months old unless accepted by the ENGINEER. Cable "mil ends" shall be unacceptable for use on this project. Wire and cable shall not have been stored in the weather outdoors.
- C. Conductors larger than No. 10 AWG shall be stranded and all conductors shall be copper, unless otherwise specified.
- D. The following information for each size of wire and cable shall be submitted to the ENGINEER for acceptance:
  - 1. Voltage rating
  - 2. Name of cable manufacturer
  - 3. Minimum insulation resistance in megohms, per 1,000 ft at 15.5° C
  - 4. Number and size of strands in each conductor
  - 5. Conductor insulation in mils
  - 6. Sheath thickness in mils
  - 7. Average OD of bare conductor
  - 8. Average overall diameter of finished cable
  - 9. Weight per 1,000 ft of finished cable
  - 10. Application or intended use
  - 11. Conductor type
- E. Cable shall be shop tested in accordance with the latest standards and applicable test procedures of the Specifications of the ICEA and certified data shall be submitted in compliance with this requirement. Sample lengths of cable shall be submitted to the ENGINEER.

- F. Each wire and cable shall be individually identified and tagged with a unique number using wire markers at each termination, splice point, and where passing through junction boxes or pull boxes (even when not spliced).

## PART 2 - PRODUCTS

### 2.01 600 VOLT AND BELOW POWER CABLES

- A. Single Conductor Cable. These cables shall be composed of stranded tinned copper conductors insulated with a heat, flame, and moisture resistant thermoplastic compound. Cables shall be rated not less than 600 volt, and shall be for circuits operating in dry and wet locations at a maximum conductor temperature of 90° C. Cables shall be UL listed as type XHHW-2.
- B. The conductors shall be stranded annealed copper, the individual strands of which shall, before stranding, be in accordance with ASTM: B 3.
- C. The stranded conductors shall conform to ASTM: B 8, Class B.
- D. The conductors shall be insulated with a properly vulcanized flame-retardant, insulating compound.
- E. Conductor insulation or phase-coded tapes shall be color-coded as follows:

#### AC Power 460 Volt and Above

Phase A - YELLOW

Phase B - BROWN

Phase C - ORANGE

Neutral - GREY

#### 208/120 Volt System

Phase A - BLACK

Phase B - RED

Phase C - BLUE

Neutral - WHITE

#### DC Power

Positive Lead - RED

Negative Lead - BLACK

DC Control - BLUE

### 120 Volt Control Wiring

Single conductor ac control wire shall be RED except a wire entering a Motor Control Center compartment or control panel which is an interlock, shall be color-coded YELLOW.

### 24 Volt Control Wiring - ORANGE

### Equipment Ground – GREEN

- G. Single conductor ac control wires shall be multicolored whenever group is installed in same conduit or terminated in same panelboard, cabinet, junction box, etc.

## 2.02 INSTRUMENT CABLES

- A. Instrumentation cables carrying analog signals shall be single or multipair twisted, shielded tinned copper conductors. In multipair cables, each pair shall be individually twisted, shielded conductors with an overall protective jacket.
- B. Minimum size No. 16 AWG with seven or more concentric strands for single pair and single triad cables and No. 18 AWG with 7 or more concentric strands for multipair and multi-triad cables shall be provided. Each pair shall have a mylar/aluminum, 100 percent coverage tape shield with a drain wire, not more than two sizes smaller than the conductor size. Conductors shall be polyethylene or polypropylene insulated for minimum 300 volt and shall be covered with chrome vinyl or PVC jacket. The conductor shall have 600 volt insulation where physical limitations require analog signal wires to run in the same enclosure with wires requiring 600 volt insulation, for a run not to exceed five ft.
- C. The CONTRACTOR shall install all cable or conductors used for instrumentation wiring in a grounded metal raceway. Analog signal wires shall exclusively occupy these conduits.
- D. All shielding shall be continuous and shall be grounded in accordance with the instrumentation equipment manufacturer's recommendations, as approved.
- E. Raceway containing instrumentation cable shall be installed to provide the following clearances:
  - 1. Raceway installed parallel to raceway conductors energized at 480, 240/120 or 208/120 volts: two feet
  - 2. Raceway installed at right angles to conductors energized at 480, 240/120 or 208/120 volts: six inches
- F. Where practicable, raceway containing instrumentation cable shall cross raceway containing conductors of other systems at right angles.
- G. Where instrumentation cables are installed in panels, etc., the CONTRACTOR shall arrange wiring to provide maximum clearance between cables and other

conductors. Instrumentation cables shall not be installed in same bundle with conductors of other circuits.

- H. Grounding of cable shield shall be accomplished at one point only, unless otherwise required by instrumentation systems manufacturer.
- I. Extra pullboxes shall be installed, for ease of cable pulling and the cable manufacturer's recommended conduit fill factor shall be followed. Cables shall be moisture sealed at all connections.
- J. Special instrument cable shall be as specified or recommended by the vendor of the equipment or instruments requiring such wiring, but shall not be sized less than the minimum wire size requirements of #16AWG, #18AWG for single and multipair cables respectively.
- K. All cable, insulation and jacket shall have adequate strength to allow for it to be pulled through the conduit systems. Sufficient conductors shall be installed to provide space and serve future equipment where shown and specified.
- L. All conductors shall be color-coded and all wires shall be suitably tagged with permanent markers at each end, at each JBX,PBX termination location. Each conductor shall be identified with a unique number corresponding to approved shop drawings.

## PART 3 - EXECUTION

### 3.01 600 VOLT AND BELOW POWER CABLES

- A. Cable Ampere Rating: The sizes of wire and cable for individual circuits shall be shown on drawings or as acceptable to the ENGINEER as being proper for the service requirements. Wires for branch circuits shall not be smaller than No # 12 AWG. Wires of greater size, as indicated or required, shall be used to minimize voltage drops for circuit runs over 100ft or where voltage drop exceeds 5%.
- B. Wire Terminals: Wires on manufactured assemblies such as distribution board, motor control centers and individual motor control equipment shall be terminated with cup terminals, pronged washers, compression type or pressure type terminals furnished on devices. Set-screw type pressure connectors shall be provided with saddles.
- C. Wires and cable terminations utilizing compression connectors shall be made with a pressure tool per the manufactures instructions. For wires 250 MCM and larger, the lugs shall have long barrels to allow double indentations.
- D. All 600 volt cables shall have the minimum possible number of splices and splices shall only be made in junction boxes. All wire splices shall be identified using wire markers.
- E. The finished splice shall be made waterproof via the application of an epoxy coating manufactured for the purpose.

- F. Sealing of Conduits. Where cables enter pullboxes, switchgear enclosures or incoming line sections from the underground system, conduit ends shall be sealed with oakum packing and plastic, rat repellent sealing compound in addition to the OZ Type "CSBG" fittings and all spare conduits shall be capped. Unused conduit and duct entrances shall be closed off by spring clip attached, galvanized, sheet steel covers.
- G. Sealing of Conduits: Where cables enter pullboxes, junction boxes, HVAC enclosures or incoming feeders from the underground system, conduit ends shall be sealed with OZ Type "CSBG" fittings and all spare conduits shall be capped with cast screw covers and made waterproof.
- H. Phasing/Rotation. All wiring to motors, automatic transfer switch, motor control centers, panelboards, etc. shall be phase coordinated with existing power where applicable and coordinated with rotational requirements of equipment. Where phasing or rotation is incorrect, contractor shall change connections to obtain proper results and retape termination at no additional cost to owner.
- I. Cables and wires shall be installed continuous from power source or pickup point to load or destination without unnecessary splices. Pullboxes shall be installed judiciously, as required by code, or to avoid tension due to the length of pull.

### 3.02 INSTRUMENTATION CABLE

- A. Instrumentation cables shall be moisture sealed, using shrink-on socks at all connections.

### 3.03 PULLING TEMPERATURE

- A. Cable shall not be flexed or pulled when the temperature of the insulation or of the jacket is such that damage will occur due to low temperature embrittlement. When cable will be pulled with an ambient temperature within a three day period prior to pulling is 40 deg F or lower, cable reels shall be stored during the three day period prior to pulling in a protected storage with an ambient temperature not lower than 55 deg F and pulling shall be completed during the work day for which the cable is removed from the protected storage.
- B. All feeder and underground conduits shall be swabbed with a brush, followed by clean rags, then a mandrel (85% of conduit diameter), before pulling cables through. A lubricating compound shall be applied to the cables to reduce friction and damage to the cables during the pulling operation.

### 3.04 TESTING

- A. Testing. All wiring shall be continuity tested, meggered, to ensure the integrity of the insulation. A type written report shall be submitted to the Engineer containing all the test results. All wire/cable failing test or judged by the engineer as being deficient, shall be replaced.

**END OF SECTION**

## PART 1 - GENERAL

### 1.01 WORK INCLUDE

- A. The CONTRACTOR shall furnish and install all junction and pullboxes as shown and as required to properly install the electrical systems.
- B. Boxes specified in this Section are of the type which must be utilized where standard octagonal and square sheet steel or cast boxes as specified in Section 16134 - OUTLET BOXES cannot be used.

## PART 2 - PRODUCTS

### 2.01 INDOORS

- A. Pull and junction boxes for dry indoor exposed use shall be galvanized sheet steel with neoprene gasketed screwed-on covers and of all welded construction.
- B. Boxes for use in hazardous shall be cast type NEMA 4 and NEMA 7 cast construction for hazardous areas as manufactured by O.Z. Electric Co., Steel City, or equal. Materials shall be aluminum or galvanized steel. Covers shall be same material as box with screwed-on covers, screws shall be stainless steel.

### 2.02 OUTDOORS

- A. Boxes for use outdoors shall be of cast NEMA 3R or where subject to water spray NEMA 4 construction as manufactured by O.Z. Electric Co.; Steel City; Hoffman or equal. Material shall be aluminum or galvanized steel. Covers shall be same material as box with screwed-on covers, screws shall be stainless steel.

### 2.03 GALVANIZING

- A. Boxes and covers shall be hot dipped or electrogalvanized after fabrication, inside and outside surfaces.

### 2.04 BOX SIZES

- A. The size of boxes shall be generous, considering the number and size of conductor and providing generous access for removal of conductors.

### 2.05 BARRIERS

- A. Galvanized steel or aluminum barriers shall be provided in junction or pullboxes to isolate conductors of different voltages such as 480 volt, 120 volt ac, dc and instrumentation signal leads. The gage of these barriers shall not be less than the gage of the box required.



## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. All junction boxes and pullboxes shall be solidly attached to structural members prior to installation of conduit and set true and plumb. Wooden plugs will not be permitted for securing boxes to concrete.
- B. Where control wires must be interconnected in a junction box, terminal boards consisting of an adequate number of screw type terminals shall be installed. Terminal board current carrying parts must be of ample capacity to carry the full load current of the circuits connected thereto. Approximately 20 percent of the total amount of terminals provided shall consist of spare terminals. Terminals shall be lettered and/or numbered to conform with the wiring diagrams.
- C. All junction boxes and pullboxes shall have identifying nameplates attached thereto.

**END OF SECTION**

**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. The CONTRACTOR shall furnish and install all outlet boxes for power and lighting, as shown, specified or required.

**PART 2 - PRODUCTS**

**2.01 OUTLET BOXES - EXPOSED**

- A. Outlet boxes for outdoor use exposed use where required for lighting fixtures, switches, receptacles and junction boxes shall be of cast rust resisting metal provided with rubber or neoprene gasketed covers of similar metal. The completed units shall be of NEMA 4 construction or NEMA 7 construction where required in hazardous areas; and of ample size to house the required devices.
- B. Boxes for housing receptacles, switches and similar devices shall be of the deep type.

**PART 3 - EXECUTION**

**3.01 OUTLET BOXES**

- A. All outlet boxes required for supporting lighting fixtures shall be provided with fixture studs of sizes suitable for supporting the weight of the fixtures connected thereto. Fixture studs shall not be less than 3/8 in. in diameter and shall be either integral with the box or of the type which is inserted and supported from the back of the box. In no case will the support of a fixture be dependent upon bolts holding the stud to the box.

**END OF SECTION**

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section specifies the furnishing and installation of safety switches complete in place.

1.02 SUBMITTALS

- A. In accordance with the General and Special Conditions, the Contractor shall submit:
- B. Manufacturer's catalog sheets for products included in this section.

PART 2 - PRODUCTS

2.01 SAFETY SWITCHES

- A. Safety type disconnecting switches shall be Type "HD", heavy duty, Class 3, Design 3, unless otherwise indicated, and be UL listed. Enclosures exposed to wet, damp or rain conditions shall be NEMA 4X stainless steel, water tight. Switches shall be rated at 600 minimum volts for 460V circuits and 240 volts for 120/208 circuits on which they are utilized. They shall be rated in horsepower, and each shall be capable of interrupting the locked rotor current of the motor for which it is to be used, which current will be assumed as ten (10) times the full rated load current. Switches applications for the other than motors shall be rated as indicated on drawings.
- B. The switches shall be of the quick-make, quick-break type and all parts shall be mounted on insulating bases to permit replacement of any part from the front of the switch. All current-carrying parts shall be of high-conductivity copper, designed to carry rated load without excessive heating. Switch contacts shall be silver-tungsten type or plated to prevent corrosion, pitting and oxidation and to assure suitable conductivity. The switch operating mechanism shall be designed to retain its effectiveness with continuous use at rated capacity without the use of auxiliary springs in the current path.
- C. Safety switches located at motors and which are used as disconnects for maintenance only, shall be non-fused and capable of being touched in the open position.
- D. Safety switches shall be equipped with an auxiliary contact rated 15 amps and shall be n/o when switch is in open position.
- E. Lugs/terminal fittings shall be rated for 75°C conductors.

- F. Hubs/knockouts shall be coordinated with conduit entry layouts.
- G. All safety, disconnect switches shall come equipped with equipment ground terminals - two lugs supplied per switch.
- H. Neutral kits shall be supplied wherever 3-phase 4-wire circuit disconnects are required.
- I. Safety switches in hazardous areas rated as Class I, Group D, Div. II areas shall be UL listed for the classification and shall be of cast aluminum construction.

## 2.02 NAMEPLATES

- A. Standard phenolic nameplates with 3/8 inch minimum size lettering engraved thereon shall be used to identify all safety switches.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Provide phenolic nameplate on cover of each switch indicating purpose or load served by the safety switch. Rivet or bolt the nameplate on the cover of NEMA 1 enclosures. Rivet or bolt and gasket the nameplate on cover of NEMA 4X enclosures.
- B. Install switches so that the maximum height above the floor to the center of the operating handles does not exceed 6 feet, 1/2 inch.
- C. Support/mount switches with a 1/2-inch minimum air space between back panel and wall/structure to prevent moisture damage/accumulation from occurring.
- D. Provide galvanized steel supports (kind or F or equal)

**END OF SECTION**

## PART 1 - GENERAL

### 1.1. DESCRIPTION OF SYSTEM & SITE

1.1.1. Provide a standby power system at the KW rating shown on plans to supply electrical power at the voltage system also shown on plans. The generator shall consist of a liquid cooled spark-ignited engine, a synchronous AC alternator, and system controls with all necessary accessories for a complete operating system, including but not limited to the items as specified hereinafter.

1.1.2. The site is an NEC ordinary location with no specific harsh environment requirements. The genset shall be applied at the listed ambient and elevation. Bidders to submit the generators rated power output at ambient 104 °F and site elevation.

### 1.2. REQUIREMENTS OF REGULATORY AGENCIES

1.2.1. EPA NSPS - The generator set must be pre-certified to meet EPA NSPS federal emission requirements for stationary standby. On-site emission testing & certification will not be acceptable.

1.2.2. NEMA MG 1 - motors and generators

1.2.3. NFPA 37 – installation and use of stationary combustion engines

1.2.4. NFPA 70 - national electrical code

1.2.5. NFPA 110 – emergency and standby power systems

1.2.6. UL 2200 – generators and outdoor generator enclosures

1.2.7. ISO 8528 load acceptance

1.2.8. Uptime Institute Tier III and IV – limitations on generator run hours and loading

1.2.9. International Building Code (IBC) 2012

### 1.3. MANUFACTURER QUALIFICATIONS

- 1.3.1. Cummins (basis of design)
- 1.3.2. Other acceptable generator manufactures:
  - Caterpillar
  - Generac
  - Kohler
- 1.3.3. Substitutions, shall be fully coordinated with the new PSE&G gas service.
- 1.3.4. This system shall be supplied by an original equipment manufacturer (OEM) who has been regularly engaged in the production of engine-alternator sets, automatic transfer switches, and associated controls for a minimum of 25 years, thereby identifying one source of supply and responsibility.
- 1.3.5. The manufacturer shall have printed literature and brochures describing the standard series specified, not a one of a kind fabrication.
- 1.3.6. Selling dealer shall have following:
  - 1.3.6.1. 24/7 service and support location within 25 miles of site.
  - 1.3.6.2. Employee technicians authorized by manufacturer for engine generator warranty repair.
  - 1.3.6.3. Technician response time to site of 4 hours
  - 1.3.6.4. Service & repair parts in-stock at level of 95%

### 1.4. SUBMITTALS

- 1.4.1. Engine Generator specification sheet
- 1.4.2. Controls specification sheet(s)
- 1.4.3. Installation / Layout dimensional drawing
- 1.4.4. Wiring schematic
- 1.4.5. Sound data
- 1.4.6. EPA NSPS emissions certification from the factory
- 1.4.7. Warranty statement - Warranty disclosure letter confirming the selling dealer employs personnel who provide authorized service and warranty repairs for all power generation components.  
ENGINE

### 2.1. ENGINE RATING AND PERFORMANCE

- 2.1.1. It will have adequate horsepower to achieve rated electrical kw output at site elevation and 104°F ambient.
- 2.1.2. The generator system shall support generator start-up and load transfer within 10 seconds.
- 2.1.3. The generator shall accept a load step of 100% of rated kW with a maximum frequency dip of 12 Hz.

## 2.2. ENGINE OIL SYSTEM

- 2.2.1. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have a replaceable oil filter(s) with internal bypass and replaceable element(s).

## 2.3. ENGINE COOLING SYSTEM

- 2.3.1. The engine is to be cooled with a unit mounted radiator, fan, water pump, and closed coolant recovery system. The coolant system shall include a coolant fill box which will provide visual means to determine if the system has adequate coolant level. The radiator shall be designed for operation in 122 degrees F, (50 degrees C) ambient temperature.
- 2.3.2. The engine shall have (a) unit mounted, thermostatically controlled water jacket heater(s) to aid in quick starting. The wattage shall be as recommended by the manufacturer.
- 2.3.3. Engine coolant and oil drain extensions, equipped with pipe plugs and shut-off valves, must be provided to the outside of the mounting base for cleaner and more convenient engine servicing.
- 2.3.4. A radiator fan guard must be installed for personnel safety that meets UL and OSHA safety requirements.

## 2.4. ENGINE STARTING SYSTEM

- 2.4.1. DC starting system.  
The engine's cranking batteries shall be lead acid sized per the manufacturer's recommendations. The batteries supplied shall meet NFPA 110 cranking requirements of 90 seconds of total crank time. Battery specifications (type, amp-hour rating, cold cranking amps) to be provided in the submittal.
- 2.4.2. The genset shall have an engine driven, battery charging alternator with integrated voltage regulation.
- 2.4.3. The genset shall have an automatic dual rate, float equalize, battery charger. The charger must be protected against a reverse polarity connection. The chargers charging current shall be monitored within the generator controller to support

remote monitoring and diagnostics. The battery charger is to be factory installed on the generator set. Due to line voltage drop concerns, a battery charger mounted in the transfer switch will be unacceptable.

### 2.5. ENGINE FUEL SYSTEM

- 2.5.1. The engine shall be configured to operate on pipe line grade natural gas.
- 2.5.2. The engine shall utilize a fuel system inclusive of carburetor, gas regulator, low gas pressure switch, and fuel shut-off solenoid.
- 2.5.3. The engines internal fuel connections shall be terminated to the generator frame via an NPT fitting for easy installation.

### 2.6. ENGINE CONTROLS

- 2.6.2. Engine speed shall be controlled with an integrated isochronous governor function with no change in alternator frequency from no load to full load. Steady state regulation is to be 0.25%.
- 2.6.3. An air-fuel-ratio controller shall be integrated into the generator controller to ensure security of settings and to support monitoring and remote diagnostics. External air-fuel-ratio controllers are not acceptable.
- 2.6.1. Engine sensors used for monitoring and control are to be conditioned to a 4-20ma signal level to enhance noise immunity.
- 2.6.2. All engine sensor connections shall be sealed to prevent corrosion and improve reliability.

### 2.7. ENGINE EXHAUST & INTAKE

- 2.7.1. The engine exhaust emissions shall meet the EPA emission requirements for standby power generation.
- 2.7.2. The manufacturer shall supply its recommended stainless steel, flexible connector to couple the engine exhaust manifold to the exhaust system. A rain cap will terminate the exhaust pipe after the silencer. All components must be properly sized to assure operation without excessive back pressure when installed
- 2.7.3. The manufacturer shall supply a critical grade exhaust silencer..
- 2.7.4. The engine intake air is to be filtered with engine mounted, replaceable, dry element filters.

## 3. ALTERNATOR



- 3.1. The alternator shall be a 4-pole, revolving field, stationary armature, synchronous machine. The excitation system shall utilize a brushless exciter with a three phase full wave rectifier assembly protected against abnormal transient conditions by a surge protector. Photo-sensitive components will not be permitted in the rotating exciter.
- 3.2. The alternator shall include a permanent magnet generator (PMG) for excitation support. The system shall supply a minimum short circuit support current of 300% of the rating for 10 seconds. The alternator shall meet temperature rise standards of 120°C over 40°C ambient. The insulation system material shall be class "H" capable. The alternator shall be protected against overloads and short circuit conditions by advanced control panel protective functions. The control panel is to provide a time current algorithm that protects the alternator against short circuits. To ensure precision protection and repeatable trip characteristics, these functions must be implemented electronically in the generator control panel -- thermal magnetic breaker implementation are not acceptable.
- 3.5. An alternator strip heater shall be installed to prevent moisture condensation from forming on the alternator windings. A tropical coating shall also be applied to the alternator windings to provide additional protection against the entrance of moisture.

#### 4. CONTROLS

- 4.1. The generator control system shall be a fully integrated microprocessor based control system for standby emergency engine generators meeting all requirements of NFPA 110 level 1.
- 4.2. The generator control system shall be a fully integrated control system enabling remote diagnostics and easy building management integration of all generator functions. The generator controller shall provide integrated and digital control over all generator functions including: engine protection, alternator protection, speed governing, voltage regulation, air-fuel-ratio control (as required) and all related generator operations. The generator controller must provide digital integration with the engine's electronic engine control module.
- 4.3. The control system shall provide an environmentally sealed design including encapsulated circuit boards and sealed automotive style plugs for all sensors and circuit board connections. The use of non-encapsulated boards, edge cards, and pc ribbon cable connections are considered unacceptable.
- 4.4. Circuit boards shall utilize surface mount technology to provide vibration durability. Circuit boards that utilize large capacitors or heat sinks must utilize encapsulation methods to securely support these components. A predictive maintenance algorithm that alarms when maintenance is required.
- 4.6. Diagnostic capabilities should include time-stamped event and alarm logs, ability to capture operational parameters during events, simultaneous monitoring of all input or output parameters, callout capabilities, support for multi-channel digital strip chart functionality and .2 msec data logging capabilities.

- 4.7. In addition to standard NFPA 110 alarms, the application loads should also be protected through instantaneous and steady state protective settings on system voltage, frequency, and power levels.
- 4.8. The control system shall provide pre-wired customer use I/O: 4 relay outputs (user definable functions), communications support via RS232, RS485, or an optional modem. Additional I/O must be an available option.
- 4.9. Customer I/O shall be software configurable providing full access to all alarm, event, data logging, and shutdown functionality. In addition, custom ladder logic functionality inside the generator controller shall be supported to provide application support flexibility. The ladder logic function shall have access to all the controller inputs and customer assignable outputs.
- 4.10. The control panel will display all user pertinent unit parameters including: engine and alternator operating conditions; oil pressure and optional oil temperature; coolant temperature and level alarm; fuel level (where applicable); engine speed; DC battery voltage; run time hours; generator voltages, amps, frequency, kilowatts, and power factor; alarm status and current alarm(s) condition per NFPA 110 level 1.

## 5. ENGINE / ALTERNATOR PACKAGING

- 5.1. The engine/alternator shall be mounted with internal vibration isolation onto a welded steel base. These units shall not need external vibration isolation for normal pad mounted applications. A mainline, thermal magnetic circuit breaker carrying the UL mark shall be factory installed. The breaker shall be rated 400 amps. The line side connections are to be made at the factory. Output lugs shall be provided for load side connections.
- 5.2. The generator shall include a unit mounted 120 volt convenience outlet.
- 5.3. Sound Attenuated Enclosure
  - 5.3.1. The genset shall be packaged with an enclosure attenuating noise to 75 dBA at 23 feet.
  - 5.3.2. The enclosure shall be completely lined with sound deadening, self-extinguishing material.
  - 5.3.3. The enclosure shall be made of steel with a minimum thickness of 14 gauge with stainless steel hinged, removable doors with lockable hardware to allow access to the engine, alternator and control panel.
  - 5.3.4. The enclosure shall be coated with electrostatic applied powder paint, baked and finished to manufacturer's specifications. The color will be manufacturer's

standard.

5.3.5. The enclosure shall utilize an upward discharging radiator hood. Due to concerns relative to radiator damage, circulating exhaust, and prevailing winds, equipment without a radiator discharge hood will not be acceptable.

5.3.6. Silencer shall be mounted inside enclosure, and not on the top.

5.3.7. All exhaust piping from the turbo-charger discharge to the silencer shall be thermally wrapped to minimize heat dissipation inside the enclosure

5.3.8. All devices requiring shore power shall be pre-wired and powered by a single 120V or 208V source.

## 6. LOOSE ITEMS

Supplier to itemize loose parts that require site mounting and installation. Preference will be shown for gensets that factory mount items like mufflers, battery chargers, etc.

6.2. Flexible fuel hose for use in gas piping installation.

6.3. Spare Parts:

6.3.1. Fuses: One spare set

6.3.2. Filters One spare set (air, fuel, oil)

## 7. ADDITIONAL PROJECT REQUIREMENTS

### 7.1. Factory testing

7.1.1. Before shipment of the equipment, the engine-generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests shall include:

7.1.1.1. Verify voltage & frequency stability.

7.1.1.2. Verify transient voltage & frequency dip response.

7.1.1.3. Load test the generator for 30 minutes.

### 7.2. Owner's Manuals

7.2.1. Three (3) sets of owner's manuals specific to the product supplied must accompany delivery of the equipment. General operating instruction, preventive maintenance, wiring diagrams, schematics and parts exploded views specific to this model must be included.

### 7.3. Installation

7.3.1. Contractor shall install the generating system including all external fuel connections in accordance with requirements of NEC, NFPA, and the

manufacturer's recommendations as reviewed by the Engineer.

#### 7.4. Service

- 7.4.1. Supplier of the genset and associated items shall have permanent service facilities within 50 miles of site. These facilities shall comprise a permanent force of EGSA certified and factory trained service personnel on 24 hour call, experienced in servicing this type of equipment, providing warranty and routine maintenance service to afford the owner maximum protection. Delegation of this service responsibility for any of the equipment listed herein will not be considered fulfillment of these specifications. Service contracts shall also be available.

#### 7.5. Warranty

- 7.5.1. Two (2) year standard warranty
- 7.5.2. The standby electric generating system components, complete genset and instrumentation panel shall be warranted by the manufacturer against defective materials and factory workmanship for a period of five (2) years. Such defective parts shall be repaired or replaced at the manufacturer's option, free of charge for parts, labor and travel.
- 7.5.3. The warranty period shall commence when the standby power system is first placed into service and within 6 months of shipment. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable. Satisfactory warranty documents must be provided. Also, in the judgment of the specifying authority, the manufacturer supplying the warranty for the complete system must have the necessary financial strength and technical expertise with all components supplied to provide adequate warranty support.

#### 7.6. Startup And Checkout

- 7.6.1. The supplier of the generator and associated items covered herein shall provide factory trained technicians to checkout the completed installation and to perform an initial startup inspection to include:
  - 7.6.1.1. Ensuring the engine starts (both hot and cold) within the specified time.
  - 7.6.1.2. Verification of engine parameters within specification.
  - 7.6.1.3. Verify no load frequency and voltage, adjusting if required.
  - 7.6.1.4. Test all automatic shutdowns of the engine-generator.
  - 7.6.1.5. Perform a load bank test at full rated load for four hours. Certification of the results of final load bank testing must be provided to owner and engineer.

## 7.7 Training

- 7.7.1 Training is to be supplied by the start-up technician for the end-user during commissioning. The training should cover basic generator operation and common issues that can be managed by the end-user.

**END OF SECTION**

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The CONTRACTOR shall furnish and install the grounding systems complete in accordance with the minimum requirements established in the NEC and as shown, specified or required.
- B. In addition to the NEC requirements, the following shall be permanently and effectively grounded:
  - 1. All pullboxes;
  - 2. All junction boxes;
  - 3. All conduit supports;
  - 4. Panelboards;
  - 5. Engine generator and frame;
  - 6. Control panels; and
  - 7. Motor Control Center.

PART 2 - PRODUCTS

2.01 GROUND CABLE

- A. The ground cable, where required, shall consist of bare medium hard drawn 97.5 percent minimum conductivity stranded copper cable.
- B. A Ground electrode shall consisting of 5/8 in. dia copper-clad steel rods is required for the generator enclosure.
- C. All ground cable taps and ground electrode taps shall be of the crucible weld copper thermite process as manufactured by Erico Products Incorporated; Burndy Co.; or equal.

## 2.02 FITTINGS

- A. Grounding connections to equipment shall be bolted. Cable end connections may be made by use of the crucible weld process or bolted type connector. Bolted type connectors for this application shall consist of corrosion resistant copper alloy with silicone bronze bolts, nuts and lock washers which are designed for this purpose.
- B. Grounding connection below grade shall be made by the crucible weld copper thermite process.

## PART 3 - EXECUTION

### 3.01 RACEWAYS

- A. Conduit which enters equipment such as pullboxes, junction boxes, control panels, panelboards, motor control centers and similar equipment shall be bonded to the ground bus, where provided, and as otherwise required by the NEC.
- B. Where raceways are not mechanically and electrically connected together, bare stranded copper bonding jumper cables shall be installed connected to the separate raceway ends utilizing insulated grounding type bushings.

### 3.02 PREPARATION AND INSTALLATION

- A. Surfaces where grounding connections are to be made shall be clean and dry. Steel surfaces shall be ground or filed to remove all scale, rust, grease and dirt. Copper and galvanized steel shall be cleaned with Emery cloth to remove oxide before making connections.

**END OF SECTION**

SECTION 16496  
AUTOMATIC TRANSFER SWITCH

PART 1 GENERAL

1.01 SCOPE

- A. Furnish and install the low voltage automatic transfer switches having the ratings, features/accessories and enclosures as specified herein and as shown on the contract drawings.

1.02 RELATED SECTIONS

- A. 16000 - ELECTRICAL
- B. 16011 - LABELS
- C. 16120 - WIRES AND CABLES
- D. 16200 - GAS GENERATORS
- E. 16450 - GROUNDING

1.03 REFERENCES

- A. The automatic transfer switches and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of UL and NEMA as follows:
  - 1. UL 1008 – Transfer Switches
  - 2. UL 991 - Tests for Safety-Related Controls Employing Solid-State Devices
  - 3. NFPA 70 – National Electrical Code
  - 4. NFPA 99 – Essential Electrical Systems of Health Care Facilities
  - 5. NFPA 110 – Emergency and Standby Power Systems
  - 6. NEMA ICS 10 – AC Transfer Switch Equipment
  - 7. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems

1.04 SUBMITTALS – FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
  - 1. Front view and plan view of the assembly
  - 2. Schematic diagram
  - 3. Conduit space locations within the assembly.
  - 4. Assembly ratings including:
    - a. Withstand and Closing rating
    - b. Voltage
    - c. Continuous current rating



- d. Short-Time rating if applicable
  - e. Short-circuit rating if ordered with integral protection
- 5. Cable terminal sizes
- 6. Product Data Sheets.
- B. Where applicable, the following additional information shall be submitted to the Engineer:
  - 1. Busway connection
  - 2. Connection details between close-coupled assemblies
  - 3. Composite front view and plan view of close-coupled assemblies

#### 1.05 SUBMITTALS – FOR CONSTRUCTION

- A. The following information shall be submitted for record purposes:
  - 1. Final as-built drawings and information for items listed in section 1.04
  - 2. Wiring diagrams
  - 3. Certified production test reports
  - 4. Installation information
  - 5. Seismic certification as specified
- B. The final (as-built) drawings shall include the same drawings as the construction drawings and shall incorporate all changes made during the manufacturing process.

#### 1.06 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

#### 1.07 REGULATORY REQUIREMENTS

- A. Provide a certificate of compliance with UL 1008 for the transfer switches furnished under this section.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

#### 1.09 FIELD MEASUREMENTS

#### 1.10 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

## 1.11 EXTRA PRODUCTS

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Eaton
- B. ASCO
- C. Caterpillar
- D. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered.

### 2.02 CONSTRUCTION

- A. Power Switching Device
  - 1. Switching devices for transfer switches shall be service entrance rated. All Contactors shall be UL listed for application in their intended enclosures for 100% of their continuous ampere rating.
  - 2. Each transfer switch shall be positively interlocked both mechanically and electrically to prevent simultaneous closing of both sources under either automatic or manual operation. Main contacts shall be mechanically held in position in both normal and emergency positions.
- B. [Transfer switches shall be open transition and provided with in-phase monitor, which will permit a transfer or re-transfer between two live sources that have a phase angle difference of +/- 8 degrees or less.]
  - 1. [Transfer switches shall be open transition and provided with an in-phase monitor feature, which will permit a transfer or re-transfer between two live sources that have a phase angle difference of +/- 8 degrees or less. In the event that the switch cannot transfer in-phase, the switch will default to a time delay in neutral transfer adjustable 0-120 seconds.]
- C. The automatic transfer switch shall be of double throw construction operated by a reliable electrical mechanism momentarily energized. There shall be a direct mechanical coupling to facilitate transfer in 6 cycles or less.
- D. Contactors or components thereof not specifically designed, as an automatic transfer switch will not be acceptable.
- E. The switching panel shall consist of a separate control or transformer panel. Control power for all transfer operations shall be derived from the line side of the source to which the load is being transferred. The transformer shall be multi-tap for ease of voltage adjustment in the field.
- F. Transfer switches will be supplied with a manual-operating handle. Manual operation shall only be performed with the switch de-energized.

- G. On transfer switches requiring a fourth pole for switching the neutral, the neutral shall be identical to the other power poles. Switched neutral poles which are add-on or overlap, or that are not capable of breaking full rated load current are not acceptable.
- H. On transfer switches requiring a solid neutral, the neutral shall be fully rated.

## 2.03 MICROPROCESSOR LOGIC

- A. The transfer switch shall be equal to a Cutler-Hammer ATC type microprocessor-based controller. The controller shall be hardened against potential problems from transients and surges. Operation of the transfer switch and monitoring of both sources shall be managed by the controller.
- B. The automatic transfer switch controllers shall meet or exceed the following standards in addition to the basic switch standards:
  - 1. IEC 61000-4-2 - EMC Testing and Measurement Techniques - Electrostatic Discharge Immunity Test
  - 2. IEC 61000-4-3 - EMC Testing and Measurement Techniques - Radio-frequency, Electromagnetic Field Immunity Test
  - 3. IEC 61000-4-4 - EMC Testing and Measurement Techniques - Electrical Fast Transient/Burst Immunity Test
  - 4. IEC 61000-4-5 - EMC Testing and Measurement Techniques - Surge Immunity Test
  - 5. IEC 61000-4-6 - EMC Testing and Measurement Techniques - Immunity to Conducted Disturbances, Induced by Radio-frequency Fields
  - 6. IEC 61000-4-11 - EMC Testing and Measurement Techniques - Voltage Dips, Short Interrupts and Voltage Variations Immunity Tests
  - 7. CISPR11, Class B - Industrial, Scientific and Medical Radio-frequency Equipment - Electromagnetic Disturbance Characteristics - Limits and Methods of Measurement
  - 8. FCC Part 15, Subpart B, Class B

## 2.04 ENCLOSURE

- A. Each transfer switch shall be provided in a NEMA 1 lockable enclosure suitable for use in environments indicated in the drawings.
- B. NEMA 1, 12, and 3R enclosures shall be painted with the manufacturer's standard light gray ANSI 61 paint.

## 2.05 CONTROLLER DISPLAY AND KEYPAD

- A. The microprocessor-based controller display shall be UV resistant and include, backlit LCD display. The controller shall be capable of displaying transfer switch status, parameters, and diagnostic data. All set point parameters shall be password protected and programmable using the controller keypad or remotely using serial port access.
- B. The microprocessor-based controller shall include a mimic bus display consisting of four (4) individual LED's (3mm) for indicating the following:
  - 1. Availability status of NORMAL source
  - 2. Availability status of EMERGENCY source

3. Connection status of NORMAL source
4. Connection status of EMERGENCY source

## 2.05 VOLTAGE AND FREQUENCY SENSING

- A. The controller shall have a voltage range of 0-790 volts (50/60 Hz) and an accuracy of +/- 1% of nominal input voltage and a frequency range of 40-70 Hz and an accuracy of +/- .3 Hz.
- B. Voltage and frequency dropout and pickup parameters are set as a percentage of the nominal voltage as indicated in the table below.

Setpoint	Sources	Dropout	Pickup
Undervoltage	Source1 and 2	78 – 97%	(DO + 2%) - 99%
Overvoltage	Source 1 and 2	105 – 110%	103% - (DO – 2%)
Underfrequency	Source 1 and 2	90 – 97%	(DO + 1Hz) – 99%
Overfrequency	Source 1 and 2	103 – 105%	101% - (DO – 1Hz)
Voltage Unbalance	Source 1 and 2	5 – 20%	(UNBAL DO% - 2) – 3%

- C. The normal and emergency sources shall include phase reversal protection. The preferred rotation is programmable as ABC or CBA.

## 2.06 TIME DELAYS

- A. A time delay shall be provided on transfer to EMERGENCY source, adjustable from 0 to 1800 seconds.
- B. A time delay shall be provided to override a momentary power outage or voltage fluctuation, adjustable from 0 to 120 seconds.
- C. A time delay shall be provided on retransfer from EMERGENCY source to NORMAL source, adjustable from 0 to 1800 seconds.
- D. A time delay shall be provided after retransfer that allows the generator to run unloaded prior to shutdown, adjustable from 0 to 1800 seconds.
- E. A time delay shall be provided for engine failure to start, fixed setting of 6 seconds.
- F. A pre-transfer time delay output adjustable from 0-120 seconds. The contact shall be a form-c contact rated for 10-Amp at 250-Vac and 10-Amp at 30-Vdc.
- G. All delays shall be field adjustable from the microprocessor-based controller without the use of special tools.

## 2.07 ADDITIONAL FEATURES

- A. One Form A contact for closure of the Generator start circuit. The contacts shall be of silver alloy with gold flashing. The contacts shall be rated for 5-Amp at 250-Vac and 5-Amp at 30-Vdc.
- B. Programmable Engine Exerciser, selectable as disabled, 7, 14, or 28 day interval, adjustable 0-600 minutes, load or no load with Failsafe

- C. The controller shall include a keypad pushbutton to initiate a system test.
- D. The controller shall include a keypad pushbutton to bypass the time delay on transfer to emergency and the time delay on retransfer to normal.
- E. The controller shall include a terminal input to accept a remote contact which closes to initiate a transfer to source 2. This feature shall be failsafe and an automatic retransfer shall occur in the event that source 2 power is lost.
- F. The controller shall include a terminal input to accept a remote contact which opens to inhibit transfer to source 2.
- G. One Form C auxiliary contact to indicate Source 1 position and one Form C contact to indicate source 2 position. The contacts shall be rated for 10-Amp, 1/3-Horsepower at 250-Vac and 10-Amp at 30-Vdc.
- H. One Form C contact for NORMAL Source Available. The contacts shall be rated for 10-Amp, 1/3-Horsepower at 250-Vac and 10-Amp at 30-Vdc.
- I. One Form C contact for EMERGENCY Source Available. The contacts shall be rated for 10-Amp, 1/3-Horsepower at 250-Vac and 10-Amp at 30-Vdc.
- J. Historical Data Storage to include:
  - a. Engine Run Time
  - b. NORMAL source Available time
  - c. EMERGENCY source Available time
  - d. NORMAL source Connected time
  - e. EMERGENCY source Connected time
  - f. LOAD Energized Time
  - g. Number of Transfers
  - h. Date, Time and Reason for Last Sixteen (16) transfers
  - i. Monitor Mode Event
  - j. Fail Safe Event
  - k. Aborted Test

## 2.08 OPTIONAL ACCESSORIES

- A. Furnish and install a remote control/ monitoring station in the office as directed by the senior center director and approved by the engineer.
  - 1. Control Functions
    - a. Control functions shall be password protected and shall include:
      - 1. Initiate engine test.
      - 2. Initiate a failsafe transfer to source 2.
      - 3. Initiate manual retransfer.
      - 4. Alarm silence
  - 2. Alarms
    - a. Remote Annunciator shall provide audible and visual alarm when on source 2.
    - b. Visual alarm upon failure of communication link.
  - 3. Mounting: Flush, modular, unless otherwise indicated.
  - 4. Communications capability to be compatible with ATS controller.

## PART 3 ADDITIONAL REQUIREMENTS

### 3.01 WITHSTAND AND CLOSING RATINGS

- A. The transfer switch shall have a specific breaker withstand and closing rating as shown on the drawings.

## PART 4 EXAMINATION

### 4.01 FACTORY TESTING

- A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of UL and NEMA standards.
  - 1. Insulation check to ensure the integrity of insulation and continuity of the entire system
  - 2. Visual inspection to ensure that the switch matches the specification requirements and to verify that the fit and finish meet quality standards
  - 3. Mechanical tests to verify that the switch's power sections are free of mechanical hindrances
  - 4. Electrical tests to verify the complete electrical operation of the switch and to set up time delays and voltage sensing settings of the logic
- B. The manufacturer shall provide a certified copy of factory test reports.
- C. Transfer switch shall include a label indicating order number, catalog number and date

### 4.02 INSTALLATION

- A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings
- B. All necessary hardware to secure the assembly in place shall be provided by the contractor

### 4.03 FIELD QUALITY CONTROL

- A. Provide the services of a qualified factory-trained manufacturer's representative to assist the contractor in installation and start-up of the equipment specified under this section for a period of 1 working day. The manufacturer's representative shall provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.

### 4.04 MANUFACTURER'S CERTIFICATION

- A. ☐ A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.
- B. The Contractor shall provide a copy of the manufacturer's representative's certification.

### 4.05 FIELD SERVICE ORGANIZATION

- A. The manufacturer of the ATS shall also have a national service organization that is available throughout the contiguous United States and is available on call 24 hours a day, 365 days a year.

**END OF SECTION**

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## **APPENDIX A: PREVAILING WAGE RATES**

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# **Notice**

## **TO ALL PUBLIC WORKS EMPLOYERS:**

**Please be advised that effective February 18, 1992, Regulation N.J.A.C. 12:60-2.1 and 6.1 of the New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.25 et seq. requires that certified payroll records must be submitted to the public body for each employee on the project. The General Contractor is responsible for ensuring that each sub-contractor submits the certified payroll within ten (10) days of the payment of wages. The public body shall receive, file and make available for inspection during normal business hours the certified payroll records.**

**A copy of the certified payroll form may be obtained by contacting the New Jersey Department of Labor, Division of Workplace Standards, Public Contracts Section, P.O. Box 389, Trenton, NJ 08625-0389, telephone (609) 292-2259.**

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## **APPENDIX B: PUBLIC UTILITIES**

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Revised 11/18

**BOROUGH OF OAKLAND  
PUBLIC UTILITIES**

The following is a list of all corporations, companies, agencies or municipalities owning or controlling the utilities in the vicinity of the project site, and the name, address and telephone number of their local representatives:

**Electric**

Orange and Rockland Utilities  
390 West Route 59  
Spring Valley, New York 10977  
Attn: Mr. Rob Gisolfi  
Tel: (914)-577-3201

**Cablevision**

683 Route 10 East  
Randolph, NJ 07869  
Attn: Mr. Shaun Maxwell  
Tel: (973) 659-2473

**Gas**

Public Service Electric and Gas Company  
42 Chestnut Street  
Clifton, NJ 07011  
Attn: Christopher Brunner  
Tel: (973) 253-3009

**Algonquin Gas Transmission  
Company**

1 Lindbergh Road  
Stony Point, New York 10980  
Attn: Tom Caldwell, Area Supervisor  
Tel: 845-786-3730

**Telephone**

Verizon  
6000 Hadley Rd  
South Plainfield, New Jersey 07080  
Attn: Thomas Grabowski  
Tel: (908) 412-6169  
**Email: [thomas.j.grabowski@verizon.com](mailto:thomas.j.grabowski@verizon.com)**

**Water**

Department of Public Works  
1 Municipal Plaza  
Oakland, New Jersey 07436  
Attn: Mr. Anthony Marcucilli  
Tel: (201) 337-6442

**Sanitary Sewers**

Department of Public Works  
1 Municipal Plaza  
Oakland, New Jersey 07436  
Attn: Mr. Anthony Marcucilli  
Tel: (201) 337-6442

**Fiber Optics**

Fibertech Networks  
9 N. Hockey Drive  
Mansfield, NJ 08022  
Attn: Mr. Alan R. Kothe  
Tel: (609) 203-3723

Notification of major utilities for markout may be accomplished by calling Garden State Underground Location Service at 1-800-272-1000.

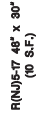
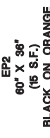
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## **APPENDIX C: STANDARD CONSTRUCTION DETAILS**

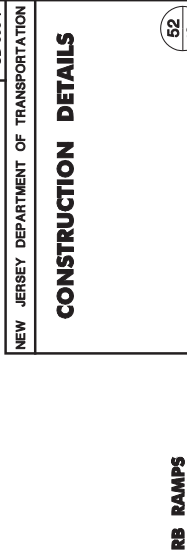
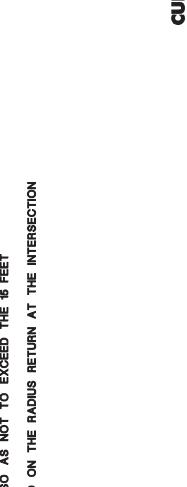
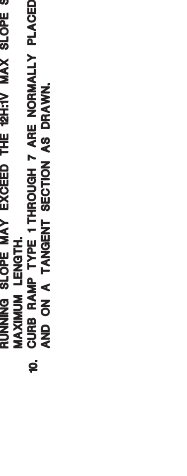
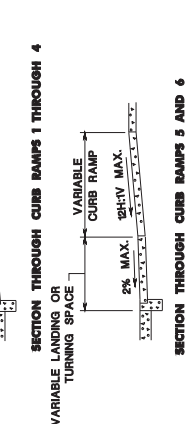
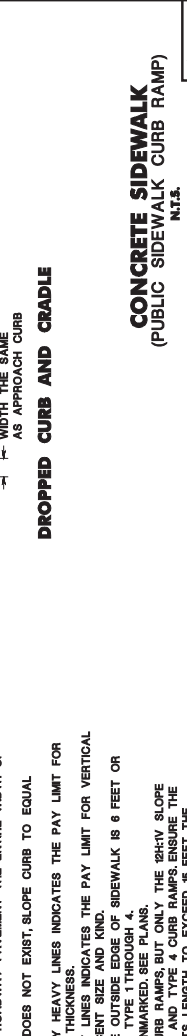
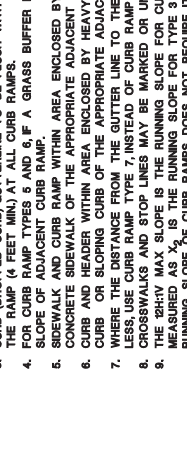
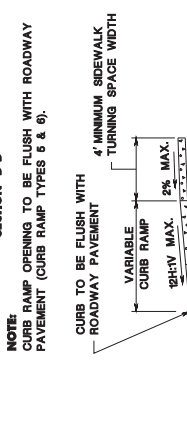
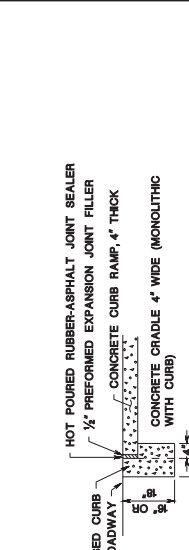
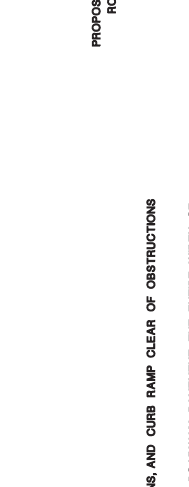
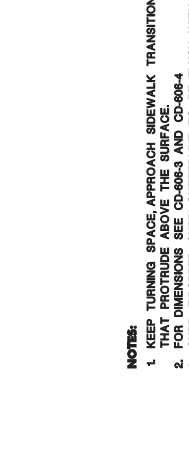
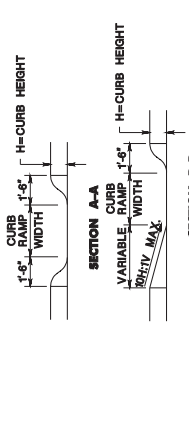
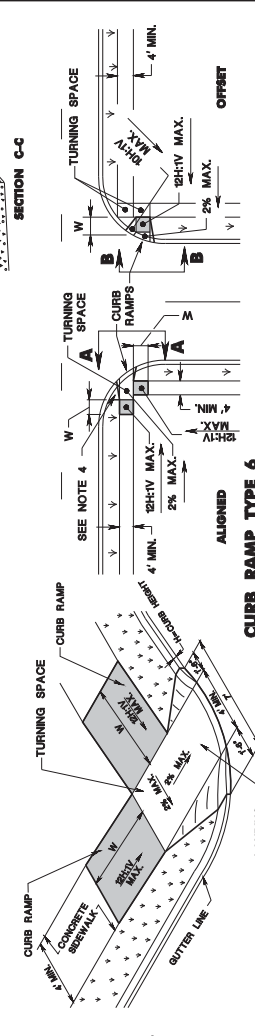
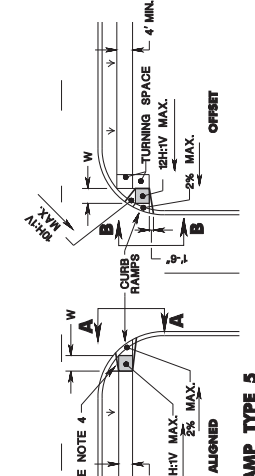
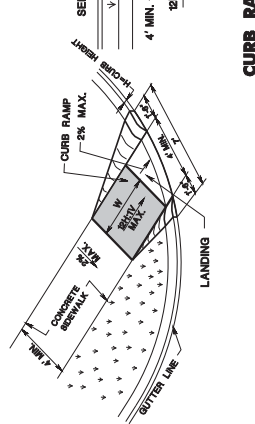
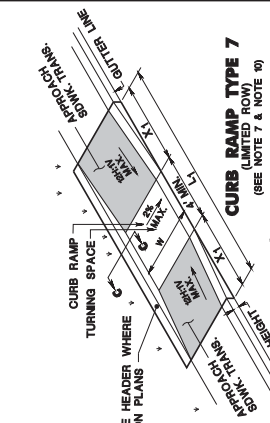
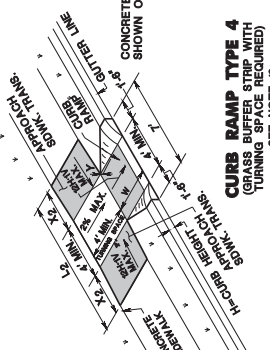
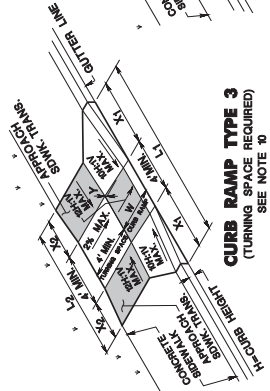
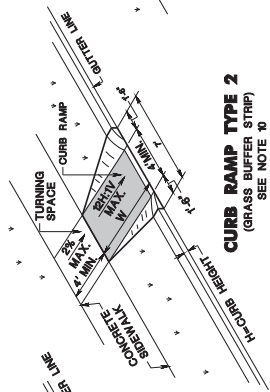
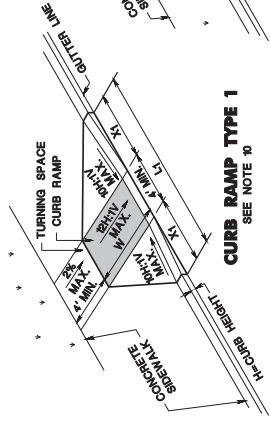
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<div>13 164</div>	
TRAFFIC CONTROL DEVICES N.T.S.	
NEW JERSEY DEPARTMENT OF TRANSPORTATION CD-159-1	
CONSTRUCTION DETAILS	
CD-159-13	
BREAKAWAY BARRICADES	
CD-159-12	
TRAFFIC CONES	
CD-159-11	
DRUMS	
CD-159-10	





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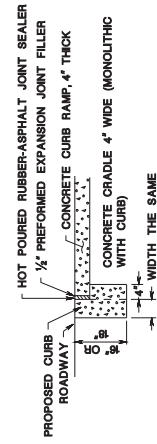


**CONCRETE SIDEWALK  
(PUBLIC SIDEWALK CURB RAMP)**  
N.T.S.

NEW JERSEY DEPARTMENT OF TRANSPORTATION  
CD-606-1

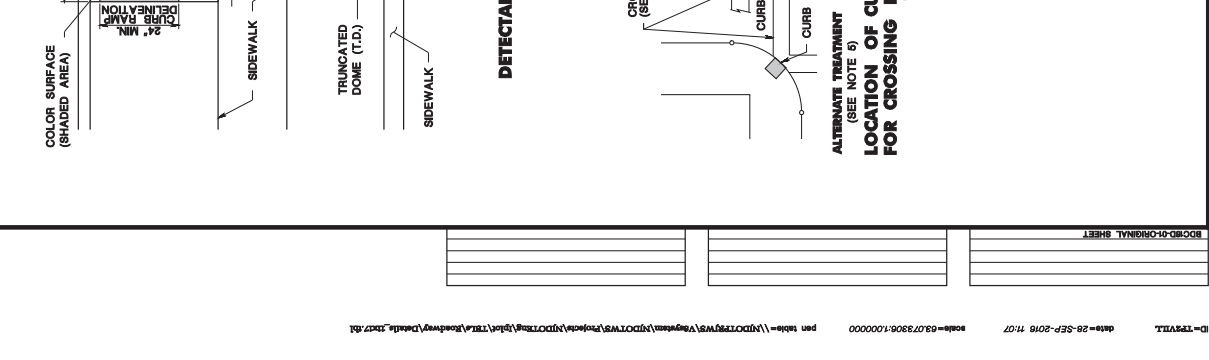
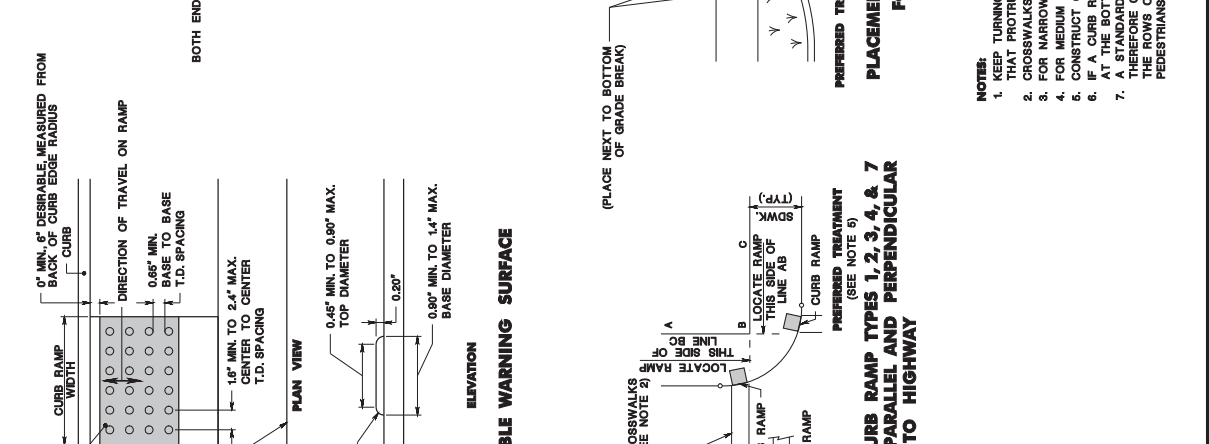
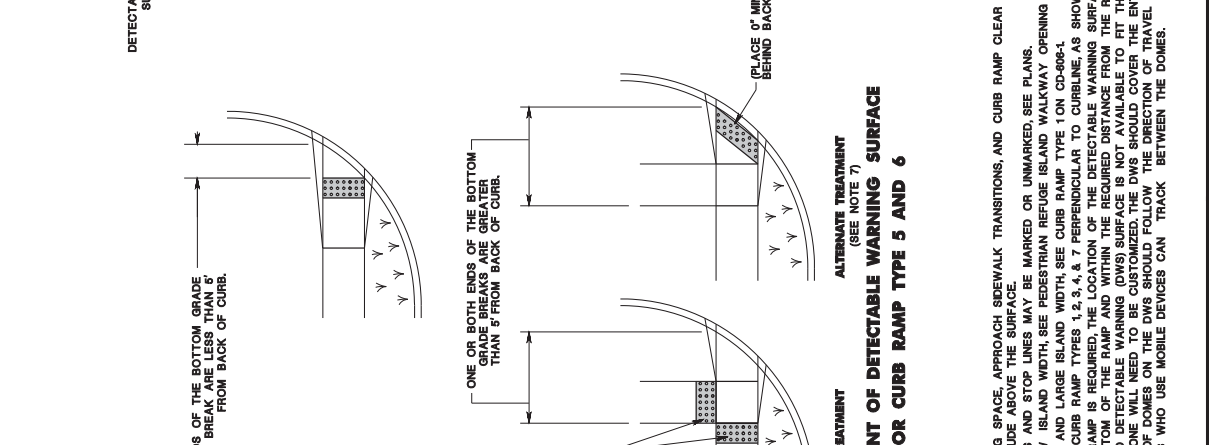
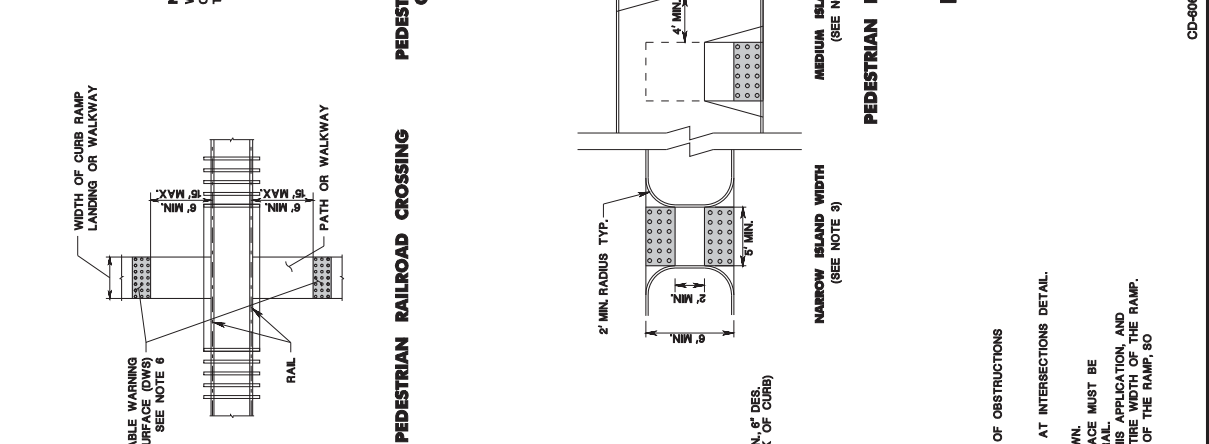
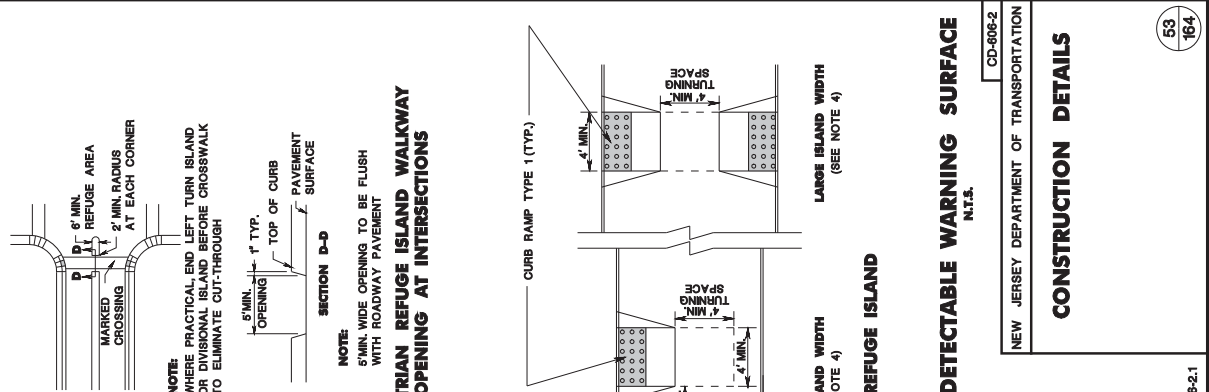
**CONSTRUCTION DETAILS**

- NOTES:**
1. KEEP TURNING SPACE, APPROACH SIDEWALK TRANSITIONS, AND CURB RAMP CLEAR OF OBSTRUCTIONS THAT PROTRUDE ABOVE THE SURFACE.
  2. FOR DIMENSIONS SEE CD-606-3 AND CD-606-4.
  3. THE RAMP SHOULD BE FLUSH WITH ROADWAY PAVEMENT THE ENTIRE WIDTH OF THE RAMP (4 FEET MIN.) ALL CURB RAMPS.
  4. FOR CURB RAMP TYPES 5 AND 6, IF A GRASS BUFFER DOES NOT EXIST, SLOPE CURB TO EQUAL SLOPE OF ADJACENT CURB RAMP.
  5. SIDEWALK AND CURB RAMP WITHIN AREA ENCLOSED BY HEAVY LINES INDICATES THE PAY LIMIT FOR CONCRETE SIDEWALK OF THE APPROPRIATE ADJACENT THICKNESS.
  6. CURB AND HEADER WITHIN AREA ENCLOSED BY HEAVY LINES INDICATES THE PAY LIMIT FOR VERTICAL CURB OR SLOPING CURB OF THE APPROPRIATE ADJACENT SIZE AND KIND.
  7. WHERE THE DISTANCE FROM THE GUTTER LINE TO THE OUTSIDE EDGE OF SIDEWALK IS 6 FEET OR LESS, USE CURB RAMP TYPE 7, INSTEAD OF CURB RAMP TYPE 1 THROUGH 4.
  8. CROSSWALKS AND STOP LINES MAY BE MARKED OR UNMARKED. SEE PLANS.
  9. THE 2%TV MAX SLOPE IS THE RUNNING SLOPE FOR CURB RAMPS, BUT ONLY THE 2%TV SLOPE APPLIES TO CURB RAMPS. THE 2% MAX SLOPE FOR CURB RAMPS DOES NOT EXCEED 18 FEET. THE RUNNING SLOPE OF CURB RAMPS DOES NOT REQUIRE ITS LENGTH TO EXCEED 18 FEET. THE MAXIMUM LENGTH.
  10. CURB RAMP TYPE 1 THROUGH 7 ARE NORMALLY PLACED ON THE RADIUS RETURN AT THE INTERSECTION AND ON A TANGENT SECTION AS DRAWN.



**DROPPED CURB AND CRADLE**









## CURB RAMP TYPE 4

0.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		1.51	1.51	7.82
4			1.91	1.91	7.82
5			2.31	2.31	9.82
6	2.75		3.91	3.91	11.82
7		2.75	4.91	4.91	11.82
8			5.91	5.91	15.83
9			6.91	6.91	19.83
3			**	**	**
4			1.72	1.72	7.44
5			2.72	2.72	9.44
6	3.0		3.72	3.72	11.45
7		3.0	4.72	4.72	13.45
8			5.72	5.72	15.45
9			6.72	6.72	17.45
3			**	**	**
4			1.34	1.34	6.68
5			2.34	2.34	8.68
6	3.5		3.34	3.34	10.69
7		3.5	4.34	4.34	12.69
8			5.34	5.34	14.69
9			6.34	6.34	16.69
3			**	**	**
4			1.09	1.09	5.95
5			2.23	2.23	7.95
6	4.0		3.37	3.37	9.93
7		4.0	4.51	4.51	11.93
8			5.65	5.65	13.93
9			6.79	6.79	15.93

1.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		2.17	2.17	7.88
4			2.52	2.52	7.88
5			3.31	3.31	9.91
6	2.75		4.45	4.45	11.94
7		2.75	5.58	5.58	13.97
8			6.72	6.72	15.97
9			7.86	7.86	17.97
3			0.82	0.82	5.46
4			1.96	1.96	7.49
5			3.09	3.09	9.52
6	3.0		4.23	4.23	11.55
7		3.0	5.37	5.37	13.58
8			6.50	6.50	15.61
9			7.64	7.64	17.64
3			0.39	0.39	4.69
4			1.53	1.53	6.72
5			2.66	2.66	8.75
6	3.5		3.80	3.80	10.78
7		3.5	4.94	4.94	12.81
8			6.07	6.07	14.84
9			7.21	7.21	16.87
3			**	**	**
4			1.09	1.09	5.95
5			2.23	2.23	7.95
6	4.0		3.37	3.37	9.93
7		4.0	4.51	4.51	11.93
8			5.65	5.65	13.93
9			6.79	6.79	15.93

2.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		2.52	2.52	8.06
4			2.87	2.87	8.06
5			3.83	3.83	10.18
6	2.75		5.15	5.15	12.30
7		2.75	6.47	6.47	14.43
8			7.78	7.78	16.55
9			9.10	9.10	18.67
3			0.56	0.56	5.53
4			2.27	2.27	7.65
5			3.58	3.58	9.78
6	3.0		4.90	4.90	11.90
7		3.0	6.22	6.22	14.02
8			7.54	7.54	16.15
9			8.86	8.86	18.27
3			0.45	0.45	4.72
4			1.77	1.77	6.85
5			3.08	3.08	8.97
6	3.5		4.40	4.40	11.09
7		3.5	5.72	5.72	13.22
8			7.04	7.04	15.34
9			8.35	8.35	17.46
3			**	**	**
4			1.27	1.27	6.04
5			2.58	2.58	8.15
6	4.0		3.90	3.90	10.29
7		4.0	5.22	5.22	12.41
8			6.54	6.54	14.53
9			7.85	7.85	16.66

3.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		2.99	2.99	8.39
4			3.34	3.34	8.39
5			4.55	4.55	10.51
6	2.75		6.11	6.11	12.88
7		2.75	7.66	7.66	15.29
8			9.21	9.21	17.69
9			10.76	10.76	20.01
3			1.13	1.13	5.46
4			2.69	2.69	7.76
5			4.25	4.25	10.06
6	3.0		5.82	5.82	12.36
7		3.0	7.38	7.38	14.65
8			8.94	8.94	16.95
9			10.50	10.50	19.25
3			0.53	0.53	4.78
4			2.10	2.10	6.99
5			3.66	3.66	9.18
6	3.5		5.22	5.22	11.38
7		3.5	6.79	6.79	13.58
8			8.35	8.35	15.78
9			9.92	9.92	17.98
3			**	**	**
4			1.50	1.50	6.21
5			3.07	3.07	8.41
6	4.0		4.63	4.63	10.61
7		4.0	6.19	6.19	12.81
8			7.75	7.75	15.01
9			9.32	9.32	17.21

## CURB RAMP TYPE 7

0.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		3.50	3.50	10.50
4			4.00	4.00	12.00
5			5.00	5.00	14.00
6	4 MIN.		6.00	6.00	16.00
7	7 MAX.		7.00	7.00	18.00
8			8.00	8.00	20.00
9			9.00	9.00	22.00

1.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		3.41	3.41	10.09
4			4.55	4.55	12.12
5	4 MIN.		5.68	5.68	14.15
6	7 MAX.		6.82	6.82	16.18
7			7.96	7.96	18.21
8			9.10	9.10	20.24
9			10.23	10.23	22.27

2.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		3.27	3.27	9.81
4			4.57	4.57	12.49
5	4 MIN.		5.88	5.88	15.17
6	7 MAX.		7.18	7.18	17.85
7			8.49	8.49	20.53
8			9.79	9.79	23.21
9			11.09	11.09	25.89

4.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		3.50	3.50	10.50
4			4.00	4.00	12.00
5			5.00	5.00	14.00
6	4 MIN.		6.00	6.00	16.00
7	7 MAX.		7.00	7.00	18.00
8			8.00	8.00	20.00
9			9.00	9.00	22.00

5.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		3.41	3.41	10.09
4			4.55	4.55	12.12
5	4 MIN.		5.68	5.68	14.15
6	7 MAX.		6.82	6.82	16.18
7			7.96	7.96	18.21
8			9.10	9.10	20.24
9			10.23	10.23	22.27

6.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		3.27	3.27	9.81
4			4.57	4.57	12.49
5	4 MIN.		5.88	5.88	15.17
6	7 MAX.		7.18	7.18	17.85
7			8.49	8.49	20.53
8			9.79	9.79	23.21
9			11.09	11.09	25.89

7.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		3.14	3.14	9.42
4			4.57	4.57	12.49
5	4 MIN.		6.00	6.00	15.56
6	7 MAX.		7.43	7.43	18.63
7			8.86	8.86	21.70
8			10.29	10.29	24.77
9			11.72	11.72	27.84

8.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		3.01	3.01	9.03
4			4.69	4.69	12.63
5	4 MIN.		6.37	6.37	16.23
6	7 MAX.		8.05	8.05	19.83
7			9.73	9.73	23.43
8			11.41	11.41	27.03
9			13.09	13.09	30.63

9.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		2.88	2.88	8.64
4			4.89	4.89	14.24
5	4 MIN.		6.89	6.89	19.84
6	7 MAX.		8.90	8.90	25.44
7			10.90	10.90	31.04
8			12.91	12.91	36.64
9			14.92	14.92	42.24

10.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		2.75	2.75	8.25
4			5.00	5.00	15.00
5	4 MIN.		7.25	7.25	21.75
6	7 MAX.		9.50	9.50	28.50
7			11.75	11.75	35.25
8			14.00	14.00	42.00
9			16.25	16.25	48.75

11.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		2.62	2.62	7.86
4			4.78	4.78	13.98
5	4 MIN.		6.94	6.94	20.10
6	7 MAX.		9.10	9.10	26.22
7			11.26	11.26	32.34
8			13.42	13.42	38.46
9			15.58	15.58	44.58

12.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FEET
3	4		2.50	2.50	7.50
4			4.69	4.69	13.09
5	4 MIN.		6.88	6.88	19.68
6	7 MAX.		9.07	9.07	26.27
7			11.26	11.26	32.86
8			13.45	13.45	39.45
9			15.64	15.64	46.04

13.0 % GUTTER LINE PROFILE					
H INCHES	W FEET	Y INCHES	X <sub>50</sub> FEET	X <sub>60</sub> FEET	L <sub>1</sub> FE

# **GENERAL NOTES:**

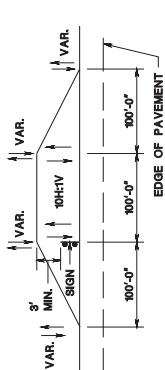
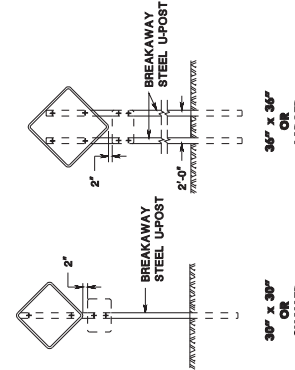
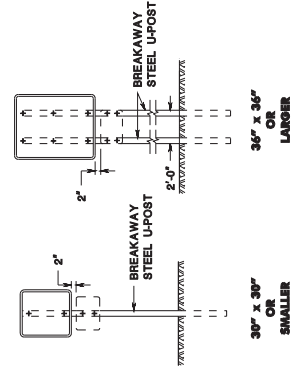
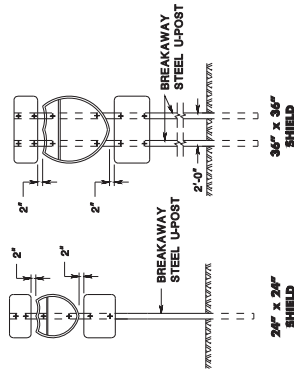
- ALL POSTS TO BE OF ADEQUATE LENGTH TO MEET THE REQUIREMENTS FOR ERECTION OF SIGN PANELS. MINIMUM LENGTH OF 10' FOR U-POSTS AND 12' FOR BREAKAWAY STEEL U-POSTS. ALL POSTS TO BE INSTALLED ON STREETS AND HIGHWAYS AND AS INDICATED BELOW.
- ALL SMALL SIGN SUPPORTS TO BE OF THE BREAKAWAY TYPE WITH EXCEPTION OF THOSE INSTALLED BEHIND GUIDE RAIL OR OTHER ROADSIDE BARRIER.
- ALL STEEL POSTS AND BRACKETS TO BE CUT, BENT, AND HOLES PUNCHED AND DRILLED BEFORE GALVANIZING TO BE ACCORDING TO ASTM A32.
- ALL STEEL U-POST SIGN SUPPORTS MUST BE INSTALLED FACING THE DOMINANT TRAFFIC FLOW. USE A MOUNTING BRACKET ON SIDE MOUNTED SIGNS SUCH AS "ONE WAY" SIGNS INSTALLED IN MEDIANS.
- SIGN PANEL SIZES ARE TO DETERMINE POST TYPE AND NUMBER AS SHOWN ON THIS DETAIL.
- BOLTS ARE NOT TO PROTRUDE MORE THAN 1/4" BEYOND THE NUT WHEN TIGHT, BUT ARE TO ENGAGE ALL THREADS IN THE NUT.
- WHEN SIGNS ARE INSTALLED ON SLOPES 10%+V OR FLATTER, THE MINIMUM VERTICAL CLEARANCE REQUIREMENTS FOR SIGNS ARE:  
FOR SINGLE POST INSTALLATIONS - THE MINIMUM DISTANCE BETWEEN THE EDGE OF THE PAVEMENT AND THE SIGN POST SHALL BE 6 FEET.  
FOR MULTIPLE POST INSTALLATIONS - THE MINIMUM DISTANCE BETWEEN THE EDGE OF PAVEMENT AND THE BOTTOM OF A MAIN SIGN PANEL MUST BE 7 FEET.
- SECONDARY SIGN PANELS (LAND SERVICE HIGHWAYS) - THE MINIMUM DISTANCE BETWEEN THE EDGE OF PAVEMENT AND THE BOTTOM OF A SECONDARY SIGN PANEL IS 6 FEET.  
SECONDARY SIGN PANELS (INTERSTATE AND FREEWAYS) - THE BOTTOM OF THE MAIN SIGN TO BE A MINIMUM OF 8 FEET AND THE SECONDARY SIGN PANEL A MINIMUM OF 5 FEET ABOVE THE EDGE OF PAVEMENT.  
WHERE GRADING OF 10%+V OR FLATTER CANNOT BE OBTAINED, OR WHERE CURB OR BERM IS GREATER THAN 4 INCHES, THE MINIMUM VERTICAL CLEARANCE WILL BE MEASURED FROM THE GROUND LINE TO THE BOTTOM OF THE SIGN.  
THE HORIZONTAL OFFSET FROM EDGE OF PAVEMENT TO EDGE OF SIGN IS DERIVED FROM SECTION 2A.9 OF THE MUTCD AS FOLLOWS:  
FOR URBAN INSTALLATIONS - IN AREAS WHERE LATERAL OFFSETS ARE LIMITED, A MINIMUM LATERAL OFFSET OF 10 FEET FROM THE EDGE OF PAVEMENT TO THE SIGN POST IS REQUIRED. EXISTING POLES MAY BE USED IN AREAS WHERE THE SIDEWALK WIDTH IS LIMITED OR WHERE EXISTING POLES ARE CLOSE TO THE CURB.  
FOR RURAL INSTALLATIONS - 8 FEET MINIMUM DESIRABLE FROM EDGE OF SHOULDER, BUT 12 FEET MINIMUM DESIRABLE FROM EDGE OF TRAFFIC OR AUXILIARY LANE.  
FOR INTERSTATE AND FREEWAY INSTALLATIONS - 6 FEET MINIMUM DESIRABLE FROM EDGE OF SHOULDER, BUT NOT LESS THAN 12 FEET FROM THE EDGE OF TRAFFIC OR AUXILIARY LANE.  
FOR RAMP INSTALLATIONS - 8 FEET MINIMUM FROM EDGE OF ROAD.  
WHERE BEHIND GUIDE RAIL - 4 FEET MINIMUM FROM BACK OF BEAM GUIDE RAIL ELEMENT TO SIGN POST.
- DO NOT INSTALL PERMANENT SIGN SUPPORTS ON SLOPES GREATER THAN 10%+V, EXCEPT WHERE GRADING OF 10%+V CANNOT BE OBTAINED OR THE SIGN SUPPORTS WILL BE BEHIND A TRAFFIC BARRIER. THE SLOPE IS TO EXTEND A MINIMUM OF 3 FEET BEYOND THE OUTSIDE EDGE OF SIGN (SEE GRADING DETAIL FOR SLOPE TREATMENT).
- EXTRUDED ALUMINUM SIGN PANELS ARE NOT PERMITTED FOR USE WITH STEEL U-POST SIGN SUPPORTS.
- DO NOT PLACE STEEL U-POST SIGN SUPPORTS IN FRONT OF GUIDE RAIL AND THE POSTS MUST NOT STRADDLE GUIDE RAIL.
- TO EXTEND THE HEIGHT OF A SIGN POST, A MAXIMUM OF ONE SPLICE MAY BE MADE AND MUST BE A MINIMUM OF 8 FEET FROM THE GROUNDLINE TO CENTER LINE OF SPLICE.

## **STEEL U-POST SIGN SUPPORTS** N.T.S.

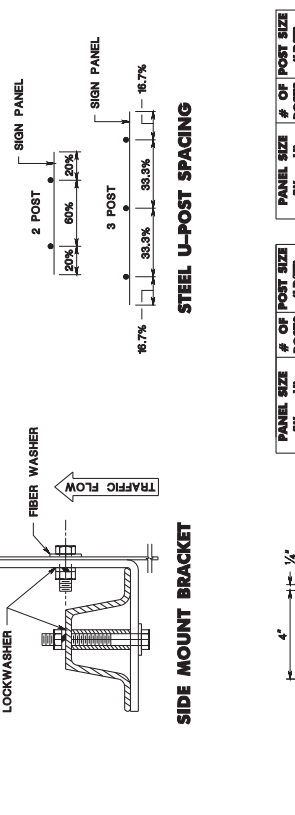
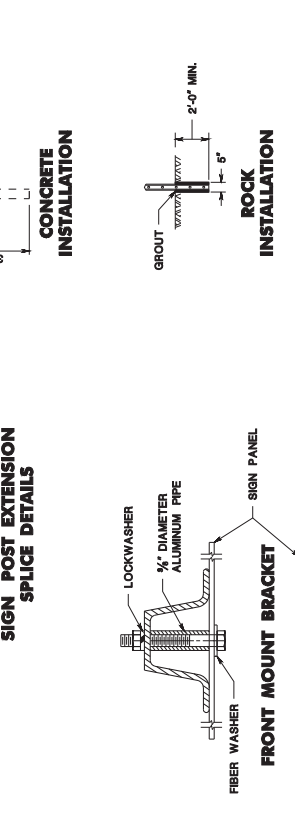
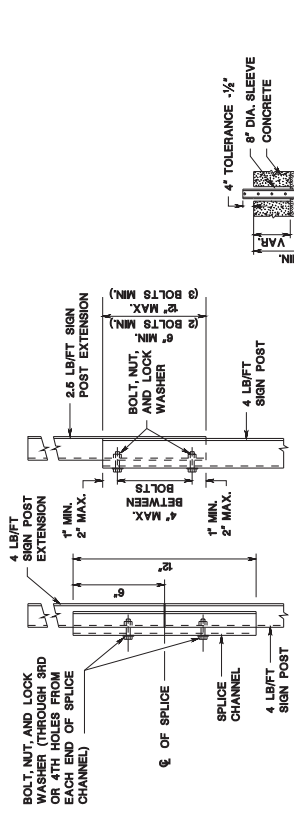
NEW JERSEY DEPARTMENT OF TRANSPORTATION

## **CONSTRUCTION DETAILS**

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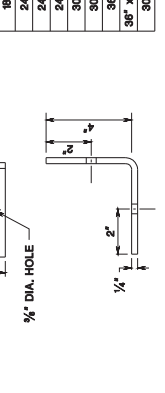
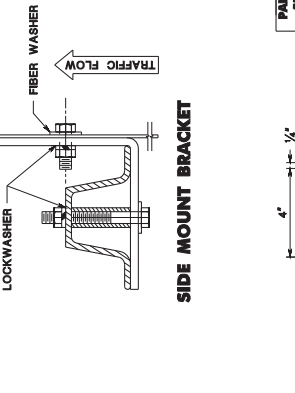
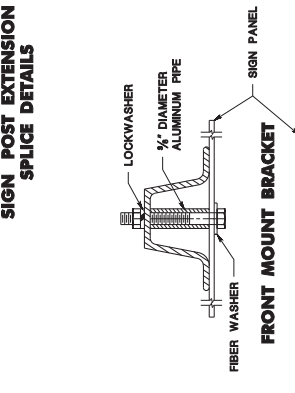
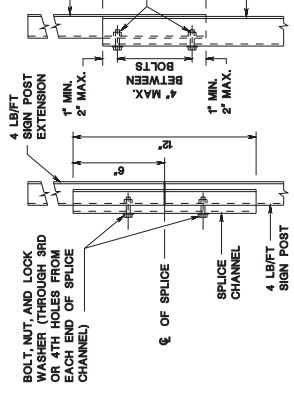


### **STEEL U-POST GRADING DETAIL**

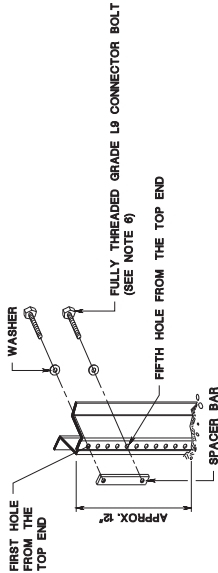


PANEL SIZE (W x H)	# OF POSTS	# OF POST SIZE (LIFT)
36" x 36"	2	2.5
36" x 48"	2	2.5
48" x 36"	2	2.5
48" x 48"	2	2.5
48" x 64"	2	2.5
60" x 36"	2	4.0
60" x 48"	2	4.0
60" x 60"	2	4.0
60" x 30"	2	4.0

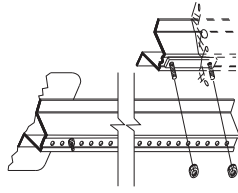
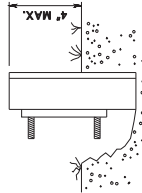
### **U-POST SELECTION TABLE** BREAKAWAY SIGN SUPPORT



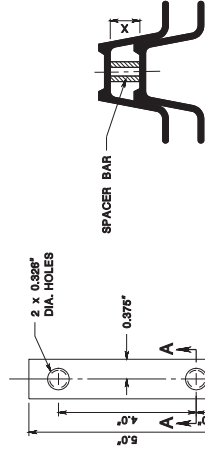
### **DETAIL OF BRACKET FOR SIDE MOUNTED SIGNS**



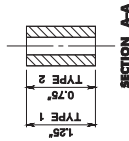
- NOTE:**
1. DRIVE ANCHOR POST ASSEMBLY TO WITHIN APPROXIMATELY 12 INCHES ABOVE GROUND LEVEL. PLACE BOLT AND WASHER IN FIRST AND FIFTH HOLES FROM THE TOP END, AND SECURE BOLTS ONTO SPACER.
  2. DRIVE ANCHOR POST ASSEMBLY TO WITHIN A MAXIMUM OF 4 INCHES ABOVE GROUND LEVEL.
  3. DIG OUT AROUND BACK OF ANCHOR POST ASSEMBLY TO ALLOW ROOM FOR TOP POST TO BE ATTACHED.
  4. NEST TOP POST ASSEMBLY ONTO PROTRUDING ANCHOR POST ASSEMBLY BOLTS, THROUGH THE FIRST AND FIFTH HOLES FROM THE BOTTOM OF THE TOP POST.
  5. PLACE AND TIGHTEN A SELF-LOCKING FLANGE NUT ON EACH BOLT. WHEN INSTALLATION IS COMPLETE, TOP OF GROUND POST NOT TO EXCEED 4 INCHES ABOVE GROUND LEVEL.
  6. SIZE OF CONNECTOR BOLT FOR TYPE 1,  $\frac{1}{2}$ " x  $1\frac{1}{2}$ ".
  7. THE CONNECTOR BOLTS ARE TO BE FULLY THREADED. EACH CONNECTOR BOLT AND NUT TO BE CLEARLY STAMPED WITH MANUFACTURER'S IDENTIFYING MARK.



## ANCHOR POST ASSEMBLY SIGN SUPPORTS



WHEN X IS GREATER THAN 0.75", USE TYPE 1 SPACER BAR  
WHEN X IS 0.75" OR LESS, USE TYPE 2 SPACER BAR



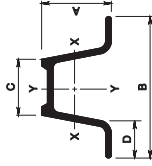
## SPACER BAR

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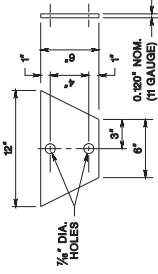
WEIGHT $\Phi$ LBS./FT.	DIMENSIONS (IN)				X-X AXIS $\Phi\Phi$		Y-Y AXIS $\Phi\Phi$	
	"A"	"B"	"C"	"D"	AREA IN. <sup>2</sup>	IN. <sup>4</sup>	IN. <sup>3</sup>	IN. <sup>3</sup>
2.50	1.518	3.082	1.278	0.669	0.700	0.319	0.559	0.352
4.00	1.988	3.600	1.336	0.834	1.187	0.611	0.707	0.664

## TYPE 1 STEEL U-POST PROPERTIES

$\Phi\Phi$  5%  
 $\Phi\Phi\Phi$  GOVERNING SECTION

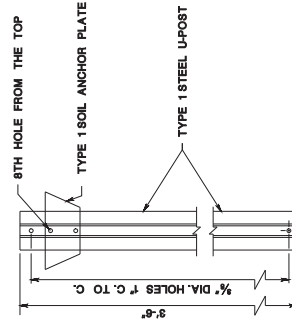


## TYPE 1 STEEL U-POST



## TYPE 1 SOIL ANCHOR PLATE

- NOTES:**
1. ANCHOR POST AND TOP POST TO BE OF EQUAL WEIGHT / FEET.
  2. SOIL ANCHOR PLATE TO BE ATTACHED TO ALL ANCHOR POSTS.
  3. THE MATERIAL FOR THE SOIL ANCHOR PLATES TO BE CARBON SHEET STEEL.
  4. THE STEEL 'U' POST TO BE GRADE 60.



## TYPE 1 ANCHOR POST ASSEMBLY

## STEEL U-POST SIGN SUPPORTS

N.I.S.

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## CONSTRUCTION DETAILS

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22. DO NOT CONSTRUCT THE FINAL HMA SURFACE PAVEMENT UNTIL THE FINAL STAGE OF THE PROJECT UNLESS OTHERWISE DIRECTED BY THE RE OR INDICATED ON THE PLANS. SET MANHOLES AND INLETS TO FINISHED GRADE AND CONSTRUCT TEMPORARY PAVEMENT RAMPS AROUND THEM WITH A MINIMUM 20:1V SLOPE IN ALL DIRECTIONS USING HOT MIX ASPHALT PAVEMENT. THIS TEMPORARY MATERIAL WILL BE REMOVED IMMEDIATELY PRIOR TO PLACING THE SURFACE COURSE.

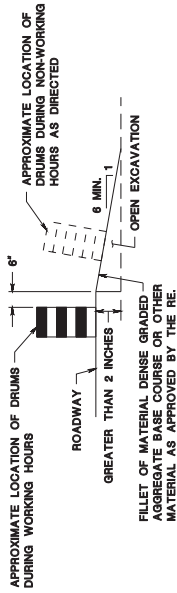
22. DO NOT CONSTRUCT THE FINAL HMA SURFACE PAVEMENT UNTIL THE FINAL STAGE OF THE PROJECT UNLESS OTHERWISE DIRECTED BY THE RE OR INDICATED ON THE PLANS. SET MANHOLES AND INLETS TO FINISHED GRADE AND CONSTRUCT TEMPORARY PAVEMENT RAMPS AROUND THEM WITH A MINIMUM 20:1V SLOPE IN ALL DIRECTIONS USING HOT MIX ASPHALT PAVEMENT. THIS TEMPORARY MATERIAL WILL BE REMOVED IMMEDIATELY PRIOR TO PLACING THE SURFACE COURSE.

22. DO NOT CONSTRUCT THE FINAL HMA SURFACE PAVEMENT UNTIL THE FINAL STAGE OF THE PROJECT UNLESS OTHERWISE DIRECTED BY THE RE OR INDICATED ON THE PLANS. SET MANHOLES AND INLETS TO FINISHED GRADE AND CONSTRUCT TEMPORARY PAVEMENT RAMPS AROUND THEM WITH A MINIMUM 20:1V SLOPE IN ALL DIRECTIONS USING HOT MIX ASPHALT PAVEMENT. THIS TEMPORARY MATERIAL WILL BE REMOVED IMMEDIATELY PRIOR TO PLACING THE SURFACE COURSE.

28. WHERE MILLING OR HMA PAVING IS PERFORMED AND THE LANE IS TO BE RE-OPENED TO TRAFFIC EACH DAY,

$$\frac{103}{164}$$





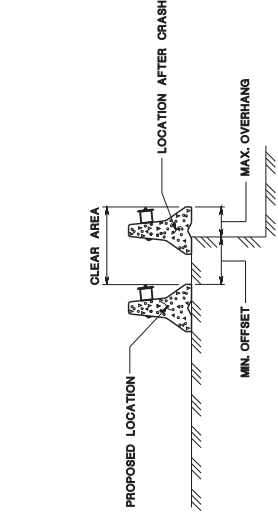
NOTE:  
ESCAPE RAMPS MUST BE CONSTRUCTED AND MAINTAINED DURING NON-WORKING HOURS WHERE A VERTICAL DROP GREATER THAN 2 INCHES EXISTS ADJACENT TO TRAVELED LANE.

#### ESCAPE RAMP DETAIL

REGULATORY APPROACH SPEED OF TRAFFIC MILES/HOUR	RECOMMENDED SIGHT DISTANCE TO BEGINNING OF CHANNELIZING TAPERS		
	DESIRED		MINIMUM
	RURAL FEET	URBAN FEET	RURAL AND URBAN FEET
25	375	525	500
30	450	625	600
35	525	725	650
40	600	825	700
45	675	925	750
50	750	1025	800
55	825	1125	850
60	900	1225	900
65	975	1325	950

#### NOTES:

1. AVOIDANCE MANEUVER IS FOR A SPEED, PATH, AND / OR DIRECTION CHANGE PRIOR TO THE BEGINNING OF CHANNELIZING TAPERS.
2. RECOMMENDED DISTANCES BETWEEN TWO SEPARATE LANE CLOSURES ARE DOUBLE THE VALUES SHOWN ABOVE.
3. RURAL AND URBAN ROAD DESIGNATIONS ARE AS DEFINED IN THE NUDOT STATE HIGHWAY STRAIGHT LINE DIAGRAMS.
4. PROVIDE DESIRABLE VALUES WHEREVER POSSIBLE. IF IT IS NOT FEASIBLE OR PRACTICAL TO PROVIDE DESIRABLE VALUES BECAUSE OF LIMITED SPACE, THEN MINIMUM VALUES CAN BE APPLIED. WHEN MINIMUM VALUES ARE USED, PAY SPECIAL ATTENTION TO THE USE OF SUITABLE TRAFFIC CONTROL DEVICES WHEN PROVIDING ADVANCED WARNING OF THE CONDITIONS THAT ARE LIKELY TO BE ENCOUNTERED.
5. LOCATE TAPERS TO MAXIMIZE THE VISIBILITY OF THEIR TOTAL LENGTH.

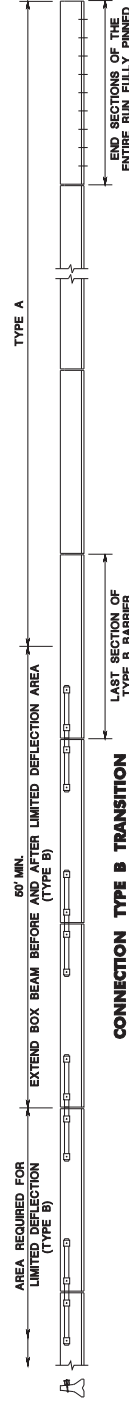


STAGE	LOCATION RTE. STA. TO STA.	CONNECTION TYPE	MIN. OFFSET 12"	MAX. OVERHANG AREA 25"	CLEAR AREA
		B			

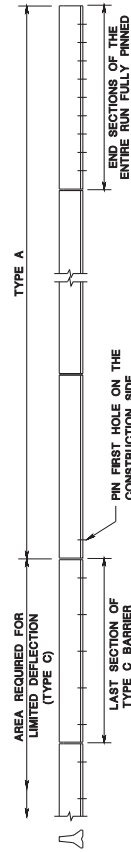
#### OPTIONAL CONNECTION TYPE B TREATMENT AT VERTICAL DROP OFF

REGULATORY APPROACH SPEED OF TRAFFIC MILES / HOUR	RECOMMENDED TAPER LENGTH AND SPACING FOR CHANNELIZING TAPERS			RECOMMENDED SPACING ALONG TANGENTS	
	MINIMUM TAPER LENGTH IN FEET 10' - FOR LANE WIDTHS OF 10'-11'	MINIMUM TAPER LENGTH IN FEET 12' - FOR LANE WIDTHS OF 12'	MAXIMUM SPACING ALONG TANGENTS IN FEET	MAXIMUM SPACING ALONG TANGENTS IN FEET	MAXIMUM SPACING ALONG TANGENTS IN FEET
25	10.51	105	125	25	50
30	15.1	150	150	30	60
35	20.61	205	225	35	70
40	27.1	270	300	40	80
45	34.1	340	375	45	90
50	41.1	410	450	50	100
55	48.1	480	525	55	110
60	55.1	550	600	60	120
65	62.1	620	675	65	130

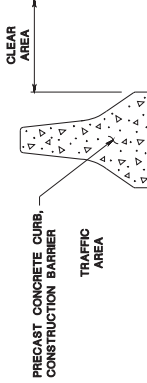
NOTE:  
THE MAXIMUM DEVICE SPACING ALONG CURVES IS DEFINED FOR TAPERS (B) IN THE ABOVE TABLE.



#### CONNECTION TYPE B TRANSITION



#### CONNECTION TYPE C TRANSITION



#### NOTES:

1. CHANGES TO THE PROPOSED CONNECTION TYPE AT ANY LOCATION MUST BE APPROVED BY THE DEPARTMENT.
2. NO ROADWAY DROP OFFS, OBSTRUCTIONS, STORAGE OF MATERIALS OR WORK WILL BE PERMITTED IN THE CLEAR AREA UNLESS APPROVED BY THE RE. EXCEPT ROADWAY DROP OFFS ARE PERMITTED ONLY WHEN USING THE OPTIONAL CONNECTION TYPE B TREATMENT AT VERTICAL DROP OFF.

STAGE	LOCATION RTE. STA. TO STA.	CONNECTION TYPE	CONNECTION TYPE	CLEAR AREA
		A		41 INCHES
		B		28 INCHES
		C		11 INCHES

#### CONSTRUCTION BARRIER CURB CONNECTION TYPE AND CLEAR AREA

N.T.S.

TCD-2

NEW JERSEY DEPARTMENT OF TRANSPORTATION

#### TRAFFIC CONTROL DETAILS

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