H2M architects + engineers

CONTRACT AND SPECIFICATIONS

RIVERHEAD WATER DISTRICT
TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK

BOOSTER PUMPING FACILITY AT EAST WINDS DRIVE

CONTRACT G – GENERAL CONSTRUCTION
CONTRACT E – ELECTRICAL CONSTRUCTION
CONTRACT P – PLUMBING CONSTRUCTION

CAPITAL PROJECT NO. 19

H2M PROJECT NO: RDWD2201

TOWN SUPERVISOR
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NOVEMBER 2024

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APPENDICES

APPENDIX A SOIL BORING REPORT

The Town Board of the Town of Riverhead on behalf of the Riverhead Water District will receive bids for:

Booster Pumping Station at East Winds Drive

TOWN CAPITAL PROJECT NO. 19

Contract G - General Construction

Contract E - Electrical Construction

Contract P - Plumbing Construction

H2M PROJECT NO.: RDWD2201

Bids will be received at the office of the Town Clerk, Riverhead Town Hall, 4 West Second Street, Riverhead, New York 11901, until **11:00 AM**, on **Thursday, December 19, 2024** at which time and place all bids will be publicly opened and read aloud.

Plans and specifications may be examined on or after **Wednesday, November 27, 2024** by visiting the Town of Riverhead website: http://townofriverheadny.gov and click on “Online Services -> Bids". Plans and specifications are available in electronic format only and can be downloaded from the aforementioned website. Plans can only be obtained from this website and vendors submitting bids without registration on said site, shall be disqualified.

Each proposal must be accompanied by a bid bond in the amount of five percent (5%) of the total bid, or a certified check made payable to the TOWN OF RIVERHEAD as assurance that the bid is made in good faith.

The right is reserved to reject any or all bids, to waive any informality, and to accept the lowest responsible bid.

BY ORDER OF THE TOWN BOARD
TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK

ACTING AS THE GOVERNING BODY
OF THE RIVERHEAD WATER DISTRICT

TOWN CLERK, TOWN OF RIVERHEAD

DATED: NOVEMBER 28, 2024

END OF SECTION 001113

BIDS FOR PROJECT

The Town of Riverhead, at the Town Clerk's office, will receive SEALED PROPOSALS for:

RIVERHEAD WATER DISTRICT
Booster Pumping Station at East Winds Drive
Town Capital Project No. 19
H2M PROJECT NO.: RDWD2201

TIME AND PLACE OF BID

Bids are to be submitted in sealed opaque envelopes, and will be received by the Town of Riverhead, at the Town Clerk's office, Town Hall, 4 West Second Street, Riverhead, New York, not later than 11:00 A.M. prevailing time, on **Thursday, December 19, 2024** at which time and place they will be publicly opened and read aloud. Use of the mails shall be at the Bidder's own risk, and the Bidder shall be responsible for physical delivery of the bid at the time and place set for opening of bids

BID ENVELOPE

All proposals and either the certified check or bid bond must be placed in a sealed opaque envelope bearing the Bidder's firm name and address and marked, "PROJECT NO.: RDWD2201, Booster Pumping Station at East Winds Drive FOR THE RIVERHEAD WATER DISTRICT, TOWN OF RIVERHEAD, SUFFOLK COUNTY, NEW YORK", but otherwise unmarked.

Bid package shall include TWO (2) COPIES each of Cover Page; Sections 004105 - Bidders Declaration, 004116 - Proposal; 004313 - Bid Security; 004519 - Non-Collusive Bidding Certificate; 004546 - NYS Vendor Responsibility Questionnaire; 004547 - Iran Divestment Act Certification; 004548 - Statement on Sexual Harassment Prevention and 004550 - Qualifications of Bidders.

PLANS AND SPECIFICATIONS

Plans and specifications may be examined on or after the **Thursday, November 28, 2024** by visiting the Town of Riverhead website: http://townofriverheadny.gov and click on “Online Services -> Bids”.

Plans and specifications are available from the aforementioned Town of Riverhead website only. All contractors who intend to submit a bid package are required to register on the web site.

VERBAL ANSWERS

The Town Board, its agents, servants or employees, or the Engineer, will not be responsible in any manner for verbal answers to any inquiries regarding the meaning of the contract drawings or Specifications given prior to the awarding of the contract.

EXAMINATION OF SITE

Bidders must satisfy themselves by personal examination of the location of the proposed work and of the actual conditions and requirements of the work and shall not, at any time after the submission of a proposal, dispute or complain of such estimate or assert that there was any misunderstanding in regard to the depth or character of excavation to be made or the nature of the work to be done.

Bidders may inspect the project site from 8:00 AM to 3:00 PM by appointment only. Appointments must be scheduled with the Riverhead Water District. Bidders may contact hcline@h2m.com, cc mames@h2m.com to schedule a site visit with the Riverhead Water District. The District shall reserve the right to reject request if not made 48 hours in advance.

PROPOSAL

The Proposal contained herein shall be used in making out bids. Any proposal not in accordance with these instructions or containing bids not asked for may be rejected. While separate prices are required for various items under this contract, it is understood that the contract will be awarded as a whole.

As the estimates of quantities of items stated in the Proposal are approximate only, bidders are required to submit their proposal upon and in the following express conditions, which shall apply and become part of every proposal received.

Bids will be compared by total amounts, said total amount being the sum of the products of the quantities multiplied by the unit price bid for the various items, with due consideration being given to the lump sum prices bid for any contingent or optional items. Unbalanced bids will not be accepted.

Each bidder shall fill out in ink, in both words and figures, in the spaces provided, its unit or lump sum bid, as the case may be, for each item in said Proposal for which it is submitting a bid. If there is any discrepancy between the prices in words and figures, the prices in words shall govern as unit and lump sum prices.

A bid which does not include bids for all items in the Proposal may not be considered valid.

If the contract is not awarded by the Town Board within forty-five (45) days after the receipt of bids, the obligation of the bidder under this Proposal may terminate at its option and it shall thereupon be entitled to a refund of its certified check or release of its bid bond furnished by it as security with its proposal.

BID BOND OR CERTIFIED CHECK

Each proposal from a Contractor shall be accompanied by a bid bond or certified check on a solvent bank of the STATE OF NEW YORK, in the amount of five percent (5%) of the total bid. Such check shall be made payable to TOWN OF RIVERHEAD, RIVERHEAD, NEW YORK, and the amount thereof shall be the measure of liquidated damages which the Town may sustain by failure, neglect or refusal of the bidder to execute and deliver the contract, should the contract be awarded to it. The checks of all unsuccessful bidders will be returned upon the rejection of bids and the awarding of the contract; also, the check of the successful bidder will be returned upon the execution of the contract and the furnishing of the required bond.

NAME OF BIDDER

Each bidder must state, in its proposal, its full name and business address, and the full name of every person, firm or corporation, interested in same, and the address of every person or firm, or president and secretary of every corporation, interested with it.

QUALIFICATIONS OF BIDDERS

(1) The Town Board reserves the right to waive any informalities in, or reject any and all bids. The Board reserves the right to reject any and all bids which do not conform to the Proposal.

(2) All bidders must prove to the satisfaction of the Town Board that they are reputable, reliable and responsible, and that they possess the necessary qualifications (financial, labor, equipment and otherwise) to complete successfully the proposed work.

(3) In determining the qualifications of a bidder, the Town Board will consider its record in the performance of any contracts entered into by it for the work contemplated or of similar nature, may make such investigation as it deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Board all such information and data for this purpose as the Town Board may request.

(4) The Town Board shall be the sole judge of the qualifications of the bidders and of the merits thereof and reserves the right to reject any bid if the record of the bidder in the performance of contracts, payment of bills and meeting of obligations to subcontractors, material men or employees is not satisfactory to the Town Board, or if the evidence submitted by, or the investigation of, such bidders fails to satisfy the Town Board that it is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein.

PERFORMANCE AND MAINTENANCE BOND

The Contractor shall furnish a Performance Bond, Labor and Materials Bond, and a one (1) year Maintenance Bond each in an amount equal to one hundred (100%) percent of the total contract price as security for its faithful performance of this contract, for the payment of all persons performing labor or furnishing materials in connection with this contract. Such bonds shall also cover any penalties, interest charges and assessments levied by any governmental unit for failure to comply with laws and/or regulations governing public work. The Maintenance Bond shall be an assurance that all work and materials provided under this contract shall be maintained for a minimum period of one (1) year. The Maintenance Bond shall be furnished following final completion, and payment under the contract. The contractor shall be required to furnish all guarantees and warranties of manufacturers of products in connection with this contract, but no manufacturer's limitation of time shall act to limit the responsibility of the contractor or its surety hereunder.

The surety must be licensed in the State of New York and have a BEST A rating, or the surety shall present information satisfactory to the TOWN/DISTRICT to permit the TOWN/DISTRICT to accept the bond.

At the time of submission of bonds or at any time thereafter, the TOWN/DISTRICT may evaluate the surety or sureties proposed, and demand a change of surety if it determines that the financial position of such surety does not provide for a proper protection of the interests of the TOWN/DISTRICT. The TOWN/DISTRICT shall be guided by its legal counsel, and insurance industry consultants in determining proper sureties for TOWN/DISTRICT public works contracts. If the TOWN/DISTRICT notifies the contractor in writing that a surety is unacceptable for any reason, then the contractor shall replace the surety and the bond in question within five (5) business days with a surety and bond deemed suitable by the said TOWN/DISTRICT. The premiums charged for all such bonds shall be a cost of the contractor and not the TOWN/DISTRICT. Upon notice to change surety being forwarded to a contractor, no further payments shall be made until a new bond in proper form naming an acceptable surety is provided.

SIGNATURE OF CONTRACTOR

The bidder to whom a contract may be awarded shall attend at the office of the Town Board, with the sureties offered by it, within seven (7) days, Saturdays and Sundays excepted, after date of notification of the acceptance of its proposal, and there sign the contract in quadripartite for the work and furnish approved security for its performance.

In case of failure to do so, the bidder shall be considered as having abandoned the same, and the check accompanying its proposal shall be forfeited to the Town Board, or the penalty of the bid bond shall be invoked.

CONTRACTOR'S INSURANCE

The Contractor shall not commence any work until it has obtained and had approved by the Town all of the insurance specified and required by the Contract.

The Contractor shall not permit any subcontractor to commence any operation on the site until satisfactory proof of carriage of the above required insurance has been posted with, and approved by, the Town Board.

RESPONSIBILITY OF BIDDER

Attention is hereby particularly directed to the provisions of the contract whereby the Contractor will be responsible for any loss or damage that may happen to the work or any part thereof during its progress; and also whereby the Contractor shall make good any defects or faults that may occur during the progress of the work or within twelve (12) months after date of the Engineer's approval of the final payment request.

LABOR RATES

The Contractor shall pay not less than the minimum hourly wage rates on this contract as established in accordance with Section 220 of the Labor Law. This project has been registered with the New York State Department of Labor. Bidders interested in this project are required to visit www.labor.ny.gov to access the prevailing wage schedule (See Section 007343 - Wage Rates for PRC #2024011736). Employees must be paid the minimum rate indicated on the schedule for the appropriate title or in accordance with current prevailing schedule at the time of construction.

Each bidder shall submit with its bid a separate sealed list that names each subcontractor that the bidder will use to perform work on the contract, and the agreed-upon amount to be paid to each, for: (i) plumbing and gas fitting, (ii) steam heating, hot water heating, ventilating and air conditioning apparatus and (iii) electric wiring and standard illuminating fixtures. After the low bid is announced, the sealed list of subcontractors submitted with such low bid shall be opened and the names of such subcontractors shall be announced, and thereafter any change of subcontractor or agreed-upon amount to be paid to each shall require the approval of the owner, upon a showing presented to the owner of legitimate construction need for such change, which shall be open to public inspection. Legitimate construction need shall include, but not be limited to, a change in project specifications, a change in construction material costs, a change to subcontractor status as determined pursuant to paragraph (e) of subdivision two (2) of section two hundred twenty-two (222) of the labor law, or the subcontractor has become otherwise unwilling, unable or unavailable to perform the subcontract. The sealed lists of subcontractors submitted by all other bidders shall be returned to them unopened after the contract award.

APPRENTICESHIP PROGRAM

Pursuant to Section 816-(b) of the New York Labor Law, the Riverhead Water District has adopted a Resolution relating to approved apprenticeship programs. If the successful bidder’s bid hereunder exceeds the sum of $250,000.00, such bidder shall, prior to entering into a contract with the District, be required to have an appropriate apprenticeship agreement that has been registered with and approved by the Commissioner of the New York State Department of Labor pursuant to the requirements found in Article 23 of the New York Labor Law. Any subcontractors under this contract shall also, in all respects, comply with these provisions.

COMPLETION OF WORK

Work is required to be completed to the satisfaction of the Engineer, and in substantial accordance with the Specifications hereunto annexed and the Plans therein referred to and the Change Orders amended to the Contract.

RESPONSIBILITY OF CONTRACTOR

Attention is hereby particularly directed to the provisions of the contract whereby the Contractor will be responsible for any loss or damage that may happen to the work or any part thereof during its progress; and also whereby the Contractor shall make good any defects or faults that may occur during the progress of the work or within twelve (12) months after its completion and acceptance. Any progress payments made by the Town during the completion of this contract by the Contractor shall not be a waiver of the foregoing provision.

TOWN BOARD
TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK

END OF SECTION 002113

This construction schedule must be followed and milestones completed within the specified time periods to avoid additional charges, including but not limited to liquidated damages (per calendar day of late work) as set forth below. Extra days used to achieve any particular milestone will be charged separately and at the expense of each Contractor required to meet that milestone. Assessment of liquidated damages will commence with the first calendar day following the milestone end date.

By 3:00 PM of each Friday during the construction period, each Contractor shall email a typed schedule to the Owner, Owner's inspector, and designated project manager. Schedule shall summarize the work for the following week, including material and equipment deliveries, special inspections, site use requirements, etc. per Spec Section 013100.

Contract 'E': Work associated with the new backup emergency generator, including engine, enclosure, transfer switch, diesel storage tank, leak and level sensors and control panels, power and control wiring, and associated equipment shall begin from the mobilization date provided in the proposal and be completed within 30 days following delivery of the generator to the site. Contract 'E' shall maintain bonds and insurances as required from the mobilization date for the generator until final completion of the generator work which includes the successful and completed start-up of the system such that the Owner has beneficial use of equipment.

Milestone	Start Date	End Date	Contract(s)	Liquidated Damages (per day)
Submit list of shop drawings/ submittals per Spec Section 013100, and submit the Draft #1 Construction Schedule per Spec Section 013216	Notice to Proceed (NTP)	15 Days	All Contracts	$0.00
Submit all submittals to the Engineer for review per Spec Section 013300, and submit the Final Combined Construction Schedule per Spec Section 013216.	NTP	45 Days	All Contracts	$0.00
Substantial Completion of work under each Contract (not including Contract 'E' emergency generator scope). Substantial completion shall include: Health Department Site Inspection Approval, complete all startup, field services, testing, acceptance by the SCDHS and Owner. Submit preliminary record set of as-built documents per Spec Section 017839.	NTP	365 Days	G, P, E	$500.00
Contract Completion (not including Contract 'E' emergency generator scope). Contract completion shall include completion of all contract work including all punch list items.	Substantial Completion	90 Days from Substantial Completion	G, P, E	$500.00
Completion of Emergency Generator Scope.	Proposal Mobilization Date	30 Days	E	$500.00

END OF SECTION 003113

BIDDER'S DECLARATION:

The undersigned, as Bidder, declares that the only person or persons interested in this bid or proposal as principal or principals is or are named herein; and that no other person than herein named has any interest in this proposal or in the contract proposed to be taken; that this bid or proposal is made without any connections with any other person or persons making a bid or proposal for the same purpose; that the bid or proposal is in all respects fair and without collusion or fraud; that it has examined the site of the work and the Contract Documents; and fully understands all the same; and it proposes and agrees, if this proposal is accepted, it will contract with the Riverhead Water District in the Contract accompanying this bid to furnish all the material, implements, etc., and perform all the work required in accordance with the Contract Documents; and it will accept in full payment therefore the following sums to wit:

Acknowledgement that the foregoing Bidder's Declaration is true and factual.

SIGNATURE	PRINT NAME	TITLE	DATE

END OF SECTION 004105

Board:

The undersigned hereby offers to furnish all labor, equipment, materials and appurtenances for **Booster Pumping Station at East Winds Drive,** Contract G - General Construction all in accordance with the plans and specifications prepared by H2M architects + engineers for the following unit and lump sum prices:

ITEM 1G **- MOBILIZATION, DEMOBILIZATION, AND GENERAL CONDITIONS**
For mobilization, demobilization, bonds, insurances, temporary facilities, surveyor, and daily and final cleaning, etc. as specified. Relocation of staging areas and off-premise storage is anticipated. **(Item not to exceed 10% of the total base bid.)**

LUMP SUM:_____ ($)
DOLLARS

ITEM 2G **- SITE REMOVALS AND EROSION CONTROL**
For clearing the site of plant life and growth as required to allow for installation of booster pump station, and installation of erosion and sediment control measures, etc., as shown and specified in the Contract Documents. *(Costs for the excavation of the recharge basin shall be separated out under the alternate bid.)*

LUMP SUM:_____ ($)
DOLLARS

ITEM 3G **- SITE WORK**
For all new site work including but not limited to asphalt paving, curbs, drainage, fencing, swing gate, sidewalks, concrete slabs for generator and fuel storage tank, light pole base, bollards, concrete spillway, blowoff piers, rough and final grading, final restoration and seeding, etc., as shown and specified in the Contract Documents. *(Costs for the fill and grading of the recharge basin shall be separated out under the alternate bid.)*

LUMP SUM:_____ ($)
DOLLARS

ITEM 4G **- BOOSTER STATION FOUNDATION CONSTRUCTION**
For all the work associated with the construction of the new pump station foundation and floor slab including but not limited to: excavation, shoring, suitable fill/materials, disposal of unsuitable material, backfilling, gravel fill, concrete, structural steel, dampproofing, rigid insulation, drainage board, pump base, etc., price shall include the cost of work to furnish, coordinate placement of, and install all the items, as shown and specified in the Contract Documents.

LUMP SUM:_____ ($)
DOLLARS

ITEM 5G **- BOOSTER STATION GENERAL CONSTRUCTION AND HVAC EQUIPMENT**
For all work associated with general construction of the new pump station including, but not limited to masonry, siding, structural steel, trusses, light gauge steel, lintels, decking, gypsum board, roofing, roof hatches, gutters and leaders, splash block, windows, doors, louvers, exhaust fans, ceiling tiles, hardware, trim, penetrations, sealants, finishes, paint, epoxy flooring, coatings, fire extinguishers, building plaque and signage, etc., price shall include the cost of work to furnish, coordinate placement of, and install all the items, as shown and specified in the Contract Documents

LUMP SUM:_____ ($)
DOLLARS

ITEM 6G **- CONTINGENCY ALLOWANCE**
For the cash allowance for additional work requested by the Owner and/or for unforseen conditions as specified in Section 012100 – Allowances.

LUMP SUM: Seventy-five thousand & 00/100 ($75,000.00)
(Forced Bid Amount of $75,000.00) DOLLARS

ITEM 7G **- INDEPENDENT LABORATORY TESTING ALLOWANCE**
For the cash allowance for independent laboratory testing, as specified in Section 012100 – Allowances.

LUMP SUM: Thirty Thousand & 00/100 ($30,000.00)
(Forced Bid Amount of $30,000.00) DOLLARS

ITEM 8G **- PROJECT RECORD DOCUMENTS AND SPARE PARTS**
For maintaining and furnishing project record documents and operation and maintenance manuals as specified in Sections 017800, 017823, 017839.

LUMP SUM:_____ ($)
(Minimum Bid of $5,000.00) DOLLARS

ITEM A1G **- RECHARGE BASIN EXCAVATION (ALTERNATE)**
For all costs associated with the removal and legal disposal of material excavated to construct the recharge basin.

PRICE PER CY ($/CY):_____ ($)
DOLLARS

TOTAL PRICE FOR 370 CY:_____ ($)
DOLLARS

ITEM A2G **- RECHARGE BASIN EARTHWORK (ALTERNATE)**
For all costs associated with the import and placement of clean gravel and sand in the recharge basin sump, grading, etc., as shown and specified in the Contract Documents.

LUMP SUM:_____ ($)
DOLLARS

TOTAL BASE BID (Sum of Items 1G through 8G**)**

_____
DOLLARS ($)

TOTAL ALTERNATE BID (Sum of Items 1G - 8G, and A1G, A2G**)**

_____
DOLLARS ($)

The Board of the Riverhead Water District reserves the right to award this contract based on either the total base bid or any combination of bid items, as may be in the best interest of the Riverhead Water District. The award shall be made to the lowest responsible bidder based upon the bid items awarded. The Board reserves the right to reject any or all bids. The Board reserves the right to award this contract within forty-five (45) days of the bid opening.

Within ten (10) consecutive calendar days after the date of the Notice of Award, the bidder shall execute the contract and furnish the required bonds and insurances. The Notice to Proceed will be issued after the contract has been executed by the Owner.

All work shown and specified in the contract documents and included in this bid shall be completed in accordance with the specified time frames listed in Section 003113 Construction Schedule.

Failure of the contractor to complete work in the specified time frames will subject him to liquidated damages as set forth in Section 003113 Construction Schedule, for each day any phase of the project is incomplete past the contracted completion dates described in this construction schedule.

In addition to liquidated damages, specific damages will be assessed and deducted from amounts otherwise due the contractor for additional inspection and contract management time required to be expended by the Engineer should the project be completed beyond the contract completion date. Such deduction shall be in accordance with the billing rates and fees established between H2M and the Riverhead Water District.

The contractor shall coordinate all work with the Owner to minimize disturbances to Owner operations.

The bidder represents herewith that he is aware of the working conditions, has carefully reviewed the proposal and specifications, has checked and certifies the accuracy of the bid.

The undersigned hereby acknowledges receipt of the following addenda (if any):

ADDENDUM NO.	DATED
_____	_____

_____ _____

_____ _____

Each proposal shall be accompanied by either a certified check drawn on a solvent bank with an office in the State of New York, or a bid bond equal to five percent (5%) of the total amount of the base bid and payable to the Riverhead Water District. The certified check or bid bond shall specify which contract it accompanies.

SECURITY ENCLOSED FOR THIS SECTION
(TOTAL BASE BID)

YES / NO
(Circle One)

PROPOSAL CERTIFICATION

This Bid is hereby submitted by:

BIDDER: _____

BIDDER'S ADDRESS: _____

_____

SIGNED BY: _____ TITLE: _____

PRINT NAME: _____ DATE: _____

FEDERAL I.D. NO. OR
SOCIAL SECURITY NO.: _____

Telephone number where the contractor or a competent representative can accept a telephone message and provide a reasonable reply as soon as possible, but within 24 hours of being contacted.

DAY: _____ NIGHT: _____

EMERGENCY: _____ FAX: _____

EMAIL: _____

Acknowledgement that the Qualification of Bidders section has been fully completed/executed.

_____
SIGNATURE PRINT NAME TITLE DATE

END OF SECTION 004116

Board:

The undersigned hereby offers to furnish all labor, equipment, materials and appurtenances for **Booster Pumping Station at East Winds Drive,** Contract P - Plumbing Construction all in accordance with the plans and specifications prepared by H2M architects + engineers for the following unit and lump sum prices:

ITEM 1P **- MOBILIZATION, DEMOBILIZATION, AND GENERAL CONDITIONS**
For mobilization, demobilization, bonds, insurances, temporary facilities, surveyor, and daily and final cleaning, etc. as specified. Relocation of staging areas and off-premise storage is anticipated. **(Item not to exceed 10% of the total base bid.)**

LUMP SUM:_____ ($)
DOLLARS

ITEM 2P **- SITE PIPING WORK**
For all new plumbing construction site work including, but not limited to new large site piping, valves, fittings, small piping, blow-off piping & gooseneck, sleeves, thrust blocks, retaining glands, service taps, saddles, screens, and disinfection, pressure testing, and water quality testing, etc., as shown and specified in the Contract Documents. Price shall include the cost of work to furnish, coordinate placement of, and install all new items.

LUMP SUM:_____ ($)
DOLLARS

ITEM 3P **- PIPING WORK PUMP STATION**
For all new plumbing construction work related to the pump station including, but not limited to furnishing and installing large process piping, valves, fittings, pipe supports, small piping, backflow device, hot water tank, indoor and outdoor emergency fixtures, analyzers, hose bibs, and wall hydrants, and disinfection and water quality samples, etc., as shown and specified in the Contract Documents. Price shall include the cost of work to furnish, coordinate placement of, and install all new items.

LUMP SUM:_____ ($)
DOLLARS

ITEM 4P **- CALCIUM HYPOCHLORITE TREATMENT SYSTEM**
For all work associated with the calcium hypochlorite treatment system, including but not limited to, installation of chemical pump, tablet chlorinator, small piping, injection quill, containment systems, accessories, etc., as shown and specified in the Contract Documents. Price shall include the cost of work to furnish, coordinate placement of, and install all new items.

LUMP SUM:_____ ($)
DOLLARS

ITEM 5P **- BOOSTER CAN PUMPING UNITS**
For furnishing and installing two (2) new 1,500 gpm and one (1) new 750 gpm booster pumps, steel booster casings, electric motors, discharge heads, baseplates, suction pipes and accessories,etc., as shown and specified in the Contract Documents. Price shall include the cost of work to furnish, coordinate placement of, and install all new items.

LUMP SUM:_____ ($)
DOLLARS

ITEM 6P **- GROUND STORAGE TANK SUBMERSIBLE MIXERS**
For all work associated with the submersible mixers for the ground storage tank, including but not limited to, installation of tank mixers, control panels, and kindorf rack, etc., as shown and specified in the Contract Documents. Price shall include the cost of work to furnish, coordinate placement of, and install all new items.

LUMP SUM:_____ ($)
DOLLARS

ITEM 7P **- INDEPENDENT LABORATORY TESTING ALLOWANCE**
For the cash allowance for testing and special inspections in accordance with specification Section 012100 – Allowances.

LUMP SUM: Twenty-five Thousand & 00/100 ($25,000.00)
(Forced Bid Amount of $25,000.00) DOLLARS

ITEM 8P **- CONTINGENCY ALLOWANCE**
For the cash allowance for additional work requested by the Owner and/or for unforseen conditions as specified in Section 012100 – Allowances.

LUMP SUM: One hundred Thousand & 00/100 ($100,000.00)
(Forced Bid Amount of $100,000.00) DOLLARS

ITEM 9P **- PROJECT RECORD DOCUMENTS AND SPARE PARTS**
For maintaining and furnishing project record documents and operation and maintenance manuals as specified in Sections 017800, 017823, 017839.

LUMP SUM: _____ ($)
(Minimum Bid Amount of $5,000.00) DOLLARS

ITEM A1P **- TANK NO. 9 ALTITUDE VALVE**
For all work related to the replacement of the District's control valve at Tank No. 9, including, but not demolition and removals, new large piping, valves, fittings, small piping, disinfection and water quality testing, and power and control modifications, etc. Price shall include the cost of work to furnish, coordinate placement of, and install all new items.

LUMP SUM:_____ ($)
DOLLARS

TOTAL BASE BID (Sum of All Items 1P through 9P**)**

_____
DOLLARS ($)

TOTAL ALTERNATE BID (Sum of All Items 1P through 9P & A1P**)**

_____
DOLLARS ($)

The Bidder shall be aware that this project has received funding from the New York State Environmental Facilities Corporation and therefore, requirements of this organization must be adhered to. Please see Appendix A of this specification, which includes the specific requirements of the Environmental Facilities Corporation Program.

The Board of the Riverhead Water District reserves the right to award this contract based on either the total base bid or any combination of bid items, as may be in the best interest of the Riverhead Water District. The award shall be made to the lowest responsible bidder based upon the bid items awarded. The Board reserves the right to reject any or all bids. The Board reserves the right to award this contract within forty-five (45) days of the bid opening.

Within ten (10) consecutive calendar days after the date of the Notice of Award, the bidder shall execute the contract and furnish the required bonds and insurances. The Notice to Proceed will be issued after the contract has been executed by the Owner.

All work shown and specified in the contract documents and included in this bid shall be completed in accordance with the specified time frames listed in Section 003113 Construction Schedule.

Failure of the contractor to complete all work within the specified time will subject him to liquidated damages as set forth in Section 003113 Construction Schedule, for each day any phase of the project is incomplete past the contracted completion dates described in this construction schedule.

In addition to liquidated damages, specific damages will be assessed and deducted from amounts otherwise due the contractor for additional inspection and contract management time required to be expended by the Engineer should the project be completed beyond the contract completion date. Such deduction shall be in accordance with the billing rates and fees established between H2M and the Riverhead Water District.

The contractor shall coordinate all work with the Owner to minimize disturbances to Owner operations.

The bidder represents herewith that he is aware of the working conditions, has carefully reviewed the proposal and specifications, has checked and certifies the accuracy of the bid.

The undersigned hereby acknowledges receipt of the following addenda (if any):

ADDENDUM NO.	DATED
_____	_____
_____	_____
_____	_____

Each proposal shall be accompanied by either a certified check drawn on a solvent bank with an office in the State of New York, or a bid bond equal to five percent (5%) of the total amount of the base bid and payable to the Riverhead Water District. The certified check or bid bond shall specify which contract it accompanies.

SECURITY ENCLOSED FOR THIS SECTION
(TOTAL BASE BID)

YES / NO
(Circle One)

PROPOSAL CERTIFICATION

This Bid is hereby submitted by:

BIDDER:_____

BIDDER'S ADDRESS:_____

_____

SIGNED BY: _____ TITLE: _____

PRINT NAME: _____ DATE: _____

FEDERAL I.D. NO. OR
SOCIAL SECURITY NO.: _____

Telephone number where the contractor or a competent representative can accept a telephone message and provide a reasonable reply as soon as possible, but within 24 hours of being contacted.

DAY: _____ NIGHT: _____

EMERGENCY: _____ FAX: _____

EMAIL: _____

Acknowledgement that the Qualification of Bidders section has been fully completed/executed.

SIGNATURE	PRINT NAME	TITLE	DATE

END OF SECTION 004117

Board:

The undersigned hereby offers to furnish all labor, equipment, materials and appurtenances for **Booster Pumping Station at East Winds Drive,** Contract E - Electrical Construction all in accordance with the plans and specifications prepared by H2M architects + engineers for the following unit and lump sum prices:

ITEM 1E **- MOBILIZATION, DEMOBILIZATION, AND GENERAL CONDITIONS**
For mobilization, demobilization, bonds, insurances, temporary facilities, surveyor, and daily and final cleaning, etc. as specified. Relocation of staging areas and off-premise storage is anticipated. **(Item not to exceed 10% of the total base bid.)**

LUMP SUM:_____ ($)
DOLLARS

ITEM 2E **- ELECTRICAL SITE WORK**
For all new electrical construction site work including, but not limited to new site service, primary and secondary wiring, power wiring, control wiring, communication wiring, instrumentation wiring, conduit, pull boxes, hand holes, meter pan, and electrical service entrance equipment, and all accessories, etc., as shown and specified in the Contract Documents. Price shall include the cost of work to furnish, coordinate placement of, and install all new items in accordance with Town and PSEG codes, permits, and ordinances.

LUMP SUM:_____ ($)
DOLLARS

ITEM 3E **- MOTOR CONTROL CENTER**
For furnishing and installing a new Motor Control Center at the East Winds Drive pump station and all associated electrical work, including but not limited to MCC and all internal motor starters, contactors, relays, circuit breakers, panelboards, transformers, surge protection devices, pilot devices, power meters, wiring, etc., as shown and specified in the Contract Documents. Price shall include the cost of work to furnish, coordinate placement of, and install all new items.

LUMP SUM:_____ ($)
DOLLARS

ITEM 4E **- PUMP STATION ELECTRICAL WORK**
For all new electrical construction work related to the pump station as shown and specified in the Contract Documents, including wiring devices, disconnect switches, panelboards, lighting fixtures, electric unit heaters (EUH), wiring, conduit, motor feeders, etc., as shown and specified in the Contract Documents. Price shall include the cost of work to furnish, coordinate placement of, and install all new items.

LUMP SUM:_____ ($)
DOLLARS

ITEM 5E **- PUMP STATION INSTRUMENTATION & CONTROLS**
For all instrumentation and controls, including but not limited to instrumentation devices, controls devices, control panels, PLCs, OITs, pilot devices, telemetry equipment, software development, wiring, conduit, etc., as shown and specified in the Contract Documents. Price shall include the cost of work to furnish, coordinate placement of, and install all new items.

LUMP SUM:_____ ($)
DOLLARS

ITEM 6E **- PUMP STATION SCADA SYSTEM**
For all labor, materials, and equipment required for the new SCADA system and integration of items into the District's existing SCADA system at their main office.

LUMP SUM:_____ ($)
DOLLARS

ITEM 7E **- EMERGENCY GENERATOR, DIESEL TANK, & AUTOMATIC TRANSFER SWITCH**
For all electrical construction work related to installing a new 450 kW emergency diesel generator and new fuel storage tank, including but not limited to, transport and traffic control measures, furnishing and installing a new engine, walk-in enclosure, and diesel fuel storage tank. Contractor shall be required to coordinate with Contract G for the construction of the slabs, install diesel service and return lines, and all accessories, etc., as shown and specified in the Contract Documents. Price shall include the cost of work to furnish, coordinate placement of, and install all new items. Additionally, the price shall include the cost to maintain bonds and insurances through completion of the work. No additional compensation will be provided if the schedule extends beyond the mobilization date provided.
Bidder's are responsible for obtaining a fabrication and delivery schedule from equipment manufactures. The bidder shall provide a projected date to begin construction of the generator and tank.

LUMP SUM:_____ ($)
DOLLARS

DATE:_____
(Provide written date of projected mobilization in month-day-year format)

ITEM 8E **- CONTINGENCY ALLOWANCE**
For the cash allowance for additional work requested by the Owner and/or for unforseen conditions as specified in Section 012100 – Allowances.

LUMP SUM: Fifty Thousand & 00/100 ($50,000.00)
(Forced Bid Amount of $50,000.00) DOLLARS

ITEM 9E **- ALARM ALLOWANCE**
For cash allowances specified in Section 012100 – Allowances, to provide fire and burglary alarm from the Districts specified installer.

LUMP SUM: Thirty Thousand & 00/100 ($30,000.00)
(Forced Bid Amount of $30,000.00) DOLLARS

ITEM 10E **- UTILITY FEE ALLOWANCE**
For all cash allowances for charges and fees from the utility associated with the electrical site service, transformer, etc. as shown and specified in the contract documents and Section 012100.

LUMP SUM: Eighty Thousand & 00/100_____ ($80,000.00)
(Forced Bid Amount of $80,000.00) DOLLARS

ITEM 11E **- PROJECT RECORD DOCUMENTS AND SPARE PARTS**
For maintaining and furnishing project record documents and operation and maintenance manuals as specified in Sections 017800, 017823, 017839.

LUMP SUM:_____ ($)
(Minimum Bid Amount of $5,000.00) DOLLARS

TOTAL BASE BID (Sum of Items 1E through 11E**)**

_____
DOLLARS ($)

The Bidder shall be aware that this project has received funding from the New York State Environmental Facilities Corporation and therefore, requirements of this organization must be adhered to. Please see Appendix A of this specification, which includes the specific requirements of the Environmental Facilities Corporation Program.

The Board of the Riverhead Water District reserves the right to award this contract based on either the total base bid or any combination of bid items, as may be in the best interest of the Riverhead Water District. The award shall be made to the lowest responsible bidder based upon the bid items awarded. The Board reserves the right to reject any or all bids. The Board reserves the right to award this contract within forty-five (45) days of the bid opening.

Within ten (10) consecutive calendar days after the date of the Notice of Award, the bidder shall execute the contract and furnish the required bonds and insurances. The Notice to Proceed will be issued after the contract has been executed by the Owner.

All work shown and specified in the contract documents and included in this bid shall be completed in accordance with the specified time frames listed in Section 003113 Construction Schedule.

Failure of the contractor to complete all work within the specified time will subject him to liquidated damages as set forth in Section 003113 Construction Schedule, for each day any phase of the project is incomplete past the contracted completion dates described in this construction schedule.

In addition to liquidated damages, specific damages will be assessed and deducted from amounts otherwise due the contractor for additional inspection and contract management time required to be expended by the Engineer should the project be completed beyond the contract completion date. Such deduction shall be in accordance with the billing rates and fees established between H2M and the Riverhead Water District.

The contractor shall coordinate all work with the Owner to minimize disturbances to Owner operations.

The bidder represents herewith that he is aware of the working conditions, has carefully reviewed the proposal and specifications, has checked and certifies the accuracy of the bid.

The undersigned hereby acknowledges receipt of the following addenda (if any):

ADDENDUM NO.	DATED
_____	_____
_____	_____
_____	_____

Each proposal shall be accompanied by either a certified check drawn on a solvent bank with an office in the State of New York, or a bid bond equal to five percent (5%) of the total amount of the base bid and payable to the Riverhead Water District. The certified check or bid bond shall specify which contract it accompanies.

SECURITY ENCLOSED FOR THIS SECTION
(TOTAL BASE BID)

YES / NO
(Circle One)

PROPOSAL CERTIFICATION

This Bid is hereby submitted by:

BIDDER:_____

BIDDER'S ADDRESS:_____

_____

SIGNED BY: _____ TITLE: _____

PRINT NAME: _____ DATE: _____

FEDERAL I.D. NO. OR
SOCIAL SECURITY NO.: _____

Telephone number where the contractor or a competent representative can accept a telephone message and provide a reasonable reply as soon as possible, but within 24 hours of being contacted.

DAY: _____ NIGHT: _____

EMERGENCY: _____ FAX: _____

EMAIL: _____

Acknowledgement that the Qualification of Bidders section has been fully completed/executed.

_____
SIGNATURE PRINT NAME TITLE DATE

END OF SECTION 004118

Enclosed is a certified check or bid bond for five percent (5%) of the total amount of the bid as required in the foregoing "Information for Bidders".

The Bidder hereby agrees to appear with its sureties at the office of the Riverhead Water District within ten (10) calendar days after due notice from the Board of the Riverhead Water District that the Contract has been awarded to it and is ready for signature; such notice to be given in writing within forty five (45) days of opening of the bids; and, on the signing of such Contract by the Bidder, to furnish the indemnifying bonds as provided in the Contract.

The Bidder hereby further agrees that in the event of its failure or refusal to enter into a contract in accordance with this bid within ten (10) days after due notice from the Board that the Contract has been awarded to it and is ready for signature, as given in accordance with the Contract Documents and/or its failure to execute and deliver the bond for the full amount of the Contract price, as provided in said Contract Documents, the Bidder's check or bid bond which is herewith deposited with the Board (at the option of said Board) become due and payable as ascertained and liquidated damages for such default; otherwise, said check or bid bond will be returned to the undersigned.

The full names and residences of all persons and parties interested in the foregoing bid as principals are as follows:

NAME	ADDRESS
_____	_____
_____	_____
_____	_____

NAME OF BIDDER: _____

BUSINESS ADDRESS OF BIDDER: _____

Telephone number where the bidder or a competent representative can accept a telephone message and provide a reasonable reply as soon as possible, but no later than twenty four (24) hours:

DAY: _____ EVENING: _____

DATED AT: _____ THE _____ DAY OF _____, 20_____

END OF SECTION 004313

Riverhead Water District

Suffolk County, New York

Bidders shall submit to the Owner the names of the Subcontractors which the Bidder proposes to use on the project. The Owner reserves the right to disapprove the use of any proposed subcontractor and in such event the Bidder shall submit the name of another Subcontractor in the like manner and in the time specified by the Owner. Such disapproval shall not result in additional costs to the Owner. The Owner reserves the right to reject any bid if the name of the proposed Subcontractors, or additional subcontractor information, is not submitted as required.

BIDDER:

FIRM NAME: _____

ADDRESS: _____

PREPARED BY: _____

SIGNED BY: _____

TITLE: _____

END OF SECTION 004350

1.0 - INDEMNITY

The Contractor and all subcontractors performing work in connection with this Contract shall HOLD HARMLESS, INDEMNIFY and DEFEND the Owner and Engineer, their consultants and each of their officers, agents and employees from any liability, claims, losses or damage including reasonable costs of defense arising out of or alleged to arise from the Contractor's or subcontractor's negligence in the performance of the work described in the Contract Documents, but not including liability that may be due to the sole negligence of the Owner, the Engineer or their officers, agents and employees.

2.0 - LIMITATION OF LIABILITY

The Contractor and all subcontractors agree to limit the liability of the Owner and the Engineer due to the Engineer's professional negligent errors or omissions such that the total aggregate liability of the Engineer to those named shall not exceed Fifty Thousand Dollars ($50,000) or five percent (5%) of the Contract award amount, whichever is greater.

3.0 - NO CLAIM FOR DELAY

The Contractor and all subcontractors agree to HOLD HARMLESS from any and all claims for loss or damages of any nature against the Owner or Engineer for delays in commencement, performance or completion of the Contract, regardless of whether said delays are, or may be, caused by the Owner, Engineer or any governmental agency.

END OF SECTION 004355

NON-COLLUSIVE BIDDING CERTIFICATE

Pursuant to Section 103-D of the General Municipal Law, the Contractor makes the following statement under penalty of perjury, and by submission of this bid or proposal, the Bidder certifies that:

(a) this bid or proposal has been independently arrived at without collusion with any other bidder or with any competitor or potential competitor; (b) this bid or proposal has not been knowingly disclosed and will not be knowingly disclosed prior to the opening of the bids or proposals for this project to any other bidder, competitor or potential competitor; (c) no attempt has been or will be made to induce any other person, partnership or corporation to submit or not to submit a bid or proposal; (d) the person signing this bid or proposal certified that he has fully informed himself regarding the accuracy of the statements contained in this certification, and under the penalties of perjury, affirms the truth thereof, such penalties being applicable to the Bidder as well as to the person signing in its behalf; (e) attached hereto (if a corporate bidder) is a certified copy of resolution authorizing the execution of this certificate by the signatory of the bid or proposal on behalf of the corporate bidder.

Resolved that _____
(Name of Corporation)
be authorized to sign and submit the bid or proposal of this corporation for the following project:

Booster Pumping Station at East Winds Drive
(Name of Project)

and to include in such bid or proposal the certificate as to non-collusion required by Section 103-D of the General Municipal Law as the act and deed of said corporation; and for any inaccuracies or misstatements in such certificate, this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution adopted by_____

at a meeting of its Board of Directors held on the _____day of _____,20___

(Seal of the Corporation)

Secretary: _____

Respectfully submitted,

FIRM NAME: _____

FIRM ADDRESS: _____

_____

SIGNED BY: _____

TITLE: _____

END OF SECTION 004519

Vendor Responsibility Questionnaire begins on the following page.

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

You have selected the For-Profit Construction questionnaire, commonly known as the "CCA-2," which may be printed and completed in this format or, **for your convenience**, **may be completed online using the New York State VendRep System.**

COMPLETION & CERTIFICATION

The person(s) completing the questionnaire must be knowledgeable about the vendor's business and operations. An owner or owner's official representative authorized to legally bind the Reporting Entity, must certify the truth of the questionnaire answers.

NEW YORK STATE VENDOR IDENTIFICATION NUMBER (VENDOR ID)

The Vendor ID is a ten-digit identifier issued by New York State when the vendor is registered on the Statewide Vendor File. This number must now be included on the questionnaire. If the business entity has not obtained a Vendor ID, contact the IT Service Desk at ITServiceDesk@osc.state.ny.us or call 866-370-4672.

DEFINITIONS

All underlined terms are defined in the "New York State Vendor Responsibility Definitions List," found at http://www.osc.state.ny.us/vendrep/documents/questionnaire/definitions.pdf. These terms may not have their ordinary, common, or traditional meanings. Each vendor must read the respective definitions for any and all underlined terms. By submitting this questionnaire, the vendor agrees to be bound by the terms as defined in the "New York State Vendor Responsibility Definitions List" existing at the time of certification.

RESPONSES

Every question must be answered fully. Each response must provide **all** relevant information to appropriately explain the answer. If you have concerns as to the legal requirements behind your answers, please seek clarification from your counsel. However, information regarding a determination or finding made in error which was subsequently corrected or overturned, and/or was withdrawn by the issuing government entity, is not required to be identified. Individuals and Sole Proprietors may use a Social Security Number but are encouraged to obtain and use a federal Employer Identification Number (EIN).

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

BUSINESS ENTITY INFORMATION		
Legal Business Name	EIN ____	
Address of the Principal Place of Business (street, city, state, zip code) NO P.O. Boxes	New York State Vendor Identification Number	
	Telephone ext.	Fax
	Website (include all)	
Authorized Contact for this Questionnaire		
Name	Telephone ext.	Fax
Title	Email	

Additional Business Entity Identities: If applicable, list any other DBA, Trade Name, Former Name, Other Identity, or EIN used in the last five (5) years, the state or county where filed and the status (active or inactive).

Type	Name	EIN	State or County where filed	Status

I. BUSINESS CHARACTERISTICS	
1.0 Business Entity Type – Check appropriate box and provide additional information:	
a) ☐ Corporation (including PC)	Date of Incorporation
b) ☐ Limited Liability Company (LLC or PLLC)	Date Organized
c) ☐ Limited Liability Partnership	Date of Registration
d) ☐ Limited Partnership	Date Established
e) ☐ General Partnership	Date Established County (if formed in NYS)
f) ☐ Sole Proprietor	How many years in business?
g) ☐ Other	Date Established
If Other, explain:	
1.0 Was the Business Entity formed in New York State?	☐ Yes ☐ No
If "No," indicate jurisdiction where the Business Entity was formed:	

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

I. BUSINESS CHARACTERISTICS

☐ United States	State	
☐ Other	Country	

1.2 Is the Legal Business Entity publicly traded?	☐ Yes ☐ No
If "Yes," provide the CIK code or Ticker Symbol:	
1.3 Is the Business Entity currently registered to do business in New York State? *Note: Select "Not Required" if the Business Entity is a Sole Proprietor or General Partnership*	☐ Yes ☐ No ☐ Not Required
If "No," explain why the Business Entity is not required to be registered to do business in New York State:	
1.4 Is the responding Business Entity a Joint Venture? Note: If the submitting Business Entity is a Joint Venture, also submit a separate questionnaire for each Business Entity comprising the Joint Venture.	☐ Yes ☐ No
1.5 If the Business Entity's Principal Place of Business is not in New York State, does the Business Entity maintain an office in New York State? *(Select "N/A" if Principal Place of Business is in New York State.)*	☐ Yes ☐ No ☐ N/A
If "Yes," provide the address and telephone number for one office located in New York State.	
1.6 Is the Business Entity a New York State certified Minority-Owned Business Enterprise, Women-Owned Business Enterprise, Service-Disabled Veteran-Owned Business, New York State Small Business, or federally certified Disadvantaged Business Enterprise?	☐ Yes ☐ No

If "Yes," check all that apply:

☐ New York State certified Minority-Owned Business Enterprise (MBE)

☐ New York State certified Women-Owned Business Enterprise (WBE)

☐ New York State certified Service-Disabled Veteran-Owned Business (SDVOB)

☐ New York State Small Business

☐ Federally certified Disadvantaged Business Enterprise (DBE)

1.7 Identify **each person** or Business Entity that is or has been within the past five (5) years, a Business Entity Official, or a Principal Owner of 5.0% or more of the Reporting Entity's shares; or one of the five largest shareholders, if applicable. *(Attach additional pages if necessary.)*

Joint Ventures: Provide information for all firms involved.

Each Business Entity identified as a Principal Owner must also submit a Vendor Responsibility Questionnaire.

(Add additional sheets if necessary.) For each person, include name, title, date of birth, percentage of ownership, and employment status. For each Business Entity that is a Principal Owner, include name, address, EIN, and percentage of ownership.

If there is no person or Business Entity that owns 5% or more of the Reporting Entity, check here: ☐

Name *(For each person,* ***include a middle initial)***	Title	Date of Birth	Percentage of ownership (Enter 0%, if not applicable)	Employment status with the firm

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

I. BUSINESS CHARACTERISTICS

				☐ Current ☐ Former ☐ N/A
				☐ Current ☐ Former ☐ N/A
				☐ Current ☐ Former ☐ N/A
				☐ Current ☐ Former ☐ N/A
Name of Each Business Entity owning 5% or more of Reporting Entity	Address	EIN	Percentage Ownership	

II. AFFILIATE and JOINT VENTURE RELATIONSHIPS

2.0 Are there any other construction-related firms in which, now or in the past five years, the submitting Business Entity or any of the individuals or business entities listed in question 1.7 either owned or owns 5.0% or more of the shares of, or was or is one of the five largest shareholders or a director, officer, partner, or proprietor of said other firm? If yes, identify below and if there is more than one, *attach additional pages with required information.*	☐ Yes ☐ No

Firm/Company Name	Firm/Company EIN (If available)	Firm/Company's Primary Business Activity

Firm/Company Address
Explain relationship with the firm and indicate percent of ownership, if applicable (enter N/A, if not applicable):

Are there any shareholders, directors, officers, owners, partners or proprietors that the submitting Business Entity has in common with the disclosed firm(s)?	☐ Yes ☐ No

Individual's Name *(Include middle initial)*	Position/Title with Firm/Company

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

II. AFFILIATE and JOINT VENTURE RELATIONSHIPS

2.1 Does the Business Entity have any construction-related affiliates not identified in the response to question 2.0 above? If yes, identify below and if there is more than one, *attach additional pages with the required information.*	☐ Yes ☐ No

Affiliate Name	Affiliate EIN (If available)	Affiliate's Primary Business Activity

Affiliate Address

Explain relationship with the affiliate and indicate percent of ownership, if applicable *(enter N/A, if not applicable)*:

Are there any shareholders, directors, officers, owners, partners or proprietors that the submitting Business Entity has in common with the disclosed affiliate(s)?	☐ Yes ☐ No

Individual's Name *(Include middle initial)*	Position/Title with Firm/Company

2.2 Has the Business Entity participated in any construction-related Joint Ventures within the past three (3) years? If yes, identify below and if there is more than one, *attach additional pages with the required information.*	☐ Yes ☐ No

Joint Venture Name	Joint Venture EIN (If available)	Identify parties to the Joint Venture

III. CONTRACT HISTORY

3.0 Has the Business Entity completed any construction contracts?	☐ Yes ☐ No

If "Yes," list the ten most recent construction contracts the Business Entity has completed for government clients using Attachment A – Completed Construction Contracts, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3294s.doc.

At the Business Entity's option, it may include construction contracts completed for private clients. If less than ten, include most recent subcontracts on projects up to that number.

3.1 Does the Business Entity currently have uncompleted construction contracts?	☐ Yes ☐ No

If "Yes," list all current uncompleted construction contracts for government clients by using Attachment B – Uncompleted Construction Contracts, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3295s.doc.

Note: Ongoing projects must be included. At the Business Entity's option, it may include construction contracts uncompleted for private clients.

IV. INTEGRITY – CONTRACT BIDDING

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

4.0 Been suspended or debarred from any government contracting process or been disqualified on any government procurement?	☐ Yes ☐ No
4.1 Been subject to a denial or revocation of a government prequalification?	☐ Yes ☐ No
4.2 Had any bid rejected by a government entity for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid?	☐ Yes ☐ No
4.3 Had a proposed subcontract rejected by a government entity for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid?	☐ Yes ☐ No

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
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IV. INTEGRITY – CONTRACT BIDDING ***Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:***	
4.4 Had a bid rejected on a government contract for failure to make good faith efforts on any Minority-Owned Business Enterprise, Women-Owned Business Enterprise, Service-Disabled Veteran-Owned Business or Disadvantaged Business Enterprise goal or statutory affirmative action requirements on a previously held contract?	☐ Yes ☐ No
4.5 Agreed to a voluntary exclusion from bidding/contracting with a government entity?	☐ Yes ☐ No
4.6 Requested or been permitted to withdraw a bid submitted to a government entity or made any claim of an error on a bid submitted to a government entity?	☐ Yes ☐ No
For each "Yes," provide an explanation of the issue(s), the Business Entity, affiliate, predecessor company or entity involved, the relationship to the submitting Business Entity, the government entity involved, project(s), relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses to explain each "YES" response.	

V. INTEGRITY – CONTRACT AWARD ***Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:***	
5.0 Defaulted on or been suspended, cancelled or terminated for cause on any contract?	☐ Yes ☐ No
5.1 Been subject to an administrative proceeding or civil action, including arbitration, seeking specific performance or restitution (except any disputed work proceeding) in connection with any government contract?	☐ Yes ☐ No
5.2 Entered into a formal monitoring agreement, integrity agreement, consent decree, or stipulation, settlement as specified by, or agreed to with, any government entity?	☐ Yes ☐ No
5.3 Had its surety called upon to complete any contract whether government or private sector?	☐ Yes ☐ No
5.4 Forfeited all or part of a standby letter of credit in connection with any government contract?	☐ Yes ☐ No
For each "Yes," provide an explanation of the issue(s), the Business Entity, affiliate, predecessor company or entity involved, the relationship to the submitting Business Entity, the government entity/owners involved, project(s), contract number(s), relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses to explain each "YES" response.	

VI. CERTIFICATIONS/LICENSES ***Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:***	
6.0 Had a revocation or suspension of any business or professional permit and/or license?	☐ Yes ☐ No
6.1 Had a denial, decertification, revocation or forfeiture of New York State certification of Minority-Owned Business Enterprise, Women-Owned Business Enterprise, Service-Disabled Veteran-Owned Business or a federal certification of Disadvantaged Business Enterprise status, for other than a change of ownership?	☐ Yes ☐ No
For each "Yes," provide an explanation of the issue(s), the Business Entity affiliate, predecessor company or entity involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses to explain each "YES" response.	

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VII. LEGAL PROCEEDINGS/GOVERNMENT INVESTIGATIONS ***Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:***	
7.0 Been the subject of a criminal investigation, whether open or closed, or an indictment for any business-related conduct constituting a crime under local, state or federal law?	☐ Yes ☐ No
7.1 Been the subject of: (i.) An indictment, grant of immunity, judgment or conviction (including entering into a plea bargain) for conduct constituting a crime; or (ii.) Any criminal investigation, felony indictment or conviction concerning the formation of, or any business association with, an allegedly false or fraudulent Minority-Owned Business Enterprise, Women-Owned Business Enterprise, Service-Disabled Veteran-Owned Business, or a Disadvantaged Business Enterprise?	☐ Yes ☐ No
7.2 Received any OSHA citation, which resulted in a final determination classified as serious or willful?	☐ Yes ☐ No
7.3 Had a government entity find a willful prevailing wage or supplemental payment violation?	☐ Yes ☐ No
7.4 Had a New York State Labor Law violation deemed willful?	☐ Yes ☐ No
7.5 Entered into a consent order, monitoring agreement or other type of oversight with the New York State Department of Environmental Conservation, or a federal, state or local government enforcement entity involving a violation of federal, state or local environmental laws?	☐ Yes ☐ No
7.6 Other than previously disclosed, been the subject of any citations, notices or violation orders; a pending administrative hearing, proceeding or determination of a violation of: • Federal, state or local health laws, rules or regulations; • Federal, state or local environmental laws, rules or regulations; • Unemployment insurance or workers compensation coverage or claim requirements; • Any labor law or regulation, which was deemed willful; • Employee Retirement Income Security Act (ERISA); • Federal, state or local human rights laws; • Federal, state or local security laws; • Federal, state, or local tax laws?	☐ Yes ☐ No
For each "Yes," provide an explanation of the issue(s), the Business Entity, affiliate, predecessor company or entity involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses to explain each "YES" response. *Note: Information regarding a determination or finding made in error, which was subsequently corrected or overturned, and/or was withdrawn by the issuing government entity, is not required.*	

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
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VIII. LEADERSHIP INTEGRITY

If the Business Entity is a Joint Venture Entity, answer "N/A - Not Applicable" to questions in this section.

Within the past five (5) years has any individual previously identified or any individual currently or formerly having the authority to sign, execute or approve bids, proposals, contracts or supporting documentation on behalf of the Business Entity with any government entity been:

8.0 Sanctioned relative to any business or professional permit and/or license?	☐ Yes ☐ No ☐ N/A
8.1 Suspended, debarred or disqualified from any government contracting process?	☐ Yes ☐ No ☐ N/A
8.2 The subject of a criminal investigation, whether open or closed, or an indictment for any business-related conduct constituting a crime under local, state or federal law?	☐ Yes ☐ No ☐ N/A
8.3 Charged with a misdemeanor or felony, indicted, granted immunity, convicted of a crime or subject to a judgment for: (i.) Any business-related activity, including but not limited to theft, fraud, coercion, extortion, bribe or bribe-receiving, giving or accepting unlawful gratuities, immigration or tax fraud, racketeering, mail fraud, wire fraud, price-fixing or collusive bidding; or (ii.) Any crime, whether or not business-related, the underlying conduct of which related to truthfulness, including but not limited to the filing of false documents or false sworn statements, perjury or larceny	☐ Yes ☐ No ☐ N/A

For each "Yes," provide an explanation of the issue(s), the individual involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses to explain each "YES" response.

IX. FINANCIAL AND ORGANIZATIONAL CAPACITY

9.0 Within the past five (5) years, has the Business Entity or any affiliate received any formal unsatisfactory performance assessment(s) from any government entity on any contract?	☐ Yes ☐ No

If "Yes," provide an explanation of the issue(s), the Business Entity or affiliate involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer below or attach additional sheets with numbered responses to explain the "Yes" response.

9.1 Within the past five (5) years, has the Business Entity or any affiliate had any liquidated damages assessed over $25,000 for any reason, including failure to meet Minority-Owned Business Enterprise, Women-Owned Business Enterprise, Service-Disabled Veteran-Owned Business, or Disadvantaged Business Enterprise goals?	☐ Yes ☐ No

If "Yes," provide an explanation of the issue(s), the name of the Business Entity or affiliate involved, the relationship to the submitting Business Entity, relevant dates, the contracting party involved, the amount assessed and the current status of the issue(s), and the balance of the assessment not yet paid. Provide answer below or attach additional sheets with numbered responses.

9.2 Within the past five (5) years, has the Business Entity or any affiliate had any liens, claims or judgments over $25,000 filed against the Business Entity which remain undischarged or were unsatisfied for more than 90 days? (*Note: Including but not limited to tax warrants or liens. Do not include UCC filings.)*	☐ Yes ☐ No

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

IX. FINANCIAL AND ORGANIZATIONAL CAPACITY

If "Yes," provide an explanation of the issue(s), the name of the Business Entity or affiliate involved, the relationship to the submitting Business Entity, relevant dates, the Lien holder or Claimants' name(s), the amount of the lien(s), the current status of the issue(s), and the balance of the lien, claim or judgment not yet paid. Provide answer below or attach additional sheets with numbered responses.

9.3 In the last seven (7) years, has the Business Entity or any affiliate, or official initiated or been the subject of any bankruptcy proceedings, whether or not closed, or is any bankruptcy proceeding pending?	☐ Yes ☐ No

If "Yes," provide the name of the Business Entity, affiliate or official involved, the relationship to the submitting Business Entity, the bankruptcy chapter number, the court name and the docket number. Indicate the current status of the proceedings as "Initiated," "Pending" or "Closed." Provide answer below or attach additional sheets with numbered responses to explain the YES response.

9.4 What is the Business Entity's Bonding Capacity?

a. Single Project	b. Aggregate (All Projects)

9.5 List Business Entity's Gross Sales for the previous three (3) Fiscal Years:

1st Year (Indicate year)	2nd Year (Indicate year)	3rd Year (Indicate year)
Gross Sales	Gross Sales	Gross Sales

9.6 List Business Entity's Average Backlog for the previous three (3) fiscal years:
(Estimated total value of uncompleted work on outstanding contracts)

1st Year (Indicate year)	2nd Year (Indicate year)	3rd Year (Indicate year)
Amount	Amount	Amount

9.7 Attach Business Entity's most recent annual financial statement and accompanying notes or complete Attachment C – Financial Information, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3296s.xls.
(This information must be attached.)

X. FREEDOM OF INFORMATION LAW (FOIL)

10.0 Indicate whether any information provided herein is believed to be exempt from disclosure under the Freedom of Information Law (FOIL). *Note: A determination of whether such information is exempt from FOIL will be made at the time of any request for disclosure under FOIL. Attach additional pages if necessary.*	☐ Yes ☐ No

If "Yes," indicate the question number(s) and explain the basis for the claim.

Authorizee

XI. AUTHORIZED CONTACT FOR THIS QUESTIONNAIRE

Name	Telephone ext.	Fax
Title	Email	

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

Certification

The undersigned: (1) recognizes that this questionnaire is submitted for the express purpose of assisting New York State government entities (including the Office of the State Comptroller (OSC)) in making responsibility determinations regarding award or approval of a contract or subcontract and that such government entities will rely on information disclosed in the questionnaire in making responsibility determinations; (2) acknowledges that the New York State government entities and OSC may, in their discretion, by means which they may choose, verify the truth and accuracy of all statements made herein; and (3) acknowledges that intentional submission of false or misleading information may result in criminal penalties under State and/or federal law, as well as a finding of non-responsibility, contract suspension or contract termination.

It being acknowledged and agreed that all responses included in this questionnaire are to the knowledge, information and belief of the Business Entity, the undersigned certifies under penalties of perjury that they:

The undersigned certifies that he/she:

- are knowledgeable about the submitting Business Entity's business and operations;
- have legal authority to bind the Business Entity;
- have read and understand all of the questions contained in the questionnaire, including all definitions;
- have not altered the content of the questionnaire in any manner;
- have reviewed and/or supplied full and complete responses to each question;
- have provided true, accurate and complete responses, including all attachments, if applicable;
- understand that New York State government entities will rely on the information disclosed in the questionnaire when entering into a contract with the Business Entity; and
- are under an obligation to update the information provided herein to include any material changes to the Business Entity's responses at the time of bid/proposal submission through the contract award notification, and may be required to update the information at the request of the New York State government entities or OSC prior to the award and/or approval of a contract, or during the term of the contract.

Signature of Owner/Official _____

Printed Name of Signatory _____

Title _____

Name of Business _____

Address _____

City, State, Zip _____

Date _____

END OF SECTION 004546

IRAN DIVESTMENT ACT CERTIFICATION

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of section 165-a of the state finance law.

Dated: _____

_____ (Name of corporation or partnership)

_____ (Signature of Individual)

_____ (Officer stating title) (Partner)

_____ (Print Name of Individual)

END OF SECTION 004547

I have been advised that the Board of the Riverhead Water District requires that vendors and contractors submitting a competitive bid on a purchase or public works contract or a proposal on a purchase or public works contract that does not require competitive bidding file with the Owner at the time of bid or proposal submission a statement in the form required for contractors by the State of New York under State Finance Law § 139-l relative to compliance with requirements for employer sexual harassment preventions programs.

On behalf of myself and my firm or corporation I make the following statement.

By submission of this bid or proposal, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that the bidder has and has implemented a written policy addressing sexual harassment prevention in the workplace and provides annual sexual harassment prevention training to all of its employees. Such policy shall, at a minimum, meet the requirements of section two hundred one-g of the labor law.

I recognize that my failure to submit this statement may result in the rejection of my bid.

If I need to qualify this statement under State Finance Law § 139-l, subparagraph (3) I hereby state the reasons why I must qualify this statement:

_____

_____

_____

I have been advised that pursuant to State Finance Law § 139-l this statement and my signature below shall be deemed to have been authorized by the board of directors of my firm or corporation, and such authorization shall be deemed to include the signing and submission of such bid or proposal and the inclusion of such statement as the act and deed of the corporation.

I, hereby affirm under the penalties of perjury that the foregoing statement is true.

_____
Signature

_____
Print Name

State of New York)
) ss.:
County of)

On the ____ day of _____ in the year 20__ before me personally came _____ to me known, who, being by me duly sworn, did depose and say that he/she/they reside(s) in _____(place of residence); that he/she/they is (are) the _____(office held) of the _____(name of corporation), the corporation described in and which executed the above instrument; that he/she/they know(s) the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by authority of the board of directors of said corporation, and that he/she/they signed his/her/their name(s) thereto by like authority.

_____
NOTARY PUBLIC

END OF SECTION 004548

Riverhead Water District
Suffolk County, New York

The Owner may make such investigation as the Owner deems necessary to determine the responsibility of any Bidder or to determine the ability of any Bidder to perform the Work. Bidders shall furnish to the Owner all information and data required by the Owner, including complete financial data, within the time and in the form and manner required by the Owner. The Owner reserves the right to reject any bid if the evidence required by the Owner is not submitted as required or if the evidence submitted by or the investigation of any Bidder fails to satisfy the Owner that the Bidder is responsible, or is able or qualified to carry out the obligations of the Contract or to complete the Work as contemplated. At the discretion of the Owner, any bidder may be required to complete and submit the enclosed New York State Vendor Responsibility Questionnaire to assist in determining the bidder's qualifications.

The following is a list showing the name of the Owner, Location, Date of Construction, General Description of Work, Amount of the Contract and Contract Period for projects of similar nature in size, construction method and construction procedure, which have been completed by the undersigned as the prime contractor, and which have been in operation for a period of not less than one year, (minimum of five such projects).

PROJECT NO. 1

Owner: _____

Contact Name and Phone Number: _____

Location: _____

General Description: _____

Contract Amount: _____

Contract Period: _____

PROJECT NO. 2

Owner: _____

Contact Name and Phone Number: _____

Location: _____

General Description: _____

Contract Amount: _____

Contract Period: _____

PROJECT NO. 3

Owner: _____

Contact Name and Phone Number: _____

Location: _____

General Description: _____

Contract Amount: _____

Contract Period: _____

PROJECT NO. 4

Owner: _____

Contact Name and Phone Number: _____

Location: _____

General Description: _____

Contract Amount: _____

Contract Period: _____

PROJECT NO. 5

Owner: _____

Contact Name and Phone Number: _____

Location: _____

General Description: _____

Contract Amount: _____

Contract Period: _____

The following is a list of the major areas of construction work under this contract to be performed by subcontractors to the bidder, showing the Type of Work and the name of the Owner, Location and Date of Construction for work of similar nature in size, construction method and construction procedure, which have been completed by the undersigned, and which have been in operation for a period of not less than one year, (minimum of five such projects).

Subcontractor Name: _____

Type of Work: _____

Owner	**Contact Name**	**Phone Number**	**Location**	**Contract Amount**

Subcontractor Name: _____

Type of Work: _____

Owner	**Contact Name**	**Phone Number**	**Location**	**Contract Amount**

Subcontractor Name: _____

Type of Work: _____

Owner	Contact Name	Phone Number	Location	Contract Amount

Subcontractor Name: _____

Type of Work: _____

Owner	Contact Name	Phone Number	Location	Contract Amount

The Riverhead Water District reserves the right to reject any and all bids which do not include a completed qualifications section and/or do not meet the necessary qualifications criteria, for both prime contractor and subcontractors, as described within this qualifications section, for construction work to be performed and completed as required by the contract documents.

BIDDER

FIRM NAME: _____

ADDRESS: _____

PREPARED BY: _____

SIGNED BY: _____

TITLE: _____

END OF SECTION 004550

THIS FORM MUST BE COMPLETED BY BIDDER AND INCLUDED IN SEPARATE SEALED ENVELOPE MARKED SUBCONTRACTORS

Each bidder, where the preparation of separate specifications is not required, shall submit with its bid a separate sealed list that names each subcontractor that the bidder will use to perform work on the contract, and the agreed-upon amount to be paid to each, for: a.) Plumbing and Gas Fitting; b.) Steam Heating, Hot Water Heating, Ventilating and AC Apparatus; and c.) Electrical Wiring and Standard Illuminating Fixtures. After the low bid is announced, the sealed list of subcontractors submitted by the apparent low bidder shall be opened and the names of subcontractors announced. Any change of subcontractor or agreed upon amount to be paid shall require the approval of the public owner, upon a showing of "legitimate construction need" for such change, which shall be open to public inspection.

"Legitimate construction need" shall include, but not be limited to:
A change in project specifications,
A change in construction material costs,
A change in subcontractor status as determined pursuant to paragraph (e) of subdivision two (2) of section two hundred twenty-two (222) of the labor law, or
The subcontractor has become unwilling, unable or unavailable to perform the subcontract.

The sealed list of subcontractors submitted by all other bidders shall be returned to them unopened after the contract award.

NOTE: This form is for "Single-Contract" projects exempt from the Wicks Law. Failure to submit this form correctly may result in disqualification of the bid.	
Contractor's Name and Address:	Bid Date:
Federal ID No.:	Total Contract Amount:
Indicate ANY work to be ***self-performed*** by the contractor in the following categories (check all that apply):	____ Plumbing and Gas Fitting ____ Steam Heating, Hot Water Heating, Ventilating and AC Apparatus ____ Electric Wiring and Standard Illuminating Fixtures
If ALL contract work is to be self-performed, i.e., ***no subcontractors*** will be used, please check here ____, skip to the bottom of the last page of the form, and sign it as required.	

Subcontractor's Name, Address and Federal ID No.	Check ***only*** one.			Subcontractor's Contract Amount
	Plumbing and Gas Fitting ____	Steam Heating, Hot Water Heating, Ventilating and AC Apparatus ____	Electrical Wiring and Standard Illuminating Fixture ____	
General Description of Work:				

Subcontractor's Name, Address and Federal ID No.	Check ***only*** one.			Subcontractor's Contract Amount
	Plumbing and Gas Fitting ____	Steam Heating, Hot Water Heating, Ventilating and AC Apparatus ____	Electrical Wiring and Standard Illuminating Fixture ____	
General Description of Work:				

Subcontractor's Name, Address and Federal ID No.	Check ***only*** one.			Subcontractor's Contract Amount
	Plumbing and Gas Fitting ____	Steam Heating, Hot Water Heating, Ventilating and AC Apparatus ____	Electrical Wiring and Standard Illuminating Fixture ____	
General Description of Work:				

Subcontractor's Name, Address and Federal ID No.	Check ***only*** one.			Subcontractor's Contract Amount
	Plumbing and Gas Fitting ____	Steam Heating, Hot Water Heating, Ventilating and AC Apparatus ____	Electrical Wiring and Standard Illuminating Fixture ____	
General Description of Work:				

This form must be filled out completely and legibly, signed by a company authorized representative and included in ***a separate, sealed envelope*** within the bid envelope. Use additional pages if needed.

Failure to complete this form accurately and in its entirety will result in disqualification of the bid.

Company Authorized Signature: _____ Date: _____

Title: _____

END OF SECTION 004552

It is the Contractor's responsibility to inform the Engineer in advance when a situation arises that forces the Contractor to cancel work for a given day. For example, if the Contractor informs the Engineer that he will be on the job on a certain day and then has to cancel the appointment because he cannot obtain certain materials or equipment, it is the Contractor's responsibility to inform the Engineer of these latest developments and to let him know that construction observation services will not be needed for that day.

In the event that the Engineer is not given ample warning of such a cancellation and, as a result, unnecessary time is spent sending field personnel out to the project site to observe the previously scheduled construction, sufficient funds will be deducted from monies due the Contractor to reimburse the Engineer for his wasted time.

By the same token, sufficient funds will be deducted from monies due the Contractor to reimburse the Engineer for any services rendered in the field or in the office regarding work that had to be performed a second time due to substandard work on the part of the Contractor on the original work.

END OF SECTION 004555

CONTRACT IN QUADRUPLICATE FOR _____

_____; FOR THE TOWN OF RIVERHEAD, SUFFOLK COUNTY, NEW YORK, dated _____, BY AND BETWEEN THE TOWN BOARD OF THE TOWN OF RIVERHEAD, SUFFOLK COUNTY, NEW YORK, acting for and in behalf of the RIVERHEAD WATER DISTRICT (herein called the TOWN DISTRICT), and _____ _____ (herein called the CONTRACTOR).

WITNESSETH, that the TOWN DISTRICT and the CONTRACTOR, in consideration of the premises and of the mutual covenants, considerations and agreements herein contained, agree as follows:

This Contract is hereby awarded to the CONTRACTOR, as per Town Board Resolution No. _____dated _____, for the work and material called for under his bid in the Proposal section of the Contract and designated as Items: _____

_____

and if required by the District, Items:_____

_____

for the sum of:_____

_____($)

for the unit and/or lump sum price(s) as listed in the Proposal herein.

1. CONTRACT DOCUMENTS AND DEFINITIONS

The Notice to Bidders, Information for Bidders, Proposal, General Conditions, Contract, Specifications and Plans, together with any Addenda, shall form part of this Contract, and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The titles, headings, headlines and marginal notes contained herein are solely to facilitate reference to the various provisions of the contract documents and in no way affect, limit or cast light upon the interpretation of the provisions to which they refer. Whenever the term "contract documents" is used, it shall mean and include this Contract, the Plans, Specifications, any Addenda, and the Notice to Bidders, Information for Bidders, General Conditions and Proposal. In case of any conflict or inconsistency between the provisions of the Contract and those of the Specifications, the provisions of the Contract shall govern.

TOWN DISTRICT: The term TOWN DISTRICT shall refer to the Town of Riverhead acting in its capacity as administrators of the Riverhead Water District. Where used independently, the terms shall refer to the Town of Riverhead (Town) and Riverhead Water District (District).

WORK: The term WORK, as used herein, refers to all of the work proposed to be accomplished at the site of the project and all such other work as is in any manner required to accomplish the completed project, and includes all plant, labor, materials, supplies, equipment and other facilities and acts necessary or proper for or incidental to the carrying out and completion of the terms of this Contract. The term WORK PERFORMED shall be construed to include material delivered to and suitably stored at the site of the project.

EXTRA WORK: The term EXTRA WORK, as used herein, refers to and includes all work required by the TOWN DISTRICT which, in the judgment of the Engineer, with the Town's approval, involves changes in or additions to work required by the Plans, Specifications and any Addenda in their present form.

SUBCONTRACTOR: The term SUBCONTRACTOR, as used herein, shall mean any person, firm or corporation applying labor and material for work at the site of the project, but not including the parties to this Contract.

ENGINEER: In the performance of the work, the TOWN DISTRICT shall be represented by its Consulting Engineer H2M architects + engineers (herein called the ENGINEER).

NOTICE: The term NOTICE, as used herein, shall mean and include written notice. Written notice shall be deemed to have been duly served when delivered to, or at the last known business address of, the person, firm or corporation for whom intended or to his, their, or its duly authorized agents, representatives or officers, or when enclosed in a postage prepaid wrapper or envelope addressed to such person, firm, or corporation at his, their, or its last known business address and deposited in a United States Mail Box.

DIRECTED, REQUIRED, APPROVED, ACCEPTABLE: Whenever they refer to the work, or its performance, "directed", "required", "permitted", "ordered", "designated", "prescribed", and words of like import shall imply the direction, requirement, permission, order, designation or prescription of the Engineer, and "approved", "satisfied", or "satisfactory", "in the judgment of", and words of like import, shall mean approved or acceptable to, or satisfactory to, in the judgment of the Engineer.

2. SCOPE OF THE WORK

The Contractor will furnish all plant, labor, material, supplies, equipment and other facilities and things necessary or proper for or incidental to, the work contemplated by this Contract as required by, and in strict accordance with, the applicable Plans, Specifications and Addenda prepared by the Engineer

and/or required by and in strict accordance with, such changes as are ordered and approved pursuant to this Contract, and will perform all other obligations imposed on him by the Contract.

3. COMPENSATION TO BE PAID TO THE CONTRACTOR

A. Agreed Prices: It is understood and agreed that the Contractor will accept as payment in full the summation of products, of the actual quantities in place upon the completion of the work, as determined by the Engineer's measurements by the unit prices bid, no allowance being made for anticipated profit or for reason of variations from the estimated quantities set forth in the Proposal.

B. Extra Work and/or Changes: The TOWN DISTRICT may, at any time, by a written order, and without notice to the sureties, require the performance of such extra work or changes in the work as it may find necessary or desirable. The amount of compensation to be paid to the Contractor for any extra work, as so ordered, shall be determined as follows:

(1) By such applicable unit prices, if any, as set forth in the contract; or

(2) If no such unit prices are set forth, then by unit prices or by a lump sum mutually agreed upon by the TOWN DISTRICT and the Contractor; or

(3) If no such unit prices are set forth, and if the parties cannot agree upon unit prices or a lump sum, then by actual net cost in money to the Contractor of the materials, permits, wages, or applied labor, premium for Workers' Compensation Insurance, payroll taxes required by law, rental for plant and equipment used (excluding small tools) to which total cost will be added 20% as full compensation for all other items of profit, costs and expenses, including administration, overhead, superintendence, insurance, insurance other than Workers' Compensation Insurance, material used in temporary structures, allowances made by the Contractor to subcontractors, additional premiums upon the Performance Bond of the Contractor and the use of small tools.

4. TIME OF ESSENCE

Inasmuch as the provisions of this Contract relating to the time for performance and completion of the work are for the purpose of enabling the TOWN DISTRICT to proceed with the construction of a public improvement, in accordance with a predetermined program, such provisions are of the essence of this Contract.

5. COMMENCEMENT OF WORK

The Contractor agrees that he will commence work within ten (10) consecutive calendar days after signing this Contract, and that the day he commences work shall constitute the first of the consecutive calendar days allowed for completion of the work.

6. TIME FOR COMPLETION

The time for completion of this Contract shall be within the number of calendar days stated in the Bid Proposal and the date of such completion shall be the date of the certificate of completion hereinafter specified. The TOWN DISTRICT reserves the right to order the Contractor to suspend operations when, in the opinion of the Engineer, improper weather conditions make such action advisable, and to order the Contractor to resume operations when weather and ground conditions permit. The days during which such suspension of work is in force are not chargeable against the specified completion time.

7. LIQUIDATED DAMAGES FOR DELAY

The time limit being essential to and of the essence of this Contract, the Contractor hereby agrees that the TOWN DISTRICT shall be, and is hereby authorized to deduct and retain out of the money which may be due or may become due to said Contractor under this agreement, the sum of ONE THOUSAND DOLLARS ($1,000.00) per day, which amount is hereby agreed upon, fixed and determined by the parties hereto as the LIQUIDATED DAMAGES, including overhead charges, services, inspector's wages, and interest on the money invested, that the TOWN DISTRICT will suffer by reason of such default, for each and every day during which the aforesaid work may be incomplete over and beyond the time herein stipulated for its completion. The TOWN DISTRICT shall have the right to extend the time for the completion of said work.

8. EXTENSIONS OF TIME - NO WAIVER

If the Contractor shall be delayed in the completion of his work by reason of unforeseeable causes beyond his control and without his fault or negligence, including but not restricted to Acts of God or of any public enemy, acts or neglect of the TOWN DISTRICT, acts or neglect of any other Contractor, fires, floods, epidemics, quarantine restrictions, strikes, riots, civil commotion or freight embargoes, the period herein above specified for completion of his work shall be extended by such time as shall be fixed by the TOWN DISTRICT.

No such extension of time shall be considered a waiver by the TOWN DISTRICT of its right to terminate the Contract for abandonment or delay by the Contractor as hereinafter provided or relieve the Contractor from full responsibility for performance of his obligations hereunder.

9. CONTRACT SECURITY

A. The Contractor shall furnish a Performance Bond in an amount equal to one hundred percent (100%) of the total contract price as security for the faithful performance of this Contract, and for the payment of all persons performing labor or furnishing materials in connection with this Contract.

B. Additional or Substitute Bond - If, at any time, the TOWN DISTRICT shall be or become dissatisfied with any surety or sureties, then upon the Performance Bond, or if, for any other reason, such bond shall cease to be adequate security to the TOWN DISTRICT, the Contractor shall, within five (5) days after notice from the TOWN DISTRICT, substitute an acceptable bond in such form and sum, and signed by such other surety as may be satisfactory to the TOWN DISTRICT. The premiums on such bonds shall be paid by the Contractor. No further payments shall be deemed due, nor shall be made until the new surety shall have been qualified.

C. Prior to release of the Performance Bond, the Contractor shall deliver to the TOWN DISTRICT a Maintenance Bond equal to one hundred percent (100%) of the total Contract price. This Maintenance Bond shall remain in full force and effect for a period of one (1) year after the date of the Engineer's approval of the final payment request and such bond, which shall be executed by the Contractor and issued by a reliable, solvent surety company authorized to do business in the State of New York shall guarantee to the TOWN DISTRICT that the Contractor shall promptly remedy any defects or faults that may occur within twelve (12) months after completion and acceptance of the work performed by the Contractor pursuant to this Contract. The date of the Maintenance Bond shall be the date of final payment or other agreed upon date of acceptance by the Engineer and District. All extra work performed under the terms of this Contract shall be covered under the Maintenance Bond and as such the bond shall represent the value of these items.

10. CONTRACTOR'S INSURANCE:

The Contractor shall not commence work under this Contract until he has obtained and had approved by the TOWN DISTRICT the insurance required under this contract. Contractor shall maintain at a minimum the following insurance giving evidence of same, on the Acord form Certificates of Insurance, Acord Form 855 – New York Construction Certificate of Liability Insurance Addendum; copy of the Additional Insured Endorsements; provide 30 days' notice of cancellation, non-renewal or material change; C105.1 form or State Insurance Fund Certificate or Self-Insured SI-12 for Workers Compensation and DB120.1 Certificate for NYS Disability.

The insurance coverage limits set forth in Schedule below are minimum coverage requirements, not limitations of liability. New York State licensed admitted carrier is preferred; any non-licensed/non-admitted carriers will be accepted at TOWN DISTRICT's discretion. The insurance carrier must have an A.M. Best Rating of at least A- IX. All subcontractors must adhere to the same insurance and indemnification requirements.

The certificate holder for all policies shall be the Riverhead Water District. The Contractor shall not permit any subcontractor to commence any operation on the site until satisfactory proof of carriage of required insurance has been posted with and approved by the TOWN DISTRICT.

Certificate Holder for all policies: Riverhead Water District
1035 Pulaski Street
Riverhead, NY 11901

Additional Insured to read: Town of Riverhead, Riverhead Water District, all elected and appointed officials, employees and volunteers of the Town District, and H2M architects + engineers using ISO Form CG2026 or equivalent including products and completed operations coverage ISO Form CG2037 or equivalent. .

Additionally insured shall be listed and covered under the Commercial General Liability including Contractual Liability and Products and Completed Operations, Automobile Liability and Excess Liability. Insurance Coverage is to be primary and non-contributory to any insurance carried by any additional insured. Waiver of Subrogation is included on the Workers Compensation and General Liability in favor of the Additional Insureds.

A. Workers Compensation & Employers Liability - The Contractor shall take out and maintain during the life of this Contract, Workers' Compensation Insurance for all of his employees employed at the site of the project, and in any case of any of the work being sublet, the Contractor shall require the subcontractor similarly to provide Workers' Compensation Insurance for all of the latter's employees, unless such employees are covered by the protection afforded by the Contractor. Minimum limits for each accident, employee and disease of $1,000,000.

B. Commercial General Liability and Insurance - The Contractor shall take out and maintain during the life of this Contract such insurance as shall protect him and any subcontractor performing work covered by this Contract for claims for damages for personal injury, including accidental death, as well as from claims for property damage which may arise from operations under this Contract, whether such operations be by himself or by any subcontractor, or by any one directly or indirectly employed by either of them, and the amounts of such insurance shall be as follows:

Occurrence – ISO Form CG2001 10-01 or equivalent	
General Aggregate	$2,000,000
Products & Completed Operations	$2,000,000
Personal & Advertising Injury	$1,000,000

Per Occurrence Limit	$1,000,000
Damage to Rented Premises	$ 100,000
Medical Expense (any one person)	$ 10,000

The above policies for commercial general liability and umbrella liability insurance must be so written as to include Contractor's Protective Liability Insurance to protect the contractor against claims arising from the operations of any subcontractor.

Extensions - Mandatory:

- Aggregate Limits to apply per project.
- Full Contractual Liability extending to Hold Harmless Agreement.
- Contractual Liability Insurance is afforded per the definition of “insured contract” as defined in Form CG0001 with no endorsements that amend or restrict the definition of “insured contract”.
- The general liability is to be primary and non-contributory to any insurance carried by any additional insured.
- The general liability must not include any exclusion, limitation or restriction pertaining to interior or exterior work height; “action over” type claims; or “injury to employee or subcontractor” exclusions, nor any exclusions for Claims that fall within the Purview of New York Labor Law Sections 200, 240 &241.
- Waiver of Subrogation in favor of all additional insureds.

C. Umbrella Liability: The Contractor shall maintain for the life of the contract excess coverage for bodily injury and property damage in an amount not less than FIVE MILLION DOLLARS ($5,000,000.).

D. Commercial Automobile Liability - The Contractor shall take out and maintain during the life of the Contract such automobile public liability insurance as shall protect him and any subcontractor performing work covered by this Contract from claims for damages for personal injury, including accidental death as well as from claims for property damage which may arise from operations under this Contract, whether such operations be by himself or by any subcontractor, or by any one directly or indirectly employed by either of them and the amounts of such insurance shall be in an amount not less than ONE MILLION DOLLARS ($1,000,000.) for bodily injuries, including wrongful death per occurrence.

D. Blanket Waiver of Subrogation – The above policies for workers’ compensation insurance as well as comprehensive general liability insurance, automobile insurance, and excess umbrella liability insurance shall include waiver of transfer of rights of recovery against the Town of Riverhead, The Riverhead Water District, and H2M architects + engineers. Such waiver of subrogation shall be evidenced by certificate of insurance or copy of endorsement to the appropriate policy.

E. Owner's Protective Liability Insurance – (TOWN DISTRICT, and/or TOWN BOARD, TOWN OF RIVERHEAD as OWNER and H2M architects + engineers as engineer) – If the Town of Riverhead, Riverhead Water District deem necessary, the Contractor shall furnish to the TOWN DISTRICT with respect to the operations he or any of his subcontractors perform, a regular Owner’s Protective Liability Insurance Policy for and in behalf of the TOWN DISTRICT and/or TOWN BOARD, TOWN OF RIVERHEAD as OWNER, providing for a limit of not less than ONE MILLION DOLLARS ($1,000,000.) each occurrence, a total limit of TWO MILLION DOLLARS ($2,000,000.) general aggregate for all damages arising out of bodily injuries to, or death of, two or more persons in any one accident; and regular Protective Property Damage Insurance

providing for a limit of not less than ONE HUNDRED THOUSAND DOLLARS ($100,000.) for all damages. The insurance must fully cover the legal liability of the TOWN DISTRICT, TOWN BOARD, TOWN OF RIVERHEAD as OWNER and H2M architects + engineers as ENGINEER. The coverage provided under this policy must not be affected if the TOWN DISTRICT performs work in connection with the project either for, or in cooperation with, the Contractor or as an aid thereto, whether the same be a part of the Contract or separate therefrom, by means of its own employees or agents, or if the TOWN DISTRICT directs or supervises the work to be performed by the Contractor.

F. Pollution Liability (where applicable) - If contract involves environmentally regulated substances or Hazardous material exposure(s) and/or the disposal of waste or other hazardous substance from the worksite, the contractor shall maintain Contractor's Pollution Liability including Pollution Legal Liability insurance in the amount of at least $5,000,000. per occurrence for 3rd party liability and clean-up. This coverage is to remain in effect for a minimum of (5) five years following the completion of work. If written on a claim made basis, the retroactive date must pre-date the inception of the contract or agreement.

11 PROOF OF CARRIAGE OF INSURANCE

The Contractor shall furnish the TOWN DISTRICT with certificates of each insurer insuring the Contractor or any subcontractor under this Contract, except with respect to subdivision D. of paragraph 10. In respect to this paragraph, the Contractor shall furnish the TOWN DISTRICT with the original insurance policy and a copy to the Engineer.

Both certificates, as furnished, and the insurance policy, as required, shall bear the policy numbers, the expiration date of the policy and the limit or limits of liability thereunder. Both the certificates and the policy shall be further endorsed to provide the TOWN DISTRICT and Engineer with any notice of cancellation at least ten (10) days prior to the actual date of such cancellation.

12. COMPLIANCE WITH LABOR AND PENAL LAWS

The Contractor hereby expressly agrees to comply with all the provisions of the Labor Law and any and all amendments thereto, insofar as the same are applicable to this Contract. The Labor Laws, as amended, provide that no laborer, worker or mechanic in the employ of the Contractor, subcontractor or other person doing or contracting to do the whole or a part of the work contemplated by this Contract, shall be permitted or required to work more than eight (8) hours in any one calendar day, except in cases of extraordinary emergency caused by fire, flood, or danger to life or property; that no such person shall be employed more than eight (8) hours in any day or more than five (5) days in any week, except in such emergency; that the wages to be paid for a legal day's work as hereinbefore defined, to laborers, workers, or mechanics upon the work called for under this Contract, or for any materials used upon or in connection therewith shall not be less than the prevailing rate for a day's work in the same trade or occupation in the locality within the State where such work is to be done and each laborer, worker, or mechanic employed by the Contractor, subcontractor, or other person about or upon the work shall be paid the wages herein provided; that employees engaged in the construction outside the limits of cities and villages are no longer exempt from the provisions of the Labor Laws which required the payment of the prevailing rate of wages and the eight (8) hour day.

Section 220A of the Labor Law, as amended by Chapter 472 of the Laws of 1932, provides that before payment is made by or on behalf of the State or any City, County, Town or Village or other civil division of the State, of any sums due on account of a con-tract for a public improvement, it is the duty of the Comptroller or the financial officer of the Municipal Corporation to require the Contractor and each and every subcontractor to file a certified statement in writing, in satisfactory form, certifying to the amounts then due and owing to any and all laborers for daily or weekly wages on account of labor

performed upon the work of the Contract, setting forth therein the names of the persons whose wages are unpaid and the amount due each, respectively.

Section 220B of the Labor Law, as amended, provides that any interested person who shall have previously filed a protest in writing objecting to the payment to any Contractor or subcontractor to the extent of the amount or amounts due or to become due to him for daily or weekly wages for labor performed on the public improvement for which the Contract was entered into, or if, for any other reason, it may be deemed advisable, the Comptroller of the State or other financial officer of the Municipal Corporation may deduct from the whole amount of any payment on account thereof the sum or sums admitted by any Contractor or subcontractor in such statement or statements so filed to be due and owing by him on account of labor performed and may withhold the amount so deducted for the benefit of the laborers for daily or weekly wages, whose wages are unpaid as shown by the verified statements filed by any Contractor or subcontractor and may pay directly to any person the amount or amounts so shown to be due for such wages.

Section 220C of the Labor Law, as amended, provides the penalty for making a false oath or verification.

Section 220D of the Labor Law provides that the advertised specifications for every Contract for the construction, reconstruction, maintenance and/or repair of highways to which the State, County, Town and/or Village is a party shall contain the provision stating the minimum rate of hourly wage that can be paid, as shall be designated by the Industrial Commissioner, to the laborers employed in the performance of the Contract, either by the Contractor, subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the Contract, and the Contract shall contain a stipulation that such laborers shall be paid not less than such hourly minimum rate of wage. Any person or corporation that willfully pays after entering into such Contract less than such stipulated minimum hourly wage scale shall be guilty of a misdemeanor and, upon conviction, shall be punished for a first offense by a fine of Five Hundred Dollars ($1,000.00) or by imprisonment for not more than thirty (30) days, or by both fine and imprisonment for a second offense by a fine of One Thousand Dollars ($1,000.) and, in addition thereto, the Contract on which the violation has occurred shall be forfeited; and no such person or corporation shall be entitled to receive any sum or nor shall any officer, agent or employee of the State pay the same or authorize its payment from the funds under his charge or control to any person or corporation for work done upon any contract, on which the Contractor has been convicted of second offense in violation of the provisions of this Section.

The minimum wage rates established by the Industrial Commissioner, State of New York, for this Contract, are as set forth in the INFORMATION FOR BIDDERS.

All excavation shall be done in compliance with Article 36 of the General Business Law and notices given as provided by GBL Section 761.

13. PAYMENT OF EMPLOYEES

The Contractor and each of his subcontractors shall pay each of his employees engaged in work on this project under this Contract in full (less deductions made mandatory by law) in cash and not less often than once each week.

14. ESTIMATES AND PAYMENTS

Progress Payments: During the progress of the work the Contractor shall submit a payment requisition to the Engineer. The Engineer will review the requisition and prepare a payment request based on the estimated amount of work performed and the quantity of materials furnished, based on the prices set forth in the Proposal. In consideration of the work done and the materials furnished, the TOWN DISTRICT will pay or cause to be paid to the Contractor the amount estimated by the Engineer as due him less a sum equal to five percent (5%) of such amount and less such additional amount as may be

necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitable discharged. The making of any such estimate or payment made thereon shall not be taken or construed as an acceptance by the Engineer or the TOWN DISTRICT of any work so estimated and paid for. The amount of the monthly estimate remaining unpaid will be retained by the TOWN DISTRICT as a guarantee that the Contractor will faithfully and completely fulfill all obligations imposed by the Contract and Specifications, and against any damages incurred by the TOWN DISTRICT by reason of any failure on the part of the Contractor to fulfill all conditions and obligations herein contained. All partial payments are subject to correction in any subsequent payment. The retained amounts shall be paid as set forth in the following subsection B.

Final Payment: Thirty (30) days after the Contractor shall have substantially completed the work required of it under the Contract the Engineer will prepare an approval of Final Payment Request. Thereafter the TOWN DISTRICT will pay to the Contractor the remaining amount of the Contract balance less a sum equal to two (2) times the value of any remaining items to be completed and less an amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged. As the remaining items of work are satisfactorily completed or corrected, the TOWN DISTRICT shall promptly pay, upon receipt of a requisition for these items less an amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged. Any claims, liens and judgments referred to in this section shall pertain to the project and shall be filed in accordance with the terms of the applicable Contract and/or applicable laws. Final Payment will not be issued without the required Maintenance Bond as described in Section 9C of this contract.

The Engineer shall make due measurement of the work done during the progress of the work and his estimate shall be final and conclusive evidence of the amounts of work performed by the Contractor under, and by virtue of, this agreement, and shall be taken as the full measure of compensation to be received by the Contractor. When requested by the Contractor, the Engineer shall measure, re-measure or re-estimate any portion of the work; but the expense of such re-measurement or re-estimating shall, unless material error be proved, be paid for by the Contractor.

Should all work not be completed and final payment request not submitted within one (1) year after the punch list has been issued, the TOWN DISTRICT will be under no obligation to make final payment.

15. ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE

The acceptance by the Contractor of the final payment shall be, and shall operate as a release to the TOWN DISTRICT from all claims and all liabilities to the Contractor for all things done or furnished in connection with this work, and for every act and neglect of the TOWN DISTRICT and other relating to, or arising out of, this work, excepting the Contractor's claims for interest upon the final payment, if these payments be improperly delayed. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from any obligations under this Contract or the Performance Bond.

16. CONSTRUCTION REPORTS

The Contractor shall submit to the Engineer prior to the commencing of any work under this Contract a detailed schedule and plan of operation, indicating the manner in which the Contractor proposes to prosecute the work, and a time schedule therefore. Such schedules are not intended to bind the Contractor to a predetermined plan or procedure, but rather to enable the Engineer to coordinate the work of the Contractor with work required of and to be performed by others.

The Contractor shall furnish the Engineer with periodic estimates for partial payments as required elsewhere in the contract documents and, in addition thereto, will furnish the Engineer with a detailed estimate for final payment. Prior to being eligible to receive final payment under this Contract, the Contractor shall furnish the Engineer with substantial proof that all bills for services rendered and materials supplied have been paid. The enumeration of the above reports in no way relieves the

Contractor of his responsibility under existing Federal or State laws of filing such other reports with agencies other than the TOWN DISTRICT as may be required by such existing laws or regulations.

17. INSPECTION AND TESTS

All material and workmanship shall be subject to inspection, examination and test by the Engineer and other representatives of the TOWN DISTRICT at any time during the construction and at any and all places where manufacturing of materials used and/or construction is carried on.

Without additional charge, the Contractor shall furnish promptly all reasonable facilities, labor and materials necessary to make tests so required safe and convenient.

If, at any time, before final acceptance of the entire work, the Engineer, with the TOWN DISTRICT's approval, considers necessary or advisable an examination of any portion of the work already completed, by removing or tearing out the same, the Contractor shall, upon request, furnish promptly all necessary facilities, labor and materials for such examination. If such work is found to be defective in any material respect, due to the fault of the Contractor or any subcontractor, or if any work shall be covered over without the approval or consent of the Engineer, with the TOWN DISTRICT's approval, whether or not the same shall be defective, the Contractor shall be liable for the expenses of such examination and of satisfactory reconstruction.

If, however, such approval and consent shall have been given, and such work is found to meet the requirements of this Contract, the Contractor shall be recompensed for the expense of such examination and reconstruction in the manner herein provided for the payment of costs of extra work pursuant to a Change Order signed by the TOWN DISTRICT and the Contractor.

The selection of laboratories and/or agencies for the inspection and tests of supplies, materials or equipment shall be subject to the approval of the Engineer. Satisfactory documentary evidence that the material has passed the required inspection and test must be furnished the Engineer prior to the incorporation of the material in the work.

Any rejected work shall be removed from the site of the project completely at the expense of the Contractor.

18. PLANS AND SPECIFICATIONS - INTERPRETATIONS

The Contractor shall keep at the site of the work a clean and neat copy of the Plans and Specifications signed and identified by the Engineer. Anything shown on the Plans and not mentioned in the Specifications or mentioned in the Specifications and not shown on the Plans shall have the same effect as if shown or mentioned respectively in both. In case of any conflict or inconsistency between the Plans and Specifications, the Plans shall govern. Any discrepancy between the figures and drawings shall be submitted to the Engineer, whose decision therein shall be conclusive.

19. SUBSURFACE CONDITIONS FOUND DIFFERENT

Should the Contractor encounter subsurface conditions at the site materially differing from those shown on the Plans or indicated in the Specifications, he shall immediately give notice to the Engineer of such conditions before they are disturbed; the Engineer shall thereupon promptly investigate the conditions and if he finds that they materially differ from those shown on the Plans or indicated in the Specifications, he shall at once make such changes in the Plans and/or Specifications as he may find necessary.

Any increase or decrease of cost resulting from such changes will be adjusted in the manner provided herein for adjustment as to extra and/or additional work and changes shall be by Change Order executed by the TOWN DISTRICT and Contractor.

20. CONTRACTOR'S TITLE TO MATERIALS

No material 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 good title to all materials and supplies used by him in the work.

21. SUPERINTENDENCE BY CONTRACTOR

At the site of the work the Contractor shall employ a Construction Superintendent or Foreman who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to the Engineer and shall be one who can be continued in that capacity for the particular job involved unless he ceases to be on the Contractor's payroll.

22. PROTECTION OF WORK, PERSONS AND PROPERTY

Precaution shall be exercised at all times for the proper protection of all persons, property and work. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery equipment and all hazards shall be guarded or eliminated in accordance with the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable law. The Contractor shall furnish entirely at his own expense any and all additional safety measures deemed necessary by the TOWN DISTRICT or its Engineer to adequately safeguard the traveling public. The Contractor shall give notice to the owners of all utilities which may serve the area and request their assistance in predetermining the location and depth of the various pipes, conduits, manholes and other underground facilities.

The Contractor shall, at all hours of the day, safely guard and protect his own work and adjacent property from any damage and shall replace or make good any such damage, loss or injury unless such be caused directly by errors contained in the contract documents, or by the TOWN DISTRICT or its duly authorized representatives.

The Contractor shall provide and maintain such watchers, barriers, lights, flares and other signals, at his own expense, as will effectively prevent any accident in consequence of his work for which the TOWN DISTRICT might be liable. The Contractor shall be liable for all injury or damage caused by his act or neglect, or that of his employees.

23. PATENT RIGHTS

As part of his obligation hereunder and without any additional compensation, the Contractor will pay for any patent fees or royalties required in respect to the work or any part thereof and will fully indemnify the TOWN DISTRICT for any loss on account of any infringement of any patent rights, unless prior to his use in the work of a particular process or a product of a particular manufacturer, he notifies the TOWN DISTRICT in writing that such process or product is an infringement of a patent.

24. REPRESENTATIONS OF CONTRACTOR

The Contractor represents and warrants:

A. That he is financially solvent and that he is experienced in and competent to perform the type of work involved under this Contract and able to furnish the plan, materials, supplies and/or equipment to be furnished for the work; and

B. That he is familiar with all Federal, State and Municipal Laws, ordinances and regulations which may in any way affect the work of those employed hereunder, including but not limited to any special acts relating to the work; and

C. That such work required by these contract documents as is to be done by him can be satisfactorily constructed and used for the purpose for which it is intended and that such construction will not injure any person or damage any property; and

D. That he has carefully examined the Plans, Specifications, and the site of the work, and that from his own investigation he has satisfied himself as to the nature and location of the work, the character, location, quality and quantity of surface and subsurface materials, structures and utilities likely to be encountered, the character of equipment, and other facilities needed for the performance of the work, the general local conditions which may in any way affect the work or its performance.

25. AUTHORITY OF THE ENGINEER

In the performance of the work, the Contractor shall abide by all orders and directions and requirements of the Engineer and shall perform all work to the satisfaction of the Engineer, at such time and places, by such methods, and in such manner and sequence as he may require. The Engineer shall determine the amount, quality, acceptability and fitness of all parts of the work, shall interpret the plans, specifications, contract documents and any extra work orders and shall decide all other questions in connection with the work. Upon request, the Engineer shall confirm in writing any oral orders, directions, requirements or determinations. The enumeration herein or else-where in the contract documents of particular instances in which the opinion, judgment, discretion or determination of the Engineer shall control, or in which work shall be performed to his satisfaction or subject to his approval, or inspection, shall not imply that only matters similar to those enumerated shall be so governed and so performed, but without exception all the work shall be governed and so performed. Nothing herein shall be construed to give the Contractor a claim for extra work unless prior thereto an appropriate Change Order has been executed by the TOWN DISTRICT and Contractor for such work.

26. SURVEYS

The Contractor shall provide all layouts, measurements, lines, and grades necessary for the execution of the work, and will furnish the necessary stakes and spikes for laying out such lines and grades and the unskilled labor necessary to place same and/or assist in measuring.

27. CHANGES AND ALTERATIONS

The TOWN DISTRICT reserves the right to make alterations in the location, line, grade, plans, form or dimensions of the work, or any part thereof, either before or after the commencement of the construction. If such alterations diminish the amount of work to be done, no claim for damages or anticipated profits will be warranted on the work which may be dispensed with. If such alterations increase the amount of work, such increases shall be paid for according to the quantity of work actually done and at the unit prices for such work as contained in the schedule of prices.

If such alterations decrease the amount of work, such decreases shall be a credit to the TOWN DISTRICT based on the quantity of work not performed as agreed to by the TOWN DISTRICT and the Contractor and at the unit prices for such work as contained in the Schedule of Prices.

28. CORRECTION OF WORK

All work and all materials, whether incorporated into the work or not, all processes of manufacture and all methods of construction shall be, at all times and places, subject to the inspection of the Engineer who shall be the final judge of quality, materials, processes of manufacture and methods of construction suitable for the purpose for which they are used. Should they fail to meet his approval they shall be

forthwith reconstructed, made good and replaced and/or corrected as the case may be, by the Contractor at his own expense. Rejected materials shall immediately be removed from the site.

If, in the opinion of the Engineer, it is not desirable to replace any defective or damaged materials or to reconstruct or correct any portion of the work injured or not performed in accordance with the contract documents, the compensation to be paid to the Contractor hereunder shall be reduced by such amount as, in the judgment of the Engineer, shall be equitable.

The Contractor expressly warrants that his work shall be free from any defects in materials or workmanship, and agrees to correct any defects, settlements, or shrinkages which may appear within one (1) year following the date of the final payment request. Neither the acceptance of the completed work nor payment therefor shall operate to release the Contractor or his sureties from any obligations under or upon this Contract or the Performance Bond.

29. WEATHER CONDITIONS

The Contractor will and will cause his subcontractors to protect carefully his and their work and materials against damage or injury from the weather. If any work or materials shall have been damaged or injured by reason of the failure on the part of the Contractor or any of his subcontractors to protect his, or their work, such work and materials shall be removed and replaced at the expense of the Contractor.

30. THE TOWN DISTRICT'S RIGHT TO WITHHOLD PAYMENTS

The TOWN DISTRICT may withhold from the Contractor so much of any approved payments due him as may, in the judgment of the TOWN DISTRICT, be necessary:

A. To assure the payment of just claims then due and unpaid of any persons supplying labor or materials for the work.

B. To protect the TOWN DISTRICT from loss due to defective work not remedied; or

C. To protect the TOWN DISTRICT from loss due to injury to persons or damage to the work or property of other contractors or subcontractors or others, caused by the act or neglect of the Contractor or any of his subcontractors. The TOWN DISTRICT shall have the right, as agent for the Contractor, to apply any such amount so withheld in such manner as the TOWN DISTRICT may deem proper to satisfy such claims or to secure such protection. Such application of such money shall be deemed payments for the account of the Contractor.

31. THE TOWN DISTRICT'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

The TOWN DISTRICT may terminate the contract, If:

A. The Contractor shall file for any form of bankruptcy relief or make an assignment for the benefit of creditors; or

B. A receiver or liquidator shall be appointed for the Contractor for any of his property and shall not be dismissed within twenty (20) days after such appointment, or the proceedings in connection therewith shall not be stayed on appeal within the said twenty (20) days; or

C. The Contractor shall violate any provision of this Contract; or

D. The Contractor shall fail or refuse to regard laws, ordinances, regulations, or the instructions of the Engineer and/or the TOWN DISTRICT.

Then, and in any such event, the TOWN DISTRICT without prejudice to any other rights or remedy it may have, and after seven (7) days written notice to the Contractor and Contractor's Surety may terminate the employment of the Contractor and take possession of the premises and all material, tools and appliances therein, and complete the work by contract or otherwise, as the TOWN DISTRICT solely may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the work is finished.

If the unpaid balance of the compensation to be paid the Contractor hereunder shall exceed the expense of so completing the work (including compensation for additional managerial, engineering, administration, legal, testing and observation services and any damages for delay), such excess shall be paid to Contractor.

If the expense shall exceed the unpaid balance, the Contractor and his sureties shall be liable to the TOWN DISTRICT for such excess.

32. CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

If the work shall be stopped by order of the Court or any public authority, Federal or State agency, for a period of three (3) months through no act or fault of the Contractor or any of his agents, servants, employees, materialmen, or subcontractors, the Contractor may, upon ten (10) days notice to the TOWN DISTRICT, discontinue his performance of the work and/or terminate the Contract.

Upon termination by the Contractor the TOWN DISTRICT may take possession of the work and complete the work by Contract or otherwise, as the TOWN DISTRICT solely may deem expedient.

If the Contract is terminated by the Contractor, the liability of the TOWN DISTRICT to the Contractor shall be for all work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment, including reasonable profit and damages.

33. RESPONSIBILITY OF WORK

The Contractor agrees to be responsible for the entire work embraced in this Contract until its completion and final acceptance, and that any unfaithful or imperfect work that may become damaged from any cause, either by act or commission or omission to properly guard and protect the work that may be discovered at any time before the completion and acceptance shall be removed and replaced by good and satisfactory work without any charge to the TOWN DISTRICT and that such removal and replacement will be performed immediately on the requirement of the Engineer, notwithstanding the fact that it may have been overlooked by the proper inspector, and partial payment made thereon. It is fully understood by the Contractor that the inspection of the work shall not relieve him of any obligation to do sound and reliable work as herein prescribed, and that any omission to disapprove of any work by the Engineer at or before the time of a partial payment or other estimate shall not be construed to be an acceptance of any defective work.

34. USES OF PREMISES AND REMOVAL OF DEBRIS

The Contractor expressly undertakes at his own expense:

A. To take every precaution against injury to persons or damages to property.

B. To store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the work as will not unduly interfere with the progress of his work or the work of any of his subcontractors, or other contractors.

C. To place upon any of the completed work only such superimposed loads as are consistent with the safety of that portion of the work.

D. To frequently clean up all refuse, rubbish, scrap materials and debris caused by the operations to the end that at all times the site of the work shall present a neat and orderly and workmanlike appearance.

E. Before the Engineer's approval of the Final Payment Request, to remove all surplus material, temporary structures, plants of any description and debris of any and every nature resulting from his operations and to put the site in a neat and orderly condition.

35. POWER OF THE CONTRACTOR TO ACT IN AN EMERGENCY

In case of an emergency which threatens loss or injury to property and/or safety to life, the Contractor will be permitted to act as he sees fit without previous instructions from the TOWN DISTRICT. He shall notify the TOWN DISTRICT thereof immediately thereafter and any compensation claimed by the Contractor due to extra work made necessary because of his acts in such emergency shall be submitted to the TOWN DISTRICT for approval and Change Order executed by the TOWN DISTRICT and the Contractor.

Where the Contractor has not taken action but has notified the Engineer of an emergency indicating injury to persons or damage to adjoining property or to the work being accomplished under this Contract, then upon authorization from the Engineer to prevent such threatened injury or damage, he shall act as instructed by the Engineer. The amount of reimbursement claimed by the Contractor on account of any such action shall be deter-mined in the manner provided herein for the payment of extra work and shall be incorporated into a Change Order executed by the TOWN DISTRICT and Contractor.

36. SUITS AT LAW

The Contractor shall indemnify and save harmless the TOWN DISTRICT from and against all suits, claims, demands or actions for any injury sustained or alleged to be sustained by any party or parties in connection with the construction of the work or any part thereof, or any commission or omission of the Contractor, his employees or agents or any subcontractors and in case any such action shall be brought against the TOWN DISTRICT, the Contractor shall immediately take care of and defend the same at his own cost and expense.

37. PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and, if through mistake or otherwise, any such provision is not inserted or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

38. SUBLETTING, SUCCESSOR AND ASSIGNS

The Contractor shall not sublet any part of the work under this Contract, nor assign any money due him hereunder without first obtaining the written consent of the TOWN DISTRICT. This Contract shall inure to the benefit of and shall be binding upon the parties hereunder and upon their respective successors and assigns, but neither party shall assign or transfer his interest herein in whole or in part without consent of the other.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals the day and year first above written.

RIVERHEAD WATER DISTRICT:

BY: _____ (TOWN SEAL)
TIM HUBBARD, SUPERVISOR

CONTRACTOR:

BY: _____

TITLE: _____ (SEAL)

STATE OF NEW YORK)
) ss:
COUNTY OF SUFFOLK)

On the _____ day of _____, 20___, before me personally came TIM HUBBARD, to me known, who being by me duly sworn, did depose and say that he is the duly elected SUPERVISOR of the TOWN OF RIVERHEAD, COUNTY OF SUFFOLK, NEW YORK, and that at a meeting of the Town Board of the Town of Riverhead, duly held on the _____ day of _____ _____, 20___, the said Board, also acting in its capacity as the Governing Body of the Riverhead Water District, authorized the said SUPERVISOR to execute all and any contracts on behalf of the Board; that he knows the seal of said Town, and that the said Water District seal is also the seal of the Town of Riverhead; that the seal affixed to the foregoing instrument is its corporate seal; that it was affixed thereto by order of the said Board, and that he signed his name thereto and executed the said instrument on behalf of the said Water District by like order and authority.

_____
NOTARY PUBLIC

ACKNOWLEDGMENT OF CONTRACTOR, IF A CORPORATION

STATE OF NEW YORK)
) ss:
COUNTY OF)

On this _____ day of _____, 20___, before me personally came and appeared _____, to me known, who by me being duly sworn, did depose and say that he resides at _____ that he is the _____ of _____, the Corporation described in and which executed the foregoing instrument, that he knows the seal of said corporation, that one of the seals affixed to said instrument is such seal, that it was so affixed by order of the Directors of said Corporation, and that he signed his name thereto by like order.

_____
NOTARY PUBLIC

ACKNOWLEDGMENT OF CONTRACTOR, IF A PARTNERSHIP

STATE OF NEW YORK)
) ss:
COUNTY OF)

On this _____ day of _____, 20___, before me personally came and appeared _____, to me known, and known to me to be one of the members of the firm of _____, described in and who executed the foregoing instrument, and he acknowledged to me that he executed the same as and for the act and deed of said form.

_____
NOTARY PUBLIC

END OF SECTION

1. GENERAL CONDITIONS

The "General Conditions" are hereby made a part of these specifications and are attached herein.

Where any article of the General Conditions is supplemented hereby, the provisions of such article shall remain in effect. All the supplemental provisions shall be considered as added thereto. Where any such article is amended, voided or superseded thereby, the provisions of such article not so specifically amended, voided or superseded shall remain in effect.

Work, materials, plant, labor and other requirements of the General Conditions shall be furnished by the contractor. No direct payment shall be made for these General Conditions, and payment shall be deemed to be included in the Contract price or various items of the entire Contract.

2. CONTRACT DOCUMENTS

The Contract Documents include, but are not limited to, the General Conditions, Detailed Specifications, Plans, Proposal Form, Contract and other sections as either cited on the Index page(s) or actually included in the bound documents.

Each section of the Contract Documents is intended to be complementary to the other sections. It is intended that they include all items of labor and materials and everything required and necessary to complete the work, even though some items of work or materials may not be particularly mentioned in every section or may have been inadvertently omitted from the Drawings or Specifications or both.

3. APPROVAL OF SUBCONTRACTORS AND MATERIALS

Prior to commencing any work under this Contract, the contractor shall submit to the Engineer for approval a list of all the subcontractors and material suppliers it proposes to use for this Contract. No subcontractor or material supplier will be permitted to deliver materials or perform any work on this Contract until it has been approved by the Engineer.

4. INTERPRETATION OF DRAWINGS, ETC.

In the event of discrepancies between the Drawings and the Specifications, the following order shall be given preference when making interpretations:

a. Addenda (later dates to take precedence over earlier dates).

b. Drawings (schedules or notes to take precedence over other data shown on Drawings).

c. Technical Specifications

d. General Conditions

On all Plans, Drawings, etc., the figure dimensions shall govern in the case of discrepancy between the scales and figures.

The contractor shall take no advantage of any error or omission in the Plans, or of any discrepancy between the Plans and Specifications, and the Engineer shall make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the Specifications and of the Plans as construed by him, and his decision shall be final.

All work that may be called for in the Specifications and not shown on the Plans, or shown on the Plans and not called for in the Specifications, shall be furnished and executed by the contractor as if designated in both. Should any work or material be required which is not denoted in the Plans and Specifications, either directly or indirectly, but which is, nevertheless, necessary for the proper carrying out of the intent

thereof, it is understood and agreed that the same is implied and required, and that the contractor shall perform such work and furnish such materials as if they were completely delineated and described.

5. ADDITIONAL WORK

Additional work, if required to be performed under this Contract, will be in accordance with the applicable paragraphs of the Contract. The Engineer shall be the sole judge as to whether such work was intended as part of the Contract or is in addition thereto.

6. SAFETY PROVISIONS

The contractor shall take every precaution and shall provide such equipment and facilities as are necessary or required for the safety of its employees. In case of an accident, first aid shall be administered to any who may be injured in the progress of the work. In addition, the contractor shall also be prepared for the removal to the hospital for treatment of any employee either seriously injured or ill.

7. SANITARY REGULATIONS

In addition to compliance with the Occupational Safety and Health Act, the contractor shall erect and maintain necessary sanitary conveniences for the use of employees on the work. Such conveniences shall be properly secluded from observation, and their use shall be strictly enforced. Such sanitary conveniences shall be constructed in compliance with all laws, ordinances or regulations governing these facilities. The contents of same shall be removed with sufficient frequency to prevent nuisance, and disposed of to the satisfaction of the Engineer.

The contractor shall obey and enforce such other sanitary regulations and orders and shall take such precautions against infectious diseases as may be deemed necessary. In case any infectious diseases occur among its employees, it shall arrange for the immediate removal of the patient from the work and his isolation from all persons connected with the work.

8. RESPONSIBILITY OF ENGINEER AND CONTRACTOR DURING CONSTRUCTION

By means of the on-site observations of the work in progress, the Engineer will endeavor to provide protection for the Owner against defects and deficiencies in the contractor's work, but the furnishing of such services shall not include construction review of the contractor's construction means, methods, techniques, sequences or procedures, or of any safety precautions and programs in connection with the work.

The contractor is responsible for complete conformance to the Plans and Specifications, proper construction procedures, coordination with subcontractors, other contractors and utilities, and safe working conditions for its employees.

9. LABOR

All contractors and subcontractors employed upon the work shall and will be required to conform to the Labor Laws of the State of New York and the various acts amendatory and supplementary thereto; and to all other laws, ordinances and legal requirements applicable thereto. All contractors and subcontractors shall submit original copies of certified payroll records for each period worked at the site. In addition all contractors and subcontractors shall provide a completed Affidavit of Labor Form 220 and Riverhead Town Wage Disclaimer Form for each payroll week prior to issuance of any partial or final payment.

All labor shall be performed in the best and most workmanlike manner by mechanics skilled in their respective trades. The standards of the work required throughout shall be of such grade as will bring results of the first class only.

Pursuant to Section 816-(b) of the New York Labor Law, the Riverhead Water District has adopted a Resolution relating to approved apprenticeship programs. If the successful bidder's bid hereunder exceeds the sum of $750,000.00, such bidder shall, prior to entering into a contract with the District, be required to have an appropriate apprenticeship agreement that has been registered with and approved by the Commissioner of the New York State Department of Labor pursuant to the requirements found in Article 23 of the New York Labor Law. Any subcontractors under this contract shall also, in all respects, comply with these provisions.

10. CLAIMS OR PROTESTS

If the contractor considers any work required of him to be outside the requirements of the Contract, or considers any record or ruling of the Engineers or Inspectors as unfair, he shall ask for written instructions or decisions immediately, and then file a written protest with the Owner against the same within five days thereafter, or be considered as having accepted the record or ruling.

11. NOTIFICATION, INTERFERENCE AND INJURY TO UTILITIES

The contractor shall cooperate in every way with the utility companies. All excavation shall be done in compliance with Article 36 of the General Business Law and notices given as provided by GBL, Section 761.

All conduits, water mains and gas mains encountered in the construction shall be properly and safely taken care of by the contractor, who shall, upon encountering same, notify the public corporation to whom they belong, in order that they may be changed in such a manner as not to interfere with the final construction.

In case any damage shall result to any service pipe for water or gas, or any private or public sewer or conduit by reason of negligence on the part of the contractor, he shall, without delay and at his own expense, repair same to the satisfaction of the Engineer, and in case such repairs are not made promptly or satisfactorily, the Owner may have the repairs made by another contractor or otherwise, and deduct the cost of same from any monies due or to become due the contractor.

12. INFRINGEMENT OF PATENTS

The contractor further agrees to hold himself responsible for any claims made against the Owner for any infringement of patents by the use of patented articles in any one phase of construction of the work and the completion of same, or any process connected with the work agreed to be performed under this Contract, or of any materials used upon said work and to save harmless and indemnify the Owner from all costs, expenses and damages which the Owner shall be obliged to pay by reason of any infringement or patents used in the construction and completion of the work.

13. DAMAGES

All damage, direct or indirect, of whatever nature resulting from either the performance of, or resulting to the work under, this Contract during its progress from whatever cause, shall be borne and sustained by the contractor, and all work shall be solely at his risk until the date of the final payment request.

14. GUARANTEE/WARRANTY

This contractor shall guarantee and warrant his work and that of his subcontractors against defects in workmanship and/or materials for a period of one (1) year from the date of final payment request by the Engineer, except as otherwise specified. Upon written notification from the Engineer, the contractor shall repair, replace or reconstruct such defects to the satisfaction of the Engineer at no cost to the Owner.

15. STANDARDIZATION

The general items specified with the Technical Specifications indicate specific manufacturers and/or catalog numbers etc., for the purpose of standardization within the District in order to minimize the stockpiling of replacement parts.

END OF SECTION

The **Wage Rates** schedule can be accessed and downloaded through the NYSDOL website: **https://dol.ny.gov/public-work-and-prevailing-wage** using the job-specific PRC# 2024011736.

END OF SECTION 007343

PART 1 - GENERAL

1.01 BRIEF PURPOSE OF PROJECT / GENERAL

A. The purpose of the project is construct a new booster pumping station and install all associated systems as shown in the Project Documents at the Town of Riverhead's site on East Winds Drive in Wading River. Additionally, this project will include site improvements such as grading, site fencing, new asphalt driveway, and new drainage recharge basin. Electrical scope will also include a new site service, transformer, and diesel generator.

B. This Section provides an abbreviated summary of the work for the Construction Contracts associated with the Owner's program to construct the project. The Owner has awarded a separate project for the construction of a new 2.5 million gallon pre-stressed concrete ground storage tank that will be constructed concurrently on-site with this project.

C. Each Contractor has been provided with copies of all relevant construction drawings for related construction contracts whose work may directly effect and impact the work under this Contract.
   1. Each Contractor shall provide a complete and operational project in anticipation of these affects and impacts.
   2. It is each Contractor's responsibility to investigate the work that will be performed by others and consider such in the conduct of his/her work.

1.02 NOMENCLATURE

A. Where the terms "Engineer/Architect", "Architect/Engineer", "Engineer", or "Architect" are used throughout these Contract Documents, they shall mean the firm of H2M architects + engineers as may be abbreviated by H2M.

B. The terms "Contractor" and/or "Prime Contractor" where used within the body of a specific Construction Contract, (i.e.; Contract G, Contract E, Contract H, Contract P, and Contract W), shall refer to the individual or company who has entered into an agreement with the Owner to perform the work contained within those Contract Documents. The lack of word capitalization shall be incidental.

C. The General Construction Contractor may be referred to as the "General Contractor", "Prime General Contractor", "Contract G Contractor" or similar wording. The lack of word capitalization shall be incidental. This Construction Contract shall be known as Contract G.

D. The Electrical Construction Contractor may be referred to as the "Electrical Contractor", "Prime Electrical Contractor", "Contract E Contractor" or similar wording. The lack of word capitalization shall be incidental. This Construction Contract shall be known as Contract E.

E. The Plumbing Construction Contractor may be referred to as the "Plumbing Contractor", "Prime Plumbing Contractor", "Contract P Contractor" or similar wording. The lack of word capitalization shall be incidental. This Construction Contract shall be known as Contract P.

1.03 ABBREVIATED SUMMARY OF CONTRACT G WORK

A. Furnish all labor, equipment, materials, tools, means, methods, and incidentals necessary to complete the Work as required by the Contract Documents for this Construction Contract. Each contractor shall coordinate, through the Owner/Engineer, the work of their contract with the work by others.

B. This following abbreviated summary is provided in order to briefly describe the work covered by the Contract Documents for this Construction Contract. It is not all inclusive of the work under the Contract.

C. The work includes, but is not limited to, the following:
   1. Furnishing of Inspector's/Engineer's Field Office (Trailer).
   2. Site supervision, management, and coordination of special inspections, and coordination with other Contracts, including site utilization plan and construction schedule.
   3. Furnish and maintain temporary dumpsters, waste containers and sanitary facilities.
   4. Preliminary site work including: utility mark-out, survey, erection of safety fencing, erosion control facilities, clearing and grubbing, and stabilized construction entrance.
   5. Protection of existing utilities and site structures.
   6. Excavation, removal of excess and/or unsuitable excavated material, sheeting reinforcement, import of suitable material, soil compaction and testing as necessary to install and construct all work shown and specified within the Contract Documents.
   7. Construction of new building, including: all concrete footings/foundations/walls, concrete slabs, concrete reinforcement, penetrations, structural steel, masonry, light-gauge steel, trusses, framing, roofing, windows, doors, siding, act ceiling, insulation, finishes, gutters, roof hatches etc.
   8. Furnish and install new louvers.
   9. Furnish and install new exhaust fans, supports, and associated equipment.
   10. Testing and balancing of fans.
   11. Surface preparation and coating of structural steel, walls, and other items as noted.
   12. Install epoxy floor coating system.
   13. Building signage.
   14. New asphalt paving for driveway areas.
   15. New chain-link site fencing and driveway gate.
   16. New sidewalks and concrete curbing.
   17. New concrete foundations and slabs for generator and diesel tank. Coordinate with Contract E for size, location, and penetrations.
   18. Site bollards and light pole base.
   19. Site restoration including final grading and placement of topsoil and seeding.
   20. New site drainage recharge basin, concrete spillway, blowoff structures and piping.
   21. Daily and final cleaning.
   22. Testing of installed equipment and work.
   23. Startup participation for the various equipment and systems of the project and provide complete service to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation.
   24. Project closeout submittals and record documents.

D. All other work shown and specified within the Contract Documents for Contract G.

1.04 ABBREVIATED SUMMARY OF CONTRACT E WORK

A. Furnish all labor, equipment, materials, tools, means, methods, and incidentals necessary to complete the Work as required by the Contract Documents for this Construction Contract. Each Contractor shall coordinate, through the Owner/Engineer, the work of their contract with the work by others.

B. This following abbreviated summary is provided in order to briefly describe the work covered by the Contract Documents for this Construction Contract. It is not all inclusive of the work under the Contract.

C. The work includes, but is not limited to, the following:
   1. Provide, install, maintain, and repair, if necessary, temporary power and light throughout the site and to the Owner/Engineer’s field office. Temporary power shall be provided at location(s) selected by the Engineer based on input by the General Contractor.

2. Provide, install, maintain, and repair, if necessary, temporary power and light throughout the site and to buildings. Temporary power shall be provided at location(s) selected by the Engineer based on input by the General Contractor.
3. Arrange for and install primary electric service, including coordination with utility company to deliver and set the new transformer and meter.
4. Main secondary feeders, power distribution, and instrumentation control wiring. Provide, mount, and install electrical conduit, wire, fittings, boxes, panels, and electrical accessories.
5. All clearing, excavation, filling, and backfilling associated with the installation of underground conduit, or wiring.
6. Setting of electrical sleeves and/or embedded conduit in all concrete construction.
7. New diesel generator and diesel storage tank, including furnishing, delivering, setting, and starting up equipment. Coordinate with Contract G for size, location, and penetrations through concrete foundation slabs. Furnish, install, and power level and leak sensors to diesel storage tank.
8. New ATS for generator.
9. New Motor Control Center.
10. New lighting fixtures, wiring and associated equipment.
11. New site light pole.
12. Furnish, install and power flow transmitters, flow recorders and install interconnecting wiring where said devices are to be provided as work of Contract E. Install and power flow transmitters, flow recorders and install interconnecting wiring where said devices are to be provided as work of other contracts.
13. New instrumentation including switches, transmitters, and recorders for flow and pressure.
14. New level transmitter for ground storage tank.
15. Furnish and install electric unit heaters and thermostats, including supports and associated equipment, and testing and balancing of systems.
16. All excavation, trenching, backfilling, and rough grading associated with the installation of pull-boxes, underground conduit, and wiring. Final restoration by Contract G.
17. Final electrical terminations to all control panels, pumping equipment, HVAC equipment, storage tanks, etc.
18. Wiring connections to all electrical equipment (including equipment furnished by others).
19. Connections to PLC for all control and telemetry equipment and devices.
20. Testing, programming and adjusting of all electrical systems.
21. Assist Contracts G & P in the start-up and testing of all equipment.
22. Startup participation for the various equipment and systems of the project. Provide complete service to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation. Provide systems and equipment training for Owner personnel.
23. Project closeout submittals and record documents.

D. All other work shown and specified in the Contract Documents for Contract E.

1.05 ABBREVIATED SUMMARY OF CONTRACT P WORK

A. Furnish all labor, equipment, materials, tools, means, methods, and incidentals necessary to complete the Work as required by the Contract Documents for this Construction Contract. Each contractor shall coordinate, through the Owner/Engineer, the work of their contract with the work by others.

B. This following abbreviated summary is provided in order to briefly describe the work covered by the Contract Documents for this Construction Contract. It is not all inclusive of the work under the Contract.

C. The work includes, but is not limited to, the following:

1. New interior large mechanical piping, valves, pipe supports, and accessories for booster can pumping system.
2. New buried site piping, valves, and accessories.
3. New penetration sleeves, placement to be coordinated with Contract G.
4. New booster can pumps, motors, discharge head, and accessories.
5. Install new steel casings.
6. Surface preparation and coating of all mechanical piping.
7. New pH and Cl2 analyzers and primary flow elements.
8. New calcium hypochlorite tablet chlorinator, pumps, injection piping, and leak sensor.
9. New water sampling lines.
10. New pressure monitoring lines.
11. New water service lines and backflow device.
12. New tankless hot water heater.
13. New interior and exterior emergency eyewash.
14. Testing and adjusting of mechanical systems.
15. Disinfection and water quality testing.
16. Startup participation for the various equipment and systems of the project. Provide complete services to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation. Provide systems and equipment training for Owner personnel.
17. Project closeout submittals.

D. All other work shown and specified in the Contract Documents for Contract P.

1.06 PARTIAL LISTING OF SPECIFIC CONTRACT REQUIREMENTS

A. The Contract Documents detail the work included in the Contract. Related requirements and conditions covered by the Contract Documents include, but are not limited to, the following:
1. Guidelines and requirements of the Occupational Safety and Health Administration.
2. Guidelines and requirements of the New York State Department of Environmental Conservation (NYSDEC).
3. Guidelines and requirements of the Suffolk County Department of Health Services.
4. Guidelines and requirements of the Town of Riverhead.
5. Local electrical utility requirements for construction, new services, alterations and related work.
6. Laws and requirements of New York State Department of Labor.
7. Laws and requirements of New York State Department of Transportation.

1.07 PARTIAL LISTING OF OVERALL CONTRACT REQUIREMENTS

A. The Contract Documents detail the work included in the Contract. Related requirements and conditions covered by the Contract Documents include, but is not limited to, the following:
1. Debris removal and daily and final cleaning up.
2. Coordination with the Owner and other contractors who have been awarded work by the Owner.
3. Coordination with utility companies necessary to schedule connection of services, and management of the installation.
4. Site utilization and management so as not to disrupt the Owner’s ability to operate the existing facilities in a safe and efficient manner.
5. By 3:00 PM of each Friday during the construction period, email a typed schedule to the Owner, Owner's inspector, and Engineer. Schedule shall summarize work for the following week, including material and equipment deliveries, special inspections, etc. per SECTION 003113 - CONSTRUCTION SCHEDULE.
6. Maintain the Town's ability to operate the facility at all times during the construction period.

7. Facilities to be used during the contract period that are to be used by the Town or their representatives and others involved with constructing the project.
8. Product and equipment storage and handling requirements.
9. Starting and adjusting of the equipment and systems required under the project.
10. Site safety in accordance with all applicable federal, state, and local regulations.
11. Project submittals, meetings, testing services, schedules, shop drawings, closeout procedures and documents, manuals, as-built drawings, and final commissioning of the work shall be provided as required by the Contract.
12. Provide and maintain, at all times, temporary roadways for site access to all parties involved with the project.
13. Site utilization and management so as to allow other prime contractors to perform work in conjunction with this project and to afford them equal opportunity and space to complete their contractual obligations with the Owner as solely defined by the Engineer.
14. To not hinder the Owner's ability to deliver a safe and potable water supply.

B. The Owner has or will award other construction contracts associated with this project.

C. It is anticipated that work of all the contracts will coincide with work of this Contract.

D. Each Contractor shall coordinate the work between the various construction contracts, through the Owner/Engineer, as required to complete the contract requirements in accordance with the requirements contained in Section 013100.

1.08 OWNER SUPPLIED PRODUCTS AND UTILITIES

A. The Owner will not be supplying equipment, labor, or tools for the project.

B. The Owner will pay for electricity usage. The restrictions on electrical usage shall be as follows:
1. Power tool usage during specified working hours will only be permitted.
2. Dewatering and trash pumps and portable heaters will not be permitted.
3. Sump pumps, if less than 1/3 horsepower will be allowed. Only two (2) sump pumps will be permitted to operate at the same time.
4. Power to the Owner/Engineer's trailer, if applicable.
5. Power to help cure concrete or painting systems will not be permitted.
6. Power to the Contractor's trailer will be permitted.

C. The Owner reserves the right to stop paying for electrical usage at any time if, in the opinion of the Owner/Engineer, the Contractor causes excessive electrical charges or does not conserve electricity to the maximum extent possible in the opinion of the Engineer. All Contractors shall conserve electricity during the course of construction.

1.09 EXISTING CONDITIONS

A. The Drawings show certain information that has been obtained by the Owner regarding various pipelines, structures, and utilities that exist at the location of the project both below and at grade.

B. The Owner and the Engineer expressly disclaim all responsibility for the accuracy or completeness of the information given on the Drawings with regard to existing facilities.

C. In the case where the Contractor discovers an obstruction not indicated on the Drawings or not described via specification reference, then the Contractor shall immediately notify the Engineer of the obstruction's existence.

D. The Engineer will determine if the obstruction is to be relocated or removed.

E. Compensation for this extra work will be paid for in accordance with the provisions in the Contract for "Extra Work".

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 011100

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Site access and control of areas outside of site.

B. Contractor use of the premises.

C. Contractor storage, parking and deliveries.

D. Work hours, employee conduct and miscellaneous employee requirements.

E. Contract requirements related to maintaining Owner's current operations and excess inspection required.

F. Suggested construction sequence.

1.02 SITE ACCESS AND CONTROL

A. Contractors shall use the designated entrance to the site as shown on the drawings. If no site entrance is designated, Contractors shall use an entrance designated by the Owner's Construction Representative.
   1. The Owner may permit, solely at the Owner's discretion, the temporary use of another entrance for site access.
   2. The Owner will only review requests made by the Contractors for an exception to the designated site entrance if made in writing at least 72 hours in advance of each of the times desired for use.

B. All contractors to maintain the entrance area clear of materials, vehicles and any other obstacle or debris. Failure to do so will result in a minimum back charge of $750 per occurrence.

C. An venue and event space is adjacent to the site. The Owner intends to be a good neighbor. Contractors shall not close any road for any period in time. The Contractors shall take whatever measures are necessary to not cause any inconvenience to the area's residents

D. All Contractors are responsible to employ methods to prevent construction materials and/or debris from leaving the site. All Contractors are responsible to routinely monitor the areas surrounding the site during the day as well as at the end of the work-day and to immediately clean up any area to its previous condition.

E. The Contractors shall employ methods to prevent the transmission of dirt from vehicles driving on exposed areas of the site from reaching the surrounding roadways. The Contractors will be responsible to immediately clean the roadway, should the measures being taken by the Contractors not satisfactorily control the transmission of any dirt to the roadway.

F. Any damages to areas outside the site, spills of soil, liquid, or any other material shall immediately be repaired, cleaned and restored to its previous condition.

G. The Contractors shall comply with all state and local requirements for allowable weight limits of vehicles on all roads.

H. The Owner reserves the right to back charge the Contractors for all costs associated with maintaining the grounds as well as maintaining areas outside the site, which may be disturbed by the Contractors should the Contractors fail to maintain or repair the aforementioned in a condition acceptable to the Owner.

I. The Contractor shall maintain the premises in a safe condition throughout the construction period. Compliance with OSHA regulations and site safety shall be the responsibility of the Contractor as it relates to work of the Contract. The posting of all applicable OSHA safety signs shall be the responsibly of the Contractor.

J. Keep all existing driveways, roads, and parking areas free and clear of materials and equipment. Do not unreasonably encumber the work area with materials and equipment.

K. Immediately remove excess excavated material or relocate to areas on the site requiring placement of fill. Do not stockpile excess material.

L. The Contractor is responsible for cleaning up the work area. Failure to maintain a clean work site daily, will result in others performing the work and the Contractor being back charged for the cleaning cost plus construction administration fees.

1.03 CONTRACTOR USE OF THE PREMISES

A. Premises, for the purpose of this Contract, shall mean the site, buildings and other structures located within the property line or in any temporary or permanent construction easements identified on the plans.

B. The Contractors shall use and manage the premises and the associated construction activities as follows:
   1. To not hinder the Owner's ability to operate their facilities.
   2. To allow other Contractors to install their work and complete their contractual obligations in the time period specified.
   3. To allow for stockpiling of construction material and debris without any significant hardship, as defined by the Owner's Construction Representative, on the Owner or other contractors.
   4. To allow for the stockpiling of excavated soil and imported fill, when called for, without any significant hardship, as defined by the Owner's Construction Representative, on the Owner or other contractors.
   5. To allow utility companies to install their work.
   6. To allow for the delivery of equipment and materials by independent trucking companies by leaving enough space for backing in and out of areas.
   7. To allow for the safe, unimpeded travel way of the Owners vehicles, Owner's Construction Representative's vehicles, Engineer's vehicles, construction vehicles and heavy construction equipment about the entire site.

C. Contractors shall be responsible for protecting Owner's property. All existing buildings, structures, shrubs, trees, lawn fixtures, sculptures and misc. equipment shall be protected at all times. Any removals or relocation of said objects, if allowed, shall be as directed by Owner's Construction Representative.

D. Contractors shall protect all of the physical structures, property and improvements upon the site from damage by their Work and shall immediately repair or replace damage caused by construction operations, employees or equipment employed by the Contractor. All labor, materials and equipment and outside contractors that are employed by the Owner to repair damage caused by the Contractor shall be billed to the Contractor directly or withheld from money due the Contractor for work already completed.

E. Immediately remove excess excavated material or relocate to areas on the site requiring placement of fill. Do not stockpile excess material on the site.

F. The construction site space is limited and it shall be the General Contractor's responsibility to manage the site during the entire construction period with input from all concerned parties as to meeting their needs. Equal consideration of the needs of others with that of the Contractor's shall be provided as judged by the Owner.

G. Due to the limited site area available for construction, staging areas shall be relocated several times during the various stages of construction. Additional compensation for relocating staging areas, equipment and material storage, and trailers are not to be considered an extra cost to the Contractor as this is an anticipated expense that shall be considered at the time of the bid.

H. Contractors are responsible for cleaning up their own materials and debris. Failure to maintain a clean work site daily will result in others performing the work and Contractors being back charged for the cleaning cost plus construction administration fees.

I. Refer to Section 015000 - Temporary Facilities and Controls for minimum rubbish removal requirements.

J. Do not discard or dispose of any waste on-site.

K. Open fires will not be permitted on the site.

L. Install erosion control measures as indicated in the Contract. The Contractor shall confine stormwater runoff to the site.

M. The General Contractor shall be responsible for managing dust as specified in Section 015719.

1.04 CONTRACTOR STORAGE, PARKING AND DELIVERIES

A. Contractors must provide exterior storage containers when required. Final location of storage container shall be determined by the Owner.

B. Do not unreasonably encumber the premises with materials and equipment. Do not store material in existing buildings. Store all equipment and materials to allow the Owner's employees to operate and conduct their business safely.

C. Confine premise storage areas to locations designated by the Owner. Immediately repair or replace damaged facilities to the satisfaction of the Owner and to a condition that existed before the damage occurred as determined by preconstruction photographs, or if photographs are unavailable, to that deemed by the Owner.

D. No storage materials will be permitted within the buildings at any time during construction.

E. Storage of chemicals and painting shall be outside the existing or new structures and shall follow manufacturer's guidelines.

F. Compressed gas containers shall be properly stored and secured per OSHA, to the satisfaction of the Owner. Failure to do so will result in a **[$250]** back charge, per occurrence.

G. Contractors shall provide minimum of 48 hours advance written notice to the Owner's Construction Representative for deliveries of materials, site visits by inspectors, manufacturer's representatives or any other occasion that impacts the use of the site. Contractors shall be responsible for any costs that are incurred by the owner, for failure to meet previously agreed upon appointments or work schedules.

H. Deliveries sent to the Owner will not be signed for or unloaded by the Owner. They will be directed to the construction site and if no employee is on site, the delivery will be rejected, at the contractor's expense.

I. Night deliveries of equipment (past the designated quitting time) will not be permitted. Do not schedule trucking companies to deliver equipment or wait for the job site to open. Delivery trucks shall not obstruct the site entrance, shall not sit within the neighborhood causing an obstruction or perceived nuisance, nor be left idling on or off the site for any period of time.

J. Parking shall be in the designated areas of the site only. All automotive type vehicles are to be locked when parked or unattended to prevent unauthorized use. Do not leave vehicles or equipment unattended with the motor running or the ignition key in place. Any vehicles or trucks in non-designated areas may be towed at contractor's expense.

1.05 WORK HOURS, EMPLOYEE CONDUCT AND MISCELLANEOUS EMPLOYEE REQUIREMENTS

A. The Contractors will be permitted to schedule working days and hours as specified in the General Terms and Conditions, if no times are specified therein then the work hours shall be Monday - Friday 7:00 am - 5:00 pm.

B. Employees are to act in a professional manner. Any employee using inappropriate language or who is disruptive to the work environment will be banned from the site.

C. Proper work attire is required. Shirts are to be worn at all times and no short pants are permitted.

D. Employees shall not converse with local residents or Owner's employees.

E. Any employee found under the influence of any drug or alcohol will be banned from the site.

1.06 CONTRACT REQUIREMENTS RELATED TO MAINTAINING OWNER'S CURRENT OPERATIONS AND EXCESS INSPECTION REQUIRED

A. All work shall be scheduled and performed in accordance with all requirements specified in this section and in Section 003113 - Construction Schedule, and per the contract drawings.

B. The Contractors shall schedule working days and hours as specified. The Contractors shall pay all excess costs for inspection services provided by the Owner/Engineer for working beyond the times specified.

C. The hourly rate paid for inspection services beyond normal working hours shall be at a maximum billing rate of **[$220]** per hour, which shall be used to compute the overtime hourly charge.

1.07 SUGGESTED CONSTRUCTION SEQUENCE

A. The following is one suggested general, not all-inclusive, sequence of construction that may be used to complete all the work under the Contract within the time specified.

B. Work restrictions may be noted throughout the suggested sequence provided below. The Contractor shall comply with all noted work restrictions that appear.

C. The following suggested sequence is provided for information only:
   1. Submit shop drawings, construction schedule, schedule of values, etc.
   2. Establish storage areas as required.

3. Perform site clearing and removals, excavate unsuitable material, and perform soil compaction and testing.
4. Construct building foundation.
5. Construct building walls and roofing system.
6. Install yard piping and fittings.
7. Install mechanical piping, mechanical and electrical equipment, and chemical systems.
8. Paint and pressure test piping.
9. Disinfect and test samples.
10. Startup and furnish reports.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 011400

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Site Utilization Plan requirements

1.02 SITE UTILIZATION PLAN REQUIREMENTS

A. The General Contractor shall prepare a Site Utilization Plan (SUP) showing staging areas, parking areas, stockpile areas, debris container areas, unloading areas, and trailer areas for review by the Engineer, Owner's Construction Representative, and other Prime Contractors. The length and number of meetings necessary to develop and adopt a SUP shall be as required.

B. Meetings will be held at the site with all concerned parties to assist the General Contractor in developing the criteria for the plan. During these meetings, all parties will present their needs and requirements for site utilization. As a minimum, each Prime Contractor shall be allocated the same amount of staging/parking/material storage area regardless of the dollar amount of their construction contract. Representatives from the local municipality or utility companies may be attending. The requirements of the local municipality and utility companies shall be incorporated into the SUP.

C. The General Contractor shall then prepare a draft site plan that attempts to incorporate the needs of all concerned parties. Another meeting will then be held at the site to review and present the plan. The plan shall then be revised at that meeting and adopted for use if it is acceptable to all relevant parties. If all parties cannot agree on an acceptable plan, then the Owner's Construction Representative will establish the Site Utilization Plan without any claims from any contractor.

D. Each Contractor, by submitting a bid, understands the importance of a workable Site Utilization Plan and also understands that the Owner's Construction Representative may be required to select a plan for each contractor to adopt that is not ideal to the planned construction activities anticipated before the bid was submitted. There shall be no claims for damages associated with site utilization.

E. If the General Contractor fails to prepare the Site Utilization Plan as stipulated above, then the Owner reserves the right to back charge the General Contractor for the costs associated with having a Site Utilization Plan developed.

F. If a Prime Contractor fails to participate or attend the meetings scheduled to develop the Site Utilization Plan then the Prime Contractor will forfeit any right to comment on the plan that is developed.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 011419

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Allowance pricing for the following items:
   1. Independent Laboratory Testing Allowance (Contracts G and P).
   2. Contingency Account (All Contracts).
   3. Utility Fee Allowance (Contract E).
   4. Fire Alarm and Security Device Allowance (Contract E).

B. This Section covers the requirements for use of the cash allowances listed above contained in the proposal (Bid Forms, Price Schedule) and included in the Contract Price bid by the Contractor and defines and stipulates the charges that will be paid for out of the stipulated allowances.

C. The Contractor shall include the cash allowances stipulated in this Section in the amount bid.

D. Eligible costs described in this Section, and Sections referenced herein, will be the only costs paid for out of the stipulated allowances.

E. All other costs associated with the project as specified and/or shown, including but not limited to the delivery, installation and all Contractor overhead and/or collateral expenses are to be distributed among the other portions of the work and shall be included in other bid items.

1.02 SUBMITTALS

A. Make all submissions under the provisions of Section 013300.

B. For each type of product/material specified to be furnished under allowance pricing provide documentation of the unit pricing on manufacturer's letterhead certifying pricing of the product/material.

C. Submit additional backup information to substantiate the invoiced amount(s) as the Engineer may require for review and approval, prior to order or payment of item.

D. Provide written breakdowns for extra work as the Owner may require.

1.03 CHANGES TO STIPULATED (CASH) ALLOWANCE

A. If the actual cost of services differs from the cash allowance, then the Contract Price will be adjusted accordingly.

1.04 PAYMENTS TO BE MADE OUT OF INDEPENDENT LABORATORY TESTING ALLOWANCE

A. Include the cash allowance amount indicated in the proposal for independent testing laboratory services specified in Section 014500. Show as a separate line item in the Schedule of Values.

B. The actual invoiced charges of the testing laboratory, including toning companies where called for, incurred for field and laboratory tests, as specified only in Section 014500 - Quality Control, shall be paid for out of the cash allowance.
   1. Any other requirement specified herein throughout these specifications for providing the services of an independent testing laboratory, underground utility location company, or similar outside independent service are to be borne by the Contractor.
   2. All costs for quality control services are to be included as part of the Contract Price (as-bid).

C. One (1) week prior to each partial payment, submit a certified invoice from each company listing and detailing the total costs incurred since the last invoice.
   1. The invoice shall be on company letterhead signed by an authorized representative of the company and shall include man-hours, tests conducted, date of tests and associated costs and fees.
   2. Payment for costs will not be made unless the information is provided and certified. Payment for costs will not be made unless the typed test data reports have been received by the Engineer.
   3. In the case of pipe toning, flags must be set to delineate the route of underground pipes and utilities prior to submission of partial payment request.

D. If in the event test results (provided by the independent testing laboratory) show non-compliance with these specifications, then at the option of the Contractor and only with the approval of the Owner, he may re-test samples to verify the original test results at his/her own expense.

E. Costs for re-testing failed components of the work, when ordered by the Engineer, will not be paid for out of the cash allowance and will be directly borne by the Contractor.

F. Funds remaining at project closeout shall be credited to the Owner.

1.05 PAYMENTS TO BE MADE OUT OF CONTINGENCY ACCOUNT

A. Include the cash allowance amount indicated in the proposal for use upon the Owner's instructions for additional improvements beyond those identified in the contract documents and for unforeseen conditions. Show as a separate line item in the Schedule of Values.

B. Should any additional work be required due to unforeseen conditions or Owner request for additional work, the cost shall be negotiated by the Engineer and paid for out of the allowance.

C. The Owner will draw funds from the contingency account only upon prior approval by the Owner's Construction Field Representative and Engineer.

D. Enclose backup documentation with the partial payment showing authorized deduct.

E. Funds remaining at project closeout shall be credited to the Owner.

1.06 PAYMENTS TO BE MADE OUT OF UTILITY FEE ALLOWANCE

A. Include the cash allowance amount indicated in the proposal for use upon the Owner's instructions for eligible charges from the utility company for the installation of a new electric service to the site.

B. Submit a certified invoice from PSEG-LI listing and detailing the total costs. The invoice shall be on the utility's company letterhead signed by an authorized representative of the company and shall include the total price and/or unit prices for associated costs and fees.

C. The Owner will draw funds from the account only upon prior approval by the Owner's Construction Field Representative and Engineer.

D. Enclose backup documentation with the partial payment showing authorized deduct.

E. Funds remaining at project closeout shall be credited to the Owner.

1.07 PAYMENTS TO BE MADE OUT OF FIRE ALARM AND SECURITY DEVICE ALLOWANCE

A. Include the cash allowance amount indicated in the proposal for use upon the Owner's instructions for eligible charges from their Fire Alarm vendor and Security vendor for the design and installation of devices for the fire alarm and security system.

B. Coordinate with the District's authorized vendors.

C. Submit a certified invoice from the vendors for the actual invoiced charges of the vendor. The invoice shall be on the vendor's company letterhead signed by an authorized representative of the company and shall include the total price and/or unit prices for associated costs and fees.

D. The Owner will draw funds from the account only upon prior approval by the Owner's Construction Field Representative and Engineer.

E. Enclose backup documentation with the partial payment showing authorized deduct.

F. Funds remaining at project closeout shall be credited to the Owner.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 012100

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes the requirements for substitution of specified products during construction.

B. *The* Engineer *will consider requests for substitutions only within* ***thirty (30)*** *days from the date of the Notice to Proceed.*

C. Only products not specifically named in the bid are eligible for substitution in accordance with the requirements contained herein these specifications.

D. Products named by the Bidder, at the time of bid, shall be furnished and installed and substitutions will not be considered by the Owner/Engineer for those products named in the bid.

1.02 CONTRACTOR'S OPTIONS

A. For products specified only by reference standard, select any product meeting that standard.

B. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named which complies with the Specifications.

C. Where products are not named, then submit products that meet the specifications.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Name - The Drawings and Specifications list acceptable manufacturers, commercial names, trademarks, brands and other product, material and equipment designations. Such names are provided to establish the required type, quality and other salient requirements of procurement.

B. Equals - An item equal to that named or described on the Drawings or in the Specifications may be provided by Contractor if accepted by the Engineer.

C. A request for product substitution constitutes a representation that the Contractor:
   1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
   2. Shall provide the same warranty for the Substitution as for the specified Product.
   3. Shall coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner, including extra charges by other Prime Contractors, material suppliers, and vendors.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. Shall reimburse the Owner and the Engineer for review or redesign services associated with reapproval by authorities.
   6. Shall reimburse the Owner for all additional engineering services claimed by the Engineer for extra services associated with the review of the Contractor’s substituted item since it could not have been originally included in the Engineer’s professional engineering services agreement. Reimbursement shall be based on the man-hours expended, at current billing rates.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

E. Substitution Submittal Procedure:
   1. The Contractor shall submit the REQUEST FOR SUBSTITUTION FORM for consideration including all required information.
   2. The Contractor shall use the form included within this Section.
   3. All forms shall be type written.
   4. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.

F. The burden to prove product equivalence rests on the Contractor.

G. The Engineer will notify Contractor in writing of decision to accept or reject request and at that time the Contractor can make a formal submittal in accordance with the requirements contained in Section 013300.

H. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

PART 3 - EXECUTION

NOT USED

This space left intentionally blank.

REQUEST FOR SUBSTITUTION FORM

Project: Booster Pumping Station at East Winds Drive

Substitution Request Number:_____

Contractor:_____

Address:_____

To:_____ Date:_____

H2M Project Number: RDWD2201

Owner: Riverhead Water District

Contract Name:_____ Contract No.:_____

Specification Title:_____

Section:_____ Page:_____ Article/Paragraph:_____

Drawing No(s).:_____

Proposed Substitution:_____

Manufacturer:_____ Address:_____

Trade Name:_____ Phone #: (____)_____

Installer:_____ Address:_____

Phone #: (____)_____

History: ___New product ___2-5 years old ___5-10 years old ___More than 10 years old

Differences between proposed substitution and specified product:

___Point-by-point comparative data attached

Reason for not providing specified item (Attach separate sheet if necessary):

Typical Similar Installation:

Project:_____

Engineer / Architect:_____

Address:_____

Owner:_____

Date Installed:_____

Submit complete installation list on separate sheets.

Proposed substitution affects other parts of Work: ___No ___Yes

Explain:_____

Gross Savings to Owner for accepting substitution: $_____

Proposed substitution changes Contract Time: ___No ___Yes

Add / deduct (circle):_____ days

Supporting data attached for evaluation of the proposed substitution:

___Product Data ___Photos ___Drawings ___Tests ___Reports ___Samples

___Other (explain):_____

Attached data includes description, specifications, drawings, photographs, performance and test data adequate for evaluation of request; applicable portions of data are clearly identified.

Attached data also includes a description of changes to Contract Documents that proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. Proposed Substitution has been fully checked and coordinated with Contract Documents.
2. Proposed Substitution does not affect dimensions shown on Drawings.
3. Proposed Substitution does not require revisions to any other Prime Contractor's work.
4. The undersigned will pay for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by requested Substitution.
5. Proposed Substitution will have no adverse affect on other trades, construction schedule, or specified warranty requirements.
6. Maintenance and service parts will be locally available for proposed substitution.
7. The undersigned further states that the function, appearance, and quality of proposed Substitution are equivalent or superior to specified item.

This request for product substitution also constitutes a representation that I, as the Contractor:

1. Has investigated proposed Product and determined that it meets or exceeds the quality of the specified Product.
2. Shall provide the same warranty for the Substitution as for the specified Product.
3. Shall coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner, including extra charges by other Prime Contractors, material suppliers, and vendors.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Shall reimburse the Owner and the Engineer for review or redesign services associated with re-approval by authorities.
6. Shall reimburse the Owner for all additional engineering services claimed by the Engineer for extra services associated with the review of the Contractor's substituted item since it could not have been originally included in the Engineer's professional engineering services agreement. Reimbursement shall be based on the man-hours expended, at current billing rates.

Contractor's Authorized Representative (Typewritten):_____

Authorized Signature:_____

Date:_____

END OF SECTION 012500

PART 1 - GENERAL

2.01 DESCRIPTION

A. Work under this Section specifies the procedures used to process partial payments and the Final Payment Request.

2.02 TIME FOR COMPLETION

A. Inasmuch as the provisions of the Contract relating to the time for performance and completion of the Work are for the purposes of enabling the Owner to proceed with the construction of a public improvement in accordance with a predetermined program, and inasmuch as failure to complete the Work within the period herein specified may result in damage or loss to the Owner, time is of the essence of the Contract.

B. Time for completion of the Work shall be in accordance with that stipulated in the Contract Documents.

C. The date for completion will be calculated from the date shown on the Notice to Proceed. The Contractor shall execute the Work with diligence from day to day, and complete it within the time fixed.

D. For the purpose of defining the date of substantial completion, the Project will be considered complete when all Work covered by the Contract has been performed and all installations and equipment have been tested and are ready for permanent use. Removal of the Contractor's equipment and other minor adjustments which do not prevent use of the Project will not be a factor in establishing the date of substantial completion.

E. Notwithstanding the foregoing, the Engineer will establish the date of substantial completion when the project is accepted and ready for operation, and no large or major items of work are as yet outstanding. At such time, the Engineer will issue a punch list, itemizing the items of work remaining. The punch list will include "minor" items only, as defined solely by the Engineer. Any prior punch lists, which include "major" or significant items, as defined by the Engineer, shall not be a criterion in establishing the date of substantial completion.

2.03 PARTIAL COMPENSATION

A. At the Owner's discretion, the Contractor may receive compensation for materials and products delivered to the site yet not installed providing:
   1. A canceled check or paid bill from the supplier is submitted to the Engineer indicating that the Contractor has paid the supplier for the material or equipment.
   2. The material or piece of equipment is properly stored and protected from the elements and/or vandalism in accordance with the manufacturer's written requirements for long term storage.
   3. A certificate of insurance is provided for the material or piece of equipment in the event of a fire, vandalism, theft, etc.
   4. A bill of material is delivered to the Engineer at the time of delivery itemizing the subject material or equipment. Payment will be made for on-site material and/or equipment in the amount of 80% of the gross amount of the paid invoice. This payment will be subject to the normal retainage of the partial estimate.
   5. The Engineer has agreed to the pre-purchasing of the materials.

B. The Contractor may not receive compensation for materials and products stored in the Contractor's yard or shop unless permitted by the Owner.

2.04 APPLICATIONS FOR PAYMENT

A. The Contractor shall review the percentage of work completed during the payment period with the Engineer, based on the bid items in the proposal. The Engineer shall make the final decision on the percentage of work completed.

B. The form of application for payment shall be AIA Document G702, application and certificate for payment supported by AIA Document G703, Continuation Sheet.

C. Submit one (1) copy of each payment application, completed, signed and notarized.

D. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

E. The payment application shall include a Contractor Invoice and a Town of Riverhead Claim Voucher.

F. Provide completed Labor Affidavit Form for each pay period included in the certified payroll reports for each payment application for both the contractor and any subcontractor(s).

G. Submit payment application to Engineer no later than the first day of each month. Payments received after the first day of each month shall be reviewed and processed after the first day of the following month. Only one application for payment will be reviewed and processed each month.

H. Submit certified payroll receipts for all workers and subcontractors. Payroll receipts shall be submitted with every application for payment. All payroll receipts shall be certified correct and notarized by a Notary in the State of New York. Application for Payment will not be processed unless all payroll receipts are received.

I. Contractor shall pay all workers and have all subcontractors pay all workers the New York State Prevailing Wage Rates.

J. Owner may conduct on-site interviews with all workers to verify payments of prevailing wage rates are enforced.

K. The Engineer shall submit the documentation along with an Engineer’s Payment Report to the Owner for payment.

L. Retainage in the amount of 5% will be held from each partial payment. Retainage will only be released upon full completion of the project and will be included in the final payment.

2.05 ACCEPTANCE OF FINAL PAYMENT REQUEST

A. The Contractor shall be conclusively deemed to have accepted the Final Payment Request as a correct statement of the total liability of the Owner and of the compensation paid and to be paid to the Contractor by the Owner unless within seven (7) days after delivery of his copy of the Final Payment Request to him, the Contractor shall return such copy to the Owner together with a statement of his objections to such request and of any claim for damages or compensation in excess of the amounts shown on the Request. The acceptance by the Contractor of the Final Payment Request approved by the Owner shall constitute a release and shall discharge the Owner from all further claims by the Contractor arising out of or relating to the Contract, including but not limited to, a release from all impact costs.

2.06 SCOPE OF PAYMENTS

A. The Contractor shall receive and accept the compensation as herein provided, in full payment for furnishing all materials, labor, tools, and equipment and for performing all work contemplated and embraced under the Contract, also for all loss or damage arising out of the nature of the Work or from the action of the elements, or from any unforeseen difficulties or obstructions which may arise or be encountered during the prosecution of the Work, and for all risks of every description connected with the prosecution of the Work, until its final acceptance by the Owner, also for all expenses incurred by, or in consequence of, the suspension or discontinuance of the said prosecution of the Work as herein specified, and for all actual or alleged infringements of patent, trademark, or copyright, and for completing the Work and the whole hereof, in an acceptable manner, according to the Plans, Specifications, and other Contract Documents. The payment of any partial or final estimate shall in no way or in no degree prejudice or affect the obligation of the Contractor, at his own cost and expense, to renew or replace all defects and imperfections, or damages. The Engineer shall be the judge, and the said Contractor shall be liable to the Owner for failure so to do.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION 012900

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Schedule of Values

1.02 SCHEDULE OF VALUES

A. Submit for approval prior to the start of the work a Schedule of Values that indicates a breakdown of the labor, materials and equipment and other costs used in the preparation of the bid. This schedule shall be in sufficient detail to indicate separate figures for such items as excavation, concrete, equipment and all other items making up the lump sum price. The cost breakdown shall be separately itemized for each lump sum bid item in the project.

B. Where the cost breakdown includes items for bond payment, insurance payment, job set-up, or job mobilization, these items will be paid based on paid invoices and copies of cancelled checks.

C. Submit a Schedule of Values to the Engineer for review and approval within fifteen (15) calendar days from the date shown on the Notice to Proceed.

1.03 FORM OF SUBMITTAL

A. Submit typewritten Contract Cost Breakdown on AIA Form G703 - Application and Certificate for Payment Continuation Sheet or EJCDC 1910-8-E. The Engineer reserves the right to revise the form or provide a form prepared by the Engineer.

B. Use the Table of Contents of the Contract Specifications as a basis for format for listing costs of work for Sections under Divisions 1-48 as sections apply to work. Not all Sections need be assigned a breakout price as determined by the Engineer.

C. Identify each line item with number and title as listed in Table of Contents.

D. Provide dollar values for each line item for labor, overhead, profit, material, and equipment components for each category of work if requested by the Engineer.

E. List quantities of materials specified under unit price allowances.

F. The Schedule of Values, after approval by the Engineer, shall be the basis for the Contractor's Application for Payment.

G. The first Application for Payment will not be reviewed prior to an approved breakdown.

1.04 PREPARATION OF SCHEDULE OF VALUES

A. Breakdown schedule of values based on bid items in proposals with further breakdown below each item. In addition to the above, provide a separate line item cost below each bid item, as applicable, for each of the following items which shall be supported by proof where requested by Engineer:
   1. Performance and payment bonds.
   2. Insurance.
   3. Mobilization and Demobilization (Amounts shall be equal in value).
   4. Temporary facilities and measures as specified in Section 015000.
   5. Project Coordination Meetings as specified in Section 013100.
   6. Preparation of the Project Construction Schedule, and updates, as specified in Section 013300.

7. Preparation of Weekly Schedules as specified in Section 013100
8. Rubbish removal and daily cleaning up. (Provide a total dollar amount and a daily rate for each calendar day during the contract period.)
9. Surveyor used for layout.
10. A total dollar amount for furnishing all the Operations and Maintenance Manuals specified throughout the specifications.
11. Final cleaning.
12. All Cash Allowance items as contained in Section 012100.

B. Show total costs including overhead and profit.

C. Provide additional details and data to substantiate the cost breakdown as requested by the Engineer.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 012973

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work of this Section includes:
   1. Requests for Interpretation or for information
   2. Coordination between contractors, if applicable
   3. Administration of subcontracts
   4. Coordination of work with other Contractors, utility companies, and the Owner/Engineer
   5. Communication and coordination requirements
   6. Qualifications of Contractor's job site superintendent

B. Site staffing requirements for the Contractor's superintendent are also specified herein, the costs for which shall be included in the Contract price.

1.02 REQUEST FOR INTERPRETATION OR INFORMATION

A. The Contractor shall use the Request for Interpretation/Information Form included within this Section when the Contractor feels that additional information is needed to perform the work of the Contract.

B. The Engineer may not respond to any requests unless the form is used.

C. The Engineer's verbal response(s) to the Contractor's formal requests, if provided, shall not constitute an official response and if acted upon by the Contractor are done so at the Contractor's own risk and liability and shall not be subject to claims for additional compensation.

D. A signed facsimile of the form will be accepted. The original of the form must be signed and provided to the project manager.

E. The Engineer will respond in writing to the request as soon as possible.

1.03 COORDINATION BETWEEN CONTRACTORS

A. During the progress of the Work, other Contractors may be engaged in performing other work or may be awarded other contracts for other work on this Project. Each Contractor shall coordinate all the work to be done with the work of each Contractor(s) through the Owner.

B. Each Contractor shall fully cooperate with each other Contractor(s) and carefully fit its own work to that provided under other contracts as shown or specified in the Contract Documents and as may be coordinated by the Owner/Engineer.

C. Each Contractor shall not commit or permit any act that will interfere with the timely performance of work by any other Contractor.

D. The Contractor shall conduct his/her own operations, and to cooperate with such other parties, so as to cause as little interference as possible with the work by others.

E. The Contractor agrees to make no claim against the Owner/Engineer for additional payment due to delays or other conditions created by the operation of others.

F. If there is a difference of opinion as to the respective project rights of each Contractor doing the work, within the limits of or adjacent to the Project, the Owner/Engineer shall decide as to the respective rights of the various parties involved in order to secure completion of the work in a satisfactory manner. The Owner/Engineer's decision shall be final and binding on each Contractor.

G. If any portion of the work of the Contractor, or any of his/her subcontractors, depends upon the proper execution of the work by others, the Contractor shall promptly give written notice to the Engineer of all purported defects in the installed work as renders it unsuitable for proper execution and completion of his own work. The Contractor shall further notify the Engineer of all supposed delays, in the performance of his/her work, as will affect the timely performance of his own work or the project.

H. The Contractor's lack of notice shall constitute an acceptance by him/her that the work of others is fit and proper for the reception of the Contractor's own work, except as to defects developing in the work that could not have been reasonably foreseen.

I. The Contractor's lack of notice shall also constitute an acceptance by him/her and an acknowledgement of the timely performance of work by other Contractors or the Owner and that no claims for additional compensation may result.

J. If the Owner/Engineer determines that the Contractor is failing to coordinate his own work with the work of others, then the Owner shall have the right to enforce the provisions of the Contract as related to non-performance.

K. The Owner/Engineer shall not be liable for any damages suffered by this Contractor by reason of any other Contractor's failure to comply with the directions so issued by the Owner/Engineer, or by reason of another Contractor's default in performance; it being understood that the Owner does not guarantee the continued efficiency or work production of any Contractor and by execution of the Contract, the Contractor fully understood the potential coordination problems associated with projects involving multiple prime construction contracts.

L. The Contractor's attention is specifically directed to the fact that he may not have exclusive occupancy of the work area within the limits of the Contract. Each Contractor shall afford the Owner, other Contractors, and utilities reasonable opportunity for the storage of their materials and equipment, and the execution of their work, and shall connect and coordinate his work with theirs as required by the Contract Documents.

1.04 SUBCONTRACTOR ADMINISTRATION AND COORDINATION

A. Terms and conditions of the Contract shall be binding upon each subcontractor.

B. Furnish each subcontractor and major equipment vendor at least one (1) copy of the Plans and Technical Specifications.

C. Provide at least one (1) copy of each approved shop drawing to each subcontractor whose work may depend upon the contents of the shop drawing submittal. The Owner reserves the right to stop all work, without claims for delay, until such time as appropriate subcontractors are furnished with appropriate shop drawings.

D. Each Contractor shall sequence and schedule the work of subcontractors. Coordinate construction and administration activities of subcontractors. The Engineer and Owner will not accept telephone calls, facsimiles or office visits from any subcontractors on the project. Subcontractor and vendor questions and clarifications shall be directed to the Engineer by the Contractor.

E. The Contractor's on-site project superintendent shall inspect all the work of all of his/her subcontractors, as it is being constructed. The Contractor's subcontractor shall not be permitted to do any work on the site without the Contractor's job site superintendent also being there to inspect the work as it is being performed.

1.05 UTILITY COORDINATION

A. Comply with the requirements of 16 NYCRR Part 753 - Protection of Underground Facilities. Submit a letter stating the case number.

B. Comply with the utility coordination requirements contained in the General Conditions.

1.06 PUBLIC/PRIVATE UTILITIES

A. Notify all public and private utilities in accordance with Article 20, Section 322-a of the New York State General Business Law for location and markout of existing utilities in the vicinity of the work.

B. Repair all utilities damaged during the Work to the standards and approval of the respective utility at no cost to the Owner.

1.07 SPECIFIC COORDINATION REQUIREMENTS

A. The Contractor shall sequence and schedule work so as not to interfere with the work by others and to afford each Contractor the time to complete their contractual obligations with the Owner. Coordinate the work of this Contract with the work by others. Coordination includes, but is not limited to, the following:
   1. Schedule work with all trades throughout the project to prevent interference.
   2. Accomplish work in coordination with the other Contractors in a manner that will allow each Contractor adequate time (at the proper stage of construction as determined by the Owner/Engineer) to perform and complete the work of their contract.
   3. The Contractor shall annotate on each of his own shop drawings and submittals, information that is relevant to the work of others or where potential conflicts in the installed work may occur. The Contractor shall “bubble” in green ink the area of potential conflict so as to alert the reviewer.
   4. Each prime Contractor shall provide the Engineer with a list of shop drawings that they may require to properly coordinate the work. If a list is not provided to the Engineer within fifteen (15) calendar days from the date of the Notice to Proceed, then it shall be taken that shop drawings of other prime Contractors are not required. Each prime Contractor shall be responsible for providing the list within the time specified.
   5. In case of conflicts due to improper coordination by any Contractor, the Owner/Engineer’s resolution will be final. No compensation will be awarded for extra work required to resolve conflicts or to coordinate the work of all contracts.
   6. Coordinate space requirements, supports, and installation of mechanical, electrical and plumbing work which may be indicated diagrammatically on the Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practicable. Place runs parallel with building lines. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and to facilitate repairs.
   7. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of all fixtures and outlets with finish elements and work by all other trades.

B. Shop Drawings and Submittals Coordination Procedure:
   1. The Engineer will forward copies of relevant shop drawings to all prime Contractors, whose work may be subject to that of others, as solely determined by the Engineer.
   2. The Contractor shall then, within five (5) calendar days of receipt, review said shop drawings provided by the Engineer for the purposes of resolving field and fabrication problems and as a way to coordinate the work.
   3. Immediately notify the Engineer should a purported conflict in the work be discovered so that the Engineer can investigate and take appropriate action.

4. If a shop drawing was so provided by the Engineer and a conflict in the work was not brought to the attention of the Engineer, then the conflict shall be immediately corrected by the Contractor submitting the shop drawing.

C. Each Contractor shall also coordinate the work by complying with the following:
   1. Construction Schedule: Each Contractor shall provide a construction schedule as specified in Section 013216 - Construction Schedules.
   2. Weekly Schedule: By 3:00 PM of each Friday during the construction period, each Contractor shall fax or email a typed memo addressed to the Engineer/Owner's resident field engineer/inspector and designated office project manager summarizing the work for the following week. The memo shall also be faxed or emailed to each Prime Contractor's home office and the Owner. The memo shall briefly itemize the planned activities for the coming week. The memo shall also include a summary of expected material/equipment deliveries, concrete pours, utility tie-ins, excavated material removals and other heavy construction traffic that may impact the work activities for the coming week.
   3. Email Account: Each Contractor shall maintain an email account that shall be used to improve communication. An email shall not constitute a formal advisement regarding the terms and conditions of the contract. Email shall only be considered an informal way of notifying relevant parties of project related activities.
   4. Email List: Each Contractor, within five (5) calendar days from the Notice To Proceed, shall provide a list of email addresses for each major equipment supplier and local representative, if such exists. A contact person shall be provided for each email address.

D. Project Coordination Meetings: All Contractors shall participate in and attend the Project Coordination Meetings as specified below:
   1. Up to three (3) project coordination meetings will be held at the Engineer's or Owner's office as specified herein and in Section 013216.
   2. The meetings will be held when so called for by the Engineer.
   3. Each meeting may last up to eight (8) hours with one hour for lunch.
   4. The Engineer will prepare the final agreed version of the schedule and distribute it to all Contractors.
   5. The Engineer reserves the right not to hold these meetings if in his/her opinion they are not needed.
   6. All Prime Contractors shall be required to attend the meetings.

1.08 CONTRACTOR'S JOB SITE SUPERINTENDENT

A. Each Contractor shall employ an on-site superintendent as specified herein below. He/She shall be a full-time employee of the Contractor.

B. Each Contractor shall name the job site superintendent within five (5) days of the Notice To Proceed. A letter to the Engineer shall be provided.

C. He/She shall have the authority to sequence and schedule the work, and to staff the project, so as not to interfere with the work by others and to complete the work daily within the time so required.

D. Each Superintendent shall have a minimum of five (5) years of experience as a job site superintendent for projects of equal size and complexity.

E. Contract G superintendent shall not be a foreman or crew supervisor and shall be qualified and experienced person who shall act to schedule and sequence the work on a daily basis.

F. Contract E superintendent may be a foreman or crew supervisor.

G. Contract P superintendent may be a foreman or crew supervisor.

H. Each superintendent shall be qualified to perform the duties so required to successfully complete the work in accordance with the Contract Documents.

I. The superintendent for Contract G shall be on the site for each work day, full time, starting within seven (7) calendar days from the date of the Notice To Proceed through the date of Final Completion, including all punch list items.

J. All other construction superintendents shall be on the project site while work under his/her contract is being performed, either by direct forces or by subcontractors as stipulated above for subcontractor coordination.

K. Each superintendent shall also visit the site daily when work is not being performed under their Contract for coordination purposes, through the Owner/Engineer. He/She shall remain on the site for a minimum of one (1) hour, if work is being performed by others. He shall telephone the Engineer/Architect's designated field representative to advise him/her that they are on the site to discuss matters related to coordination.

L. Each superintendent shall speak English. If required by the Engineer, provide a resume for the proposed superintendent that shall be typed and shall list the qualifications of the superintendent. Prior to the Contractor assigning a superintendent to the project, he may wish to arrange an interview with the Engineer to determine the proposed superintendent's ability to properly coordinate the work through the Owner/Engineer. The Contractor shall employ a superintendent acceptable to the Owner.

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REQUEST FOR INTERPRETATION/INFORMATION (RFI)

OWNER'S NAME: Riverhead Water District

PROJECT NAME & CONTRACT DESIGNATION: Booster Pumping Station at East Winds Drive

CONSTRUCTION CONTRACT NO.: RDWD2201

Product, Item, or System:	
Request Date:	RFI No.:
Specification Section:	Paragraph Ref:
Contract Drawing Reference(s):	
Describe Request:	
Signed:	See Contractor's Attachments for Additional Description for Information
Owner/Engineer Response:	
Engineer (Printed):	See Engineer's Attachments for Additional Information
Engineer's Signature & Date	*Response Accepted By Contractor* *Contractor's Signature & Date*

The Work shall be carried out in accordance with these supplemental instructions without change in Contract amount or Contract time for completion. Prior to proceeding with these instructions, indicate your acceptance of these instructions by signing where indicated and returning this form to the Engineer.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 013100

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work of this Section includes the requirements for progress meetings.

1.02 PRE-CONSTRUCTION CONFERENCE

A. Each Contractor is required to attend the pre-construction conference at a location, date, and time selected by the Owner.

B. The owner, a partner, or a corporate officer representing each Contractor shall attend the conference. The job site superintendent and office project manager for each Contractor shall also attend.

C. The Engineer will prepare an agenda for the conference.

1.03 PROGRESS MEETINGS

A. Progress meetings will be held approximately once every two (2) weeks during the project. The Owner may elect to hold meetings more or less frequently.

B. At least seven (7) calendar days advance notice will be given by the Engineer or the date for the upcoming meeting will be set during the progress meeting.

C. Attendance at progress meetings shall be mandatory. An amount of $1,000 shall be deducted from the Contract Amount for each announced meeting not attended by the Contractor.

D. The owner, a partner, or a corporate officer representing the Contractor shall attend each announced progress meeting. The job site superintendent and office project manager for each Contractor shall also attend.

E. Subcontractors shall attend when requested by the Owner or Engineer at no cost to the Owner.

F. Meetings will be conducted by Engineer at a location selected by the Owner, normally at or adjacent to the project site.

G. The minimum agenda will cover:
   1. Review minutes of previous meetings.
   2. Identify present problems and resolve them.
   3. Plan work progress during next work period.
   4. Review the status of off-site fabrication and delivery schedule.
   5. Review shop drawings and submittal schedules.
   6. Review change order status.
   7. Review status of construction progress schedule.
   8. Coordinate access requirements.
   9. Other business related to the work.

1.04 OTHER MEETINGS

A. Attend special meetings which may be required or called for by Federal, State or Local authorities, utility companies, Owner, Engineer or any other firm, person or organization related to the project.

1.05 CONDUCTING MEETINGS

A. General - This paragraph covers Owner and/or Engineer meetings with Contractor and/or his subcontractors. Neither Owner nor Engineer wishes to meet solely with a subcontractor and requests for such meetings to be discouraged. If a meeting is deemed necessary, every effort will be made to have Contractor attend. If, for some reason, circumstances do not allow such, the meeting may be held, minutes of the meeting will be sent to contractor and decisions on any major questions will be reserved until contractor has been consulted. Subcontractors may accompany contractor to meetings provided contractor notifies Engineer in advance.

B. Chairman - When Engineer/Owner attend meetings, Engineer, or his duly authorized representative, will act as chairman. Should Owner-Contractor meetings be necessary, Owner will chair such meetings.

C. Notices - Engineer or Owner will issue notices of meetings to all parties concerned and will note, thereof, who must attend and who may attend if they so desire. When a Contractor desires a formal meeting, make a request through Engineer. Except when Engineer determines that a prompt meeting is essential, all notices will be issued at least one week in advance of the meeting date.

D. Agenda - All parties shall inform Engineer of items desired to be discussed and Engineer will notify all parties of all items to be considered. This is to allow each party to fully prepare for the meeting. This shall not be construed to mean that other items cannot be brought up at the meetings.

E. Time Limits - It is the intent to hold productive and efficient meetings and to keep them as short as is reasonably possible. The Chairman will be the sole judge as to whether or not further discussion on any matter is warranted and all discussions shall cease when he so orders.

F. Minutes - Minutes of meetings will be kept, written and distributed by the Chairman or his duly authorized representative. Minutes of all meetings will be available upon request to the Chairman.

G. Conduct - It is the intent to conduct all meetings in an orderly manner, to reasonably discuss all items and to hear and observe the rights and opinions of all parties. The Chairman will allow each party to speak, however, he reserves the right to order any individual to leave the meeting at any time for any reason.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 013119

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for preparing construction schedules and for keeping them up to date.

B. Prepare a Gantt Chart type schedule and keep it up to date as specified hereinafter.

C. All schedules shall be submitted in accordance with the requirements contained herein in Section 013300.

D. Refer to Section 013100 regarding the requirements for attendance at Project Coordination Meetings and additional requirements concerning the submission of other project coordination and sequencing information.

1.02 SCHEDULE PREPARATION MILESTONE DATES & REQUIREMENTS

A. Each Contractor shall prepare Draft #1 Construction Schedule for presentation and discussion during Project Coordination Meeting No. 1.
   1. The Engineer will provide at least seven (7) calendar days written notice regarding the date of the first meeting.
   2. At the Engineer's discretion, Project Coordination Meeting No. 1 may immediately take place on the same date and directly following the Pre-Construction Conference. The Notice To Proceed will contain information regarding the Pre-Construction Conference and Project Coordination Meeting No. 1 should it be so decided by the Engineer.
   3. Draft #1 Construction Schedule shall be prepared as specified hereinafter.
      a. The schedule shall show all the major and subordinate tasks necessary to complete the project in the specified time and interim milestones.
      b. It shall allow adequate time for other Prime Contractors to complete their related work as best estimated by the Contractor. It being understood that the Contractor's allotted time for others to perform their work is non-binding and does not relieve the Contractor from completing all the work in the specified contract completion time in accordance with the Contract Documents. It also being understood that this is the Contractor's realistic best estimate of the time needed for others to complete their related work.
      c. The schedule shall also show the dependencies and time allocated for each task.
   4. The date, place, and time for Project Coordination Meeting No. 2 shall be established at the first meeting, but in no case be more than ten (10) calendar days from the date of the first meeting.

B. As a result of the first meeting, a better understanding of each Contractor's time requirements will have been achieved. Within five (5) working days of the date of *Project Coordination Meeting No. 1*, each Contractor shall prepare Draft #2 Construction Schedule and submit it to the Engineer and each other Prime Contractor for review. Each Contractor shall mail his/her schedule to all parties via Overnight Mail with a Return Receipt Requested.
   1. *Project Coordination Meeting No. 2* shall be attended by all Prime Contractors for the purpose of jointly developing a Combined Construction Schedule. The meeting shall focus on the time needed to complete each task and subordinate task and for establishing task dependencies.
   2. All Contractors shall deliver to the Engineer the electronic file of his/her Draft #2 Construction Schedule at the meeting. The Engineer will use the data files to prepare the Draft Combined Construction Schedule.
   3. The date, place, and time for *Project Coordination Meeting No. 3* shall be established at the meeting.

C. The purpose of *Project Coordination Meeting No. 3* is to review the Engineer's Draft Combined Construction Schedule and to make minor adjustments as are needed.

D. The Engineer, after the third meeting and as soon as possible, will make the agreed upon changes and provide final versions to all Prime Contractors for adoption as the Final Combined Construction Schedule.
   1. The final schedule shall be implemented by all Prime Contractors on a daily basis. All tasks and subordinate tasks shall be completed on schedule.
   2. Each Contractor shall increase resources as are needed to comply with the established milestone dates should the schedule start to lag.

E. The Engineer's decision regarding the time allotted for a given task shall be final and each Contractor shall apply necessary resources to accomplish the work. Submission of a bid shall be intended to mean that the Contractor agrees that the determination is binding.

1.03 PRIME CONTRACTORS SCHEDULE TYPES

A. Gantt Chart Type: The General Contractor shall prepare a Gantt Chart type schedule as specified hereinafter.
   1. Contractor E shall prepare a Gantt Chart type schedule as specified hereinafter.
   2. Contractor P shall prepare a Gantt Chart type schedule as specified hereinafter.

1.04 CONSTRUCTION SCHEDULE - GENERAL

A. Coordinate the work and maintain the construction schedule. In the event actual progress begins to lag the schedule, promptly employ additional means and methods of construction to make up the lost time.

B. Keep the construction schedule current and revise and resubmit as often as necessary to accurately reflect the conditions of the work, past progress and anticipated future progress.

C. The construction schedule shall be completed, submitted, and deemed received by the Engineer prior to the first payment application.

D. The schedule, when approved by the Engineer and the Owner, shall establish the dates for starting and completing work for the various portions of the Contract. It shall be the duty of the Contractor to conform to his/her own schedule and to perform the work within the time limits indicated. Failure to adhere to the approved schedule shall expose the Contractor to disputes, claims and additional costs incurred by others.

E. Coordinate letting of subcontracts, material purchases, shop drawing submissions, delivery of materials, and sequence of operations, to conform to the schedule.

1.05 CONSTRUCTION SCHEDULE - GANTT CHART TYPE

A. The schedule shall show, in detail, the proposed sequence of the work and the estimated date of starting and completing each stage of the work in order to complete the project within the contract time.

B. Prepare the schedule in a manner so that the actual progress of the work can be recorded and compared with the expected progress.

C. Coordinate the construction schedule with the proposed schedules of the equipment suppliers and subcontractors.

D. The schedule shall be plotted out in color and shall be 36-inch by 40-inch. It shall contain as many sheets as are necessary to show all rolled down tasks. Partially printed schedules will not be accepted. Each Contractor shall arrange to have it plotted on a color plotter suitable for the intended application.

E. The schedule shall show the following:
   1. Task links/task dependency in blue ink.
   2. Work under the Contract in green ink.
   3. Work by others in blue ink.
   4. Milestone dates (zero duration) by a red diamond.
   5. The end date for each task and subtask at the end of a bar.
   6. The description of all major tasks within the bar. The bar shall be red.
   7. Critical path.

1.06 REVISION OF PROJECT PROGRESS SCHEDULE

A. Each Prime Contractor shall evaluate and provide updated construction schedules monthly in accordance with job requirements. Each update shall be submitted to the Engineer for information purposes and be provided by the last Friday of every month

B. Each Contractor shall modify his construction schedule to accommodate coordination of the construction contracts by the Owner/Engineer without claims for additional compensation or delay.

C. The Engineer will provide an electronic version of the Final Combined Construction Schedule for use in keeping the schedule up to date.

D. From time to time, and at stages deemed appropriate by the Engineer, the Engineer may issue updated schedules to reflect the project's status. The percent complete for each task may be shown, as determined by the Engineer.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 013216

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Project record documents shall be prepared as specified herein.

B. Building foundation, equipment slabs, drainage recharge basin, and fence locations and elevations shall be staked and verified by the General Contractor's surveyor in accordance with the requirements of this specification section and as contained in Section 323113.13.

1.02 QUALITY ASSURANCE

A. The Contractor shall employ a land surveyor licensed in the State where the project is located. The surveyor shall be acceptable to the Engineer in terms of experience and qualifications.
   1. Submit evidence of the surveyor's errors and omissions (professional liability) insurance coverage in the form of an insurance certificate.
   2. The surveyor shall maintain a minimum coverage of $1,000,000 for professional liability.
   3. The Owner, Engineer, and Contractor shall be named as insurance certificate holders.
   4. A thirty-day cancellation notice shall be provided.
   5. Physical work shall not be performed until the certificate is provided and approved by the Owner.

B. All instruments used on the project shall be of professional quality and in first class condition.
   1. All instruments shall have been calibrated by a manufacturer's service station within the last twelve (12) months.
   2. Submit certificate of calibration or paid invoice showing that the unit has been calibrated, if so required by the Engineer.

1.03 SUBMITTALS FOR REVIEW

A. Submit name, address, and telephone number of Surveyor before starting survey work.

B. Surveyor's professional liability insurance certificate.

C. On request, submit documentation verifying accuracy of survey work.

D. Submit a copy of the site drawing signed by the land surveyor showing locations of other benchmarks set by the surveyor, baseline location and offset hubs. If requested, the Engineer will provide a reproducible drawing or a drawing in digital format for use by the surveyor.

1.04 EXAMINATION

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Engineer of any discrepancies discovered.

1.05 SURVEY REFERENCE POINTS

A. The Contractor's surveyor shall locate and protect survey control and reference points located throughout the project site.

B. Control datum for survey is that indicated on the Drawings or will be provided by the Engineer.

C. The Contractor shall protect survey control points prior to starting any site work. Preserve permanent reference points during construction.

D. Promptly report to the Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
   1. The surveyor shall replace dislocated survey control points based on original survey control when directed by the Engineer.
   2. Make no changes without prior written notice to Engineer.

E. The surveyor shall set control lath for rough and final grading purposes. Lath shall be placed at sufficient intervals to control grade or as directed by the Engineer.

F. All new structures, pits, chambers, drainage pools, curbs, roads, swales, and other physical elements shall be located by survey control.

G. Underground pipelines need not be located using survey control but shall be located using standard survey equipment operated by persons experienced in their operation.

1.06 SURVEY REQUIREMENTS

A. The Engineer will provide one (1) benchmark if requested.

B. The Contractor shall, with his own forces, obtain working or construction lines or grades as needed subject to the check of the surveyor. The surveyor shall set offsets.

C. Establish elevations, lines, offsets and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements, stakes for grading, curbs, fill and topsoil placement, utility locations, slopes and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations, and equipment foundations.

D. Provide tie distances on record drawings to all underground structures, valves, pipes, and utilities installed as work of this Contract.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 013223

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for making submissions for the project. Electronic submissions will be required unless expressly noted otherwise.

B. Refer to Section 013216 - Construction Schedule for the requirements concerning the submission of construction schedules and for making updates thereto.

1.02 IDENTIFICATION OF SUBMITTALS

A. Each and every submission shall be provided by the Contractor and shall be accompanied by a SUBMISSION TRANSMITTAL FORM. The Contractor shall use the specimen form made a part of this Section. *Submittals not containing the form will be returned to the Contractor un-reviewed.* The Engineer will not review project submissions until such time as the form is competed in its entirety. Identify each submittal and resubmittal using the form.

B. Each individual submittal shall be identified with a 'submission log number' as specified here in this example: 033000.01-1
   1. The Section number for which the submittal applies, followed by a period, shall be indicated, "033000.".
   2. The submittal within the Section shall be indicated by the next grouping "01". For instance and in this example, the concrete design mix may be submission "01", the waterstop catalog cut may be "02", and so on. Submittals shall be sequentially numbered within the Specification Section, i.e. 01, 02, etc.
   3. The number of times the submission was made shall be preceded by a dash and a numerical suffix as follows: "-1". In this example, the concrete design mix is being submitted for the first time. Use the number "1" for the first time it is being submitted.
   4. Subsequent submissions of the concrete design mix shall utilize the original number and a sequential numeric suffix, i.e. "2" for a resubmission, "3" for the second resubmission, and so on. Substitute the new number for the original "1".

C. Where a layout drawing, containing different elements of the project, is being submitted and there is a question as to what the log number might be, then the Contractor shall contact the Engineer so that an agreed upon log number can be assigned.

D. It is incumbent on the Contractor to initially assign the submission log number designation to each submission. Submissions not containing a log number, as specified above, will be returned to the Contractor un-reviewed by the Engineer.

E. Every submittal shall also be accompanied by a Transmittal Letter (or "Speed Form") addressed to the Engineer's Project Manager as hereinafter defined.

1.03 COORDINATION OF SUBMITTALS

A. Prior to submitting to the Engineer, fully coordinate all interrelated work. As a minimum, do the following:
   1. Determine and verify all field dimensions and conditions by field measuring existing conditions and the installed work of this Contract and work by others.
   2. Coordinate with all trades, subcontractors, vendors, system and equipment suppliers and manufacturers, public agencies, and utility companies and secure all necessary approvals, in writing.

B. Make submittals in groups containing all associated items that in some way depend upon each other.

1. This also applies to color charts, as one color may not be able to be selected without the selection of other colors so as to form a color-coordinated group.
2. The Engineer may elect not to review partial or incomplete submissions, whereupon he will notify the Contractor of the additional submissions that are required before a review can be made.

1.04 TIMING OF SUBMITTALS

A. Make submittals far enough in advance of scheduled dates of installation to provide time for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery. The Engineer will review submittals in a manner as expedient as possible, and will generally send a written response to the Contractor within seven (7) calendar days of receipt of submittals.

B. Submissions may be returned reviewed, unreviewed, rejected, returned conditioned upon submission of related items, or for other reasons set forth in the Contract Documents.

C. Make submissions well in advance as the returning, rejecting or disapproval of submissions or other similar circumstances are possible and are deemed "avoidable delays". Costs for these delays or those attributed to Contractor's tardiness in making submittals shall be borne by the Contractor.

D. ***All*** submittals requiring Engineer's review (except operations manuals) as required under the technical specifications of these documents shall be submitted within **FORTY FIVE (45)** consecutive calendar days after the date of the Notice to Proceed. An amount of **$250** per calendar day shall be deducted from payment due the Contractor for ***each*** day that an outstanding submittal exists, said amount being the cost associated with the Engineer's review.

E. Operation and maintenance manuals shall be submitted at least **FORTY FIVE (45)** consecutive calendar days prior to scheduled startup of the unit or system.

F. If material or equipment is installed before it has been deemed to be in general compliance with the Contract Documents, as determined by the Engineer, the Contractor shall be liable for its removal and replacement at no extra charge and without an increase in contract time.

1.05 DESTINATION OF SUBMITTALS

A. Each submission of documents shall be accompanied by a transmittal form containing the name of the project, the contract name, the Engineer's project manager, a submittal ID number, and a description of content for the submitted items.

B. A copy of the TRANSMITTAL FORM shall also be provided to the Engineer's inspector at the job site.

C. Electronic submittals shall be transmitted through the Newforma® Project Center website or by email, pending instruction by the Engineer. H2M architects + engineers is using a project information application called Newforma® Project Center. One of its components is Newforma Info Exchange, a web application that facilitates sending and sharing transmittals, and file sharing.

D. As an external team member on this project the Contractor will be required to access the H2M architects + engineers/Newforma Info Exchange website for information related to the project, including file transfers, RFI, Submittals, Action Items, and project Calendar information. The Contractor will have access to this website using any internet-capable computer running Internet Explorer or Firefox. All data transmitted through the H2M architects + engineers/Newforma Info

Exchange website is encrypted and logged. Further instructions will be provided to the Contractor after the contract is awarded.

E. Other submissions, such as material samples or other items as instructed by the Engineer, shall be sent to the Engineer's office as follows:
   1. Melville, NY (538)
      H2M architects + engineers
      538 Broad Hollow Road - 4th Floor East
      Melville, NY 11747
      Attention: H2M Project Manager (Named at Pre-Construction Conference or in the Notice to Proceed)

1.06 CLARITY OF SUBMITTALS

A. All printed materials shall be neat, clean, professionally drafted by hand or by computer, clear, legible, and of such quality that they can be easily reproduced by normal photocopying.

B. All electronic submittals shall be produced with a minimum resolution of 300 dpi.

C. Binders of information shall be separated into groups, subsystems, or similar equipment/function. Copies not conforming to this paragraph will be returned to the Contractor without the Engineer's review.

1.07 CONTRACTOR'S REPRESENTATION

A. By making a submission, the Contractor represents that he has determined and verified all field measurements and dimensions, field construction criteria, site and building constraints in terms of limitations in moving equipment into an enclosed space, materials, catalog and model numbers and similar data and that he has checked and coordinated each submission with other work at or adjacent to the project site in accordance with the requirements contained in Section 013100 - Project Management and Coordination and the Contract Documents.

B. Every SUBMISSION TRANSMITTAL FORM shall contain the Contractor's approval stamp and date showing that the submittal has been approved by the Contractor. The Engineer will not review submittals that have not yet been reviewed and approved by the Contractor.

1.08 ENGINEER/ARCHITECT'S REVIEW

A. Engineer will review and comment on each submission conforming to the requirements of this Section.
   1. Engineer's review will be for conformance with the design concept of the project and will be confined to general arrangement and compliance with the Contract Documents only, and will not be for the purpose of checking dimensions, weights, clearances, fittings, laying lengths, tolerances, interference's, for coordinating the work by others or subcontractors.
   2. The Engineer's review of a separate item, or portion of a system, does not represent a review of an assembly or system in which the item functions.

B. The Engineer will mark submittals as follows:
   1. NO EXCEPTION TAKEN (**A**) - No corrections, no marks. The content of this submittal has been reviewed by the Engineer and been found to be in general compliance with the Contract Documents. No further submission of this submittal is required and the information contained in the submittal may be built into the work in accordance with the Contract Documents.
   2. MAKE CORRECTIONS NOTED (**B**) - Minor amount of corrections. The content of this submittal has been reviewed by the Engineer and has been found in general to be in compliance with the Contract Documents. The notations made on the submittal by the

Engineer shall be incorporated into the work in accordance with the terms and conditions of the Contract Documents. No further submission of this submittal is required.

3. AMEND AND RESUBMIT (**C**) - The content of this submittal has been reviewed by the Engineer and this review has determined that additional data and/or modification to the submitted data or other changes are required to bring the work represented in this submittal into compliance with the Contract Documents. This submittal shall be reviewed and revised in accordance with the Engineer's comments and resubmitted to the Engineer for review. The information contained on the resubmittal shall not be incorporated into the work until the submittal is returned to the Contractor marked "NO EXCEPTION TAKEN" or "MAKE CORRECTIONS NOTED".
4. REJECTED (**D**) - The content of this submittal has been reviewed by the Engineer and has been determined not to be in accordance with the requirements contained in the Contract Document and requires too many corrections or other justifiable reason. The submittal shall be corrected and resubmitted or a submittal of an alternate shall be provided. No items are to be fabricated under this mark.
5. SUBMIT SPECIFIED ITEM (**E**) - The content of this submittal has been reviewed by the Engineer and this review has indicated that the work displayed in the submittal is not in compliance with the Contract Documents. The Contractor shall submit another submittal for this portion of the work, which complies with the Contract Documents.
6. RECEIVED (**R**) - This submittal is accepted on the project and filed for record purposes only, in accordance with the terms and conditions of the Contract Documents. Documents marked "RECEIVED" will not be returned.

C. No payment will be made on any item for which a submission is required if such submission:
   1. has not been made,
   2. has been made but was not stamped "No Exceptions Taken" by Engineer,
   3. has been made and stamped "Make Corrections Noted", but contractor has not complied with Engineer's notes marked on the submittal,
   4. has been made and stamped "No Exceptions Taken", but item provided does not conform to the shop drawing nor to the Contract Documents.

D. Submittals not required by these specifications will not be recognized or processed.

E. Provide an 8-inch by 10-inch space for the Engineer's review stamp.

1.09 RESUBMISSIONS

A. Prepare new and additional submissions, make required corrections, and resubmit corrected copies until found in compliance with the Contract Documents.

B. On, or with, re-submittals, clearly describe revisions and changes made, other than the corrections requested by Engineer, which did not appear on the previous submissions.

1.10 CONTRACTOR'S RESPONSIBILITIES

A. Engineer's review of submittals shall not relieve the Contractor of his/her responsibility for any deviation from the requirements of the Contract Documents nor relieve the Contractor from responsibility for errors or omissions in the submittals.

B. No portion of the work requiring a submission shall be commenced until the Engineer has found the submission in general compliance with the Contract Documents.

C. The Contractor shall provide written notification of any specification or drawing deviation.

1.11 EXCESS COSTS FOR ENGINEERING/ARCHITECTURAL SERVICES

A. The Owner will charge to the Contractor, and will deduct from the partial and final payments due the Contractor, all excess engineering and architectural expenses incurred by the Owner for extra services (work) conducted or undertaken by the Engineer as stipulated below:
   1. Services and other similar charges because of the Contractor's errors, omissions, or failures to conform to the requirements of the Contract Documents as related to administrative charges associated with non-compliance with the requirements for making project submissions.
   2. Services and other similar charges required to examine and evaluate any changes or alternates proposed by the Contractor and which may vary from the Contract Documents.
   3. Services and other similar charges as a result of the Contractor's proposed substitution of materials, equipment or products which require a redesign of any portion of the project, as contained in the Contract Documents at the time of bid.
   4. Services and other similar charges as a result of the Contractor's proposed substitution of products which require an engineering and/or architectural evaluation, beyond the time stipulated in Section 012500, to determine if the substituted product is equal to that specified.
   5. Services and other similar charges as a result of changes by the Contractor to dimensions, weights, sizes, voltages, phase, horsepower, materials of construction, and similar physical or operating characteristics of the product furnished which require redesign of the project in any way.
   6. Services and other similar charges for the review of resubmissions of shop drawings that have been marked as "No Exceptions Taken" or "Make Corrections Noted".
   7. Services and other similar charges for the review of shop drawings submitted more than two (2) times for the same product or portion of the work.

1.12 MISCELLANEOUS SUBMITTALS

A. Provide a Submittal Schedule within seven (7) calendar days from the date of the Notice to Proceed. The Submittal Schedule shall list all submittals for the project referenced by draft log number. Provide the estimated date that the submittal will be transmitted to the Engineer for review.

B. Within seven (7) calendar days from the date of the Pre-Construction Meeting, submit a Proposed Products List. This list shall be a complete listing of all products proposed for use, with name of manufacturer, service headquarters, trade name and model number of each product. Partial listings will not be accepted.

C. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.13 SUBCONTRACTOR LIST

A. The Contractor shall submit, on AIA Form G705, within THIRTY (30) calendar days after the date of the Notice to Proceed, a list of all subcontractors, including the names of the major subcontractors that were submitted at the time of the bid.

1.14 MATERIAL SAFETY DATA SHEETS (MSDS)

A. Comply with "Right to Know" requirements of Chapter 551 of Laws of New York, 1980, concerning notification of the use of toxic substances.

B. Any product or substance used by the Contractor or its subcontractors which is listed in Subpart Z of OSHA Part 1910 Title 29 of the Code of Federal Regulations entitled "Toxic and Hazardous

Substances" shall be identified to the Owner/Engineer by the Contractor's submission of a standard Material Safety Data Sheet (MSDS) in accordance with "Right To Know" requirements.

C. Products will not be permitted to be kept on site without a MSDS.

1.15 SHOP DRAWINGS

A. Submit shop drawings for all fabricated work, for all manufactured items and for items specifically required by the specifications.

B. Submit one (1) electronic copy of each standard drawing, catalog cut, or other material. All shop drawings or submittals that are not in the standard 8-1/2" x 11" format shall be submitted both electronically and in paper. Samples shall be delivered directly to the office of the Engineer. The Engineer will return an electronic copy of each submittal once reviewed.

C. Subcontractors shall submit shop drawings directly to the Contractor for checking. Thoroughly check subcontractors' shop drawings for measurements, sizes of members, details, materials, and conformance with the Contract Documents.
   1. Return submittals which are found to be inaccurate or in error.
   2. Do not submit to the Engineer until all corrections have been made.

D. Clearly show the relationship of the various parts of the project and where the information provided on the submission depends upon field measurements and existing conditions.

E. The Contractor shall make all measurements, confirm existing conditions, and include them on the shop drawings before making a submission to the Engineer.

F. Submissions for a single item, or group of related items shall be complete.

G. When submitting manufacturers' catalogs, pamphlets or other data sheets, in lieu of prepared shop drawings, clearly mark the items being submitted for review.

H. If the shop drawings contain any departures from the contract requirements, specifically describe them in the letter of transmittal.
   1. Where such departures require revisions to layouts, structural, architectural, electrical, HVAC or any other changes to the work as shown, Contractor shall, at his own expense, prepare and submit revised drawings accordingly.
   2. Make drawings the same size as the Contract Drawings and to the same scale.

1.16 SAMPLES

A. Where required, or where requested by the Engineer, submit sample or test specimens of materials to be used or offered for use.
   1. Samples shall be representative, in all respects, of the material offered or intended, shall be supplied in such quantities and sizes as may be required for proper examination and tests, and shall be delivered to Engineer, prepaid, along with identification as to their sources and types of grades.
   2. Submit samples well in advance of anticipated use to permit the making of tests or examinations.

B. Samples will be checked for conformance with the design and for compliance with the Contract Documents.

C. Work shall be in accordance with the approved sample. The use of materials or equipment for which samples are requested or required to be submitted is not permitted until such time that the Engineer has completed his review.

1.17 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation. Provide manufacturer's instructions with shop drawings.

1.18 CERTIFICATIONS

A. Submit certifications of compliance indicated in the Contract Documents.

B. Certifications shall be complete and exact, they shall be properly authenticated by the written signature, in ink, of an owner, officer or duly authorized representative of the person, firm or organization issuing such certification and they shall guarantee that the materials or equipment are in complete conformance with the requirements of these specifications.

1.19 COLORS AND PATTERNS

A. Unless the precise color and pattern are specified, whenever a choice of color or pattern is available in a specified product, submit accurate color and pattern charts for Engineer's and Owner's review and selection.

1.20 MANUFACTURER'S SERVICE CENTER

A. The product of a manufacturer who does not maintain an adequate nearby service center and a sufficient stock of spare parts are subject to rejection by Engineer solely on that basis.

B. With each submission, submit information on manufacturer's facilities and give complete details of his service policies and capabilities, and a general idea of the stock of spare parts available. Submit this information in the form of a certification. Also include names, addresses and telephone numbers of at least three of the service center's present customers who are in the area of the project.

1.21 TEST RESULTS AND INSTALLATION

A. Whenever field startup services are specified, the Contractor shall obtain from the manufacturer and submit to the Engineer Manufacturer Startup Reports (MSR's). The report shall detail the results of the field visit and all special conditions resulting from the startup.

B. Whenever field or factory tests are required on materials, equipment and systems, such tests shall be performed and the test results submitted to Engineer in the form of a MSR.

C. Do not deliver to the project or incorporate into the work any materials or equipment for which Engineer has not completed his review and found same to be in general conformance with the Contract Documents.

D. Submit MSR's within thirty (30) calendar days after the date of the startup or factory test.

1.22 SPARE PARTS LIST

A. Prepare a list of all spare parts specified to be provided in other Sections. Compile the total list for the purposes of reviewing actual spare parts delivered versus spare parts specified to be provided. The list shall reference the Section, model number, and quantity to be provided.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

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CONTRACTOR'S COMPANY NAME
ADDRESS

SUBMISSION TRANSMITTAL FORM

CLIENT NAME: Riverhead Water District
PROJECT TITLE: Booster Pumping Station at East Winds Drive

H2M PROJECT NO.: RDWD2201

Product, Item, or System Submitted:			
Submission Date:		Submission Log No.:	
Specification Section:		Paragraph Reference:	
Contract Drawing Reference(s):			
Manufacturer's Name:			
Manufacturer's Mailing Address:			
Manufacturer's Contact Information:	*Name*	( ) *Tel. no.*	*Email*
Supplier's Name:			
Supplier's Mailing Address:			
Supplier's Contact Information:	*Name*	( ) *Tel. no.*	*Email*
This item is a substitution for the specified item:		____ No	____ Yes
		Contractor's Brief Comments or Remarks (attach separate letter as needed):	
Contrator's Approval Stamp with Signature & Date		By making this submission, we represent that we have determined and verified all field measurements and dimensions, field construction criteria, site and building constraints in terms of limitations in moving the item into the enclosed space, materials, catalog and model numbers and similar data and that we have checked and coordinated this submission with other work at or adjacent to the installed location in accordance with the requirements contained in the Contract Documents.	

END OF SECTION 013300

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Codes

B. Governing agencies

C. Permits

1.02 CODES

A. Comply with the requirements of the various codes referred to in these Specifications. Such codes shall be the date of the latest revision in effect at the time of receiving bids.

B. If there is a conflict between local, state, and/or Federal regulatory requirements, seek a consultation with the State Department of Labor. Resolve conflicts to the satisfaction of the State Department of Labor prior to commencing work.

C. Electrical Work: Conform to the requirements of the National Electrical Code (NEC) unless otherwise shown or specified. The Owner will be the sole judge of the interpretation of these rules and requirements.

1.03 GOVERNING AGENCIES

A. All work shall conform to and be performed in strict accordance with all governing agencies such as, but not limited to:
   1. Occupational Safety and Health Act - OSHA
   2. State Department of Environmental Conservation
   3. State Building Code
   4. State Fire Code
   5. National Fire Protection Association - NFPA
   6. National Electrical Code
   7. State Plumbing Code
   8. New York State Energy Code
   9. County Department of Health
   10. Town Codes, Rules, Laws and Ordinances
   11. Sewer District Sewer Use Code
   12. Local Water District
   13. Electric Utility

1.04 PERMITS AND INSPECTIONS

A. Representatives of the Owner shall have access to the work for inspection purposes. The Contractor shall provide facilities suitable to the Owner to facilitate inspections of the installed work.

B. Obtain and pay for all permits, fees, licenses, certificates, inspections and other use charges required in connection with the work.

C. Obtain a New York Board of Fire Underwriters inspection and certificate.

D. The following permits and/or certifications will be obtained by the Owner from the appropriate permitting agencies:
   1. Suffolk County Department of Health 348 – Public Water Supply Improvement.
   2. Suffolk County Department of Health 347 – Backflow Prevention Devices.

3. Suffolk County Department of Health Article XI – Chemical Storage.
4. Suffolk County Department of Health Article 7 - Diesel Storage.

1.05 LISTINGS

A. Equipment and materials for which Underwriters' Laboratories, Inc. (UL) provides product listing service, shall be listed and bear the listing mark. Alternately, ETL Testing Laboratories, Inc. Product Safety Testing Listing is acceptable if the listed product has been tested to the applicable UL Standard.

1.06 FIRE RESISTANT CONSTRUCTION MATERIALS AND ASSEMBLIES

A. Conform to the fire rating classifications based upon the test methods and acceptance criteria in the Standard, Fire Tests of Building Construction and Materials for which Underwriters' Laboratories, Inc. (UL) provides listings.

B. Materials and assemblies shall comply with the acceptance criteria, detailed description of the assembly, its performance in the fire test and other pertinent details such as specification of materials, Classification coverage, and alternate assembly details.

C. Alternatively, fire resistance rating classifications by other issuing organizations listed in the Fire and Building Codes are acceptable.

1.07 COORDINATION WITH ELECTRIC UTILITY COMPANY

A. Comply with the utility company requirements for the incoming electric service.
   1. Pay the utility company's charges in connection with the installation of the incoming service.
   2. An allowance for the utility company's charges is included in Section 012100.

1.08 COORDINATION WITH WATER UTILITY

A. Comply with the water utility requirements for water and fire service connections. Obtain and pay for all necessary permits from the water utility. Obtain authority to connect to the existing water mains.
   1. Make necessary connections to existing public water mains under supervision of the water utility representative.

B. Pay the water utility's charges for the connections.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 014100

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for monitoring the quality of the constructed project.

B. Work of this Section also includes services of an independent testing laboratory for quality assurance testing.

C. The services of the testing laboratory will be paid for out of the cash allowance included by the Contractor in the price as bid in accordance with the requirements contained herein and in Section 012100 - Allowances.

1.02 REFERENCES

A. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

B. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

C. ASTM D4561 - Practice for Quality Control Systems for an Inspection and Testing Agency for Bituminous Paving Materials.

D. ASTM E699 - Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

1.03 QUALITY ASSURANCE - CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or workmanship that is more precise.

C. Perform work by persons qualified to produce workmanship of specified quality.

D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

E. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

1.04 MOCK-UP

A. Assemble and erect specified items with specified attachment and anchorage devices, flashing, seals, and finishes.

B. Accepted mock-ups shall be a comparison standard for the remaining work.

C. Where a mock-up has been accepted by the Engineer and is specified to be removed, then the Contractor shall remove the mock-up and the clear area when directed to do so by the Engineer.

1.05 QUALITY ASSURANCE - TESTING LABORATORY

A. In order to establish compliance with the Contract Documents, materials shall be tested, examined and evaluated before they are incorporated into the work. During and after installations, additional tests, examinations, and evaluations shall be made to determine continued compliance throughout the course of the work.

B. Testing laboratory shall be a reputable, experienced firm that is capable of performing all of the required testing and authorized to operate in the state in which the project is located.

C. Perform all sampling and testing in accordance with specified procedures and use the materials, instruments, apparatus, and equipment required by the codes, regulations and standards. Where specific testing requirements or procedures are not described, perform the testing in accordance with all pertinent codes and regulations and with recognized standards for testing.

D. In the event that samples and test specimens are not properly taken, handled, stored or delivered or if other requirements of this Section are not complied with, Engineer reserves the right to delegate any or all of this work to others, or to take whatever action deemed necessary to ensure that sampling and testing are properly accomplished, for which all costs shall be borne by Contractor.

E. Engineer reserves the right to disapprove the use of a specific testing laboratory, even after prior approval, if the laboratory fails to meet or comply with the requirements of this Section. If this should occur, immediately discharge the testing laboratory and retain the services of a different laboratory acceptable to Engineer.

F. The testing laboratory shall meet the following criteria:
   1. Be capable of performing all of the required tests.
   2. Be regularly engaged in performing the types of services required.
   3. Have adequate facilities, materials, equipment, and personnel to perform the services.
   4. Have an adequately trained, experienced and qualified staff.
   5. Have at least one registered professional engineer licensed in the state in which the project is located who shall be capable of performing field tests, supervising laboratory testing and interpreting test results. The professional engineer shall be thoroughly knowledgeable in materials, soils, asphalt paving and concrete.
   6. Shall be able to be on the Project site within two hours after being notified.
   7. Comply with the requirements of ASTM C1077, ASTM D3740, ASTM D4561, ASTM E548 and ASTM E699.
   8. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.06 REFERENCE STANDARDS

A. Conform to reference standards by date that the project was last bid.

B. Obtain copies of standards when required by Contract Documents.

C. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.07 SUBMITTALS

A. Within fifteen (15) calendar days from the date of the Notice to Proceed, submit documentation from three (3) testing laboratories that clearly indicates experience, location, qualifications of staff, and descriptions of any limitations or restrictions of the firm.
   1. Include a price schedule for standard tests and a billing rate schedule for technician classifications.
   2. Based upon this information, the Engineer will select one firm to be the primary testing laboratory and one firm to act as a standby.

B. Certified copies of each test report shall be mailed directly to the Engineer. The Contractor shall arrange with the laboratory to secure copies.

C. Each report shall be in writing and shall include the testing method used, the test results, the specified results, the exact location of where the test specimens were taken, the date taken, Project identification, Contractor's name and other pertinent information required for a complete and meaningful test report.

D. Each report shall be signed and certified by a responsible officer of the testing laboratory.

E. E-mail reports directly to Engineer within 24 hours after the sample is taken, except in those instances when tests cannot be immediately performed because of required curing, incubation periods, or lengthy testing procedures.

F. The laboratory shall verbally communicate test results when requested by the Engineer. This does not eliminate nor replace the requirements for a written report.

1.08 SCHEDULING - LABORATORY SERVICES

A. Except where otherwise specified, the Engineer will determine the number of samples to be taken, the date and time samples will be taken and tests made, the number and type of tests to be performed, who will collect the samples, how they will be handled and stored and when laboratory personnel are required on site.

B. Engineer will notify Contractor of his decision to take samples and/or have tests made and provide him with the pertinent information. Contractor is responsible for notifying the testing laboratory and for having the testing performed, on schedule.

C. In addition to the above, Contractor shall make his own arrangements for the sampling and testing of materials he proposes to incorporate into the work. This shall not be paid for out of the cash allowance.

D. Notify Engineer at least 72 hours in advance of the times at which scheduled samples or tests will be conducted.

E. If samples and/or tests cannot be taken or performed when required, delay the work until such time that they can be accomplished. Where possible, any work that has been installed but has not been sampled or tested as required, shall be tested by other means. Upon Engineer's request, uncover any work, which has been buried or covered, and perform special tests designated by Engineer. If the work cannot be tested by other means, Engineer may declare the work unacceptable. All costs associated with noncompliance and for special testing shall be borne by the Contractor and not be paid for out of the cash allowance.

F. Should the testing laboratory be scheduled to take or collect samples or to perform tests, and finds that it is unable to do so as a result of delays in construction, inclement weather, or any

other reason, reschedule the tasks for a date acceptable to Engineer. Costs associated with times testing laboratory is unable to perform scheduled services shall be borne by the Contractor and will not be paid for under the allowance.

G. Plan all work and operations to allow for the taking and collection of samples and allow adequate time for the performance of tests. Delay the progress of questionable work until the receipt of the certified test reports.

1.09 TESTING REQUIREMENTS

A. Dry Paint Thickness Measurement: Perform dry paint thickness using calibrated SSPC Type 2 fixed probe gages.

B. Compaction Testing - Soil:
   1. Perform compaction testing in accordance with ASTM D2922, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) or ASTM D1556 Density and Unit Weight of Soil In Place by the Sand Cone Method.
   2. Perform tests and analysis of fill material in accordance with ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. Rammer and 12-inch Drop.

C. Compaction Testing - Asphaltic Concrete Pavement:
   1. Perform asphaltic concrete compaction testing in accor-dance with ASTM D2950 - Standard Test Method of Density of Bituminous Concrete in Place by Nuclear Methods.
   2. Calibrate nuclear density measurement equipment based on theoretical maximum specific gravity of asphaltic con-crete pavement material.
   3. Perform test to determine theoretical maximum specific gravity in accordance with ASTM D2041 Theoretical Maximum Specific Gravity of Bituminous Pavement Mixtures. Perform test on mix at plant prior to delivery. Collect sample at plant in accordance with ASTM D979 - Sampling Bituminous Paving Mixtures and perform test in approved laboratory if plant does not have necessary equipment.

D. Concrete Testing:
   1. Collect samples in accordance with ASTM C172, Practice for Sampling Freshly Mixed Concrete.
   2. Make test cylinders in accordance with ASTM C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   3. Test concrete cylinders in accordance with ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   4. Test slump and air entrainment.

E. Asphalt Testing:
   1. Collect samples at point of delivery in accordance with ASTM D979, Standard Practice for Sampling Bituminous Paving Mixtures.
   2. Perform extraction test in accordance with ASTM D2172, Standard Test Meth-ods for Quantitative Extraction of Bitumen from Bituminous Paving Mix-tures.
   3. Perform gradation test in accordance with ASTM C136, Method for Sieve Analysis of Fine and Coarse Aggregates.

F. Water Quality Testing:
   1. In accordance with Section 331120 - Water Quality Sampling, Section 331140 -Disinfection of Water Facilities, and Section 331300 - Disinfection of Water Utility Distribution Piping.

1.10 TESTING SCHEDULE

A. Dry Paint Thickness Measurement:
   1. Make five (5) separate spot measurements spaced evenly over 100 square feet of area.
   2. For structures exceeding 1000 square feet of finished surface, three 100 square feet areas shall be randomly selected by the Engineer plus one 100 square foot area for each additional 1000 square feet of finished surface. This requirement shall be subject to change as required by the Engineer.

B. Compaction Testing of Soil:
   1. Pipe Installation: As directed by the Engineer.
   2. Concrete flatwork: As directed by the Engineer.
   3. Pavement subgrade: As directed by the Engineer.

C. Concrete Testing: Make six (6) concrete test cylinders for each 50 c.y. or fraction thereof.
   1. Test two (2) cylinders at 7 days.
   2. Test two (2) cylinders at 28 days.
   3. The remaining cylinders shall be tested at a time to be determined by the Engineer. This requirement shall be subject to change as required by the Engineer.

D. Asphalt Testing: As directed by the Engineer.

E. Compaction Testing of Pavement: As directed by the Engineer.

F. Water Quality Testing:
   1. As directed by Engineer.

1.11 FIELD OBSERVATION OF CONTRACTOR'S WORK

A. The Engineer will provide periodic observation of the Contractor's work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions. Verify that the existing substrate is capable of structural support or attachment of new Work being applied or attached. Examine and verify specific conditions described in individual specification sections. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance. Seal cracks or openings of substrate prior to applying next material or substance.

B. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 FIELD QUALITY CONTROL

A. Allow representatives of the testing laboratory access to the work at all time. Provide all equipment, labor, materials, and facilities required by the laboratory to properly perform its functions. Cooperate with and assist laboratory personnel during the performance of their work.

B. Test specimens and samples shall be taken by the person(s) designated in other Sections, or as directed by Engineer. Conduct field sampling and testing in the presence of Engineer. Provide all materials, equipment, facilities and labor for securing samples and test specimens and for performing all field-testing.

END OF SECTION 014500

CLIENT **PROJECT** **ADDRESS**	**STATEMENT OF SPECIAL INSPECTIONS AND TESTS** As required by the 2020 Building Code of New York State

BC NYS § 1704.3 requires the project Design Professional to complete the Statement of Special Inspections and Tests. Completion of the Statement of Special Inspections & Tests and submission to the Building Department with the Construction Permit Application is a condition for issuance of the Building Permit.

Owner	Building
Riverhead Water District	
Project Title	
Booster Pumping Station at East Winds Drive	
Project #	Project Address
RDWD2201	East Winds Drive, Wading River, New York,11933
Architect/Engineer	
H2M Architects, Engineers, Land Surveying and Landscape Architecture, D.P.C.	
Name of Person Completing this Statement	Phone / Date
Scott D. Lehn, P.E.	(631) 756-8000 / 07/29/2024
Comments	

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS)	**CONTINUOUS**	**PERIODIC**	**REFERENCE STANDARD**	**BC NYS REFERENCE**	**CHECK IF REQUIRED**	**IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY**
A. Steel Construction				1705.2		
1. Structural Steel.			AISC 360 Chapter N.5	1705.2 1705.2.1		
2. Cold Formed steel deck.			SDI QA/QC 2011	1705.2 1705.2.2		
3. Installation of open-web steel joist and joist girders.			SJI specification (Section 2207.1)	1705.2 1705.2.3 1705.2.4		
B. Concrete Construction				1705.3 Table 1705.3		
1. Inspection of reinforcing steel, including prestressing tendons, and placement.		X	ACI 318: Ch. 20, 25.2, 25.3, 26.6.1-26.6.3	1705.3 1908.4	x	033000
2a. Reinforcing Bar welding - Weldability of reinforcing bars other than ASTM A706.		X	AWS D1.4; ACI 318: 26.6.4	1705.3.1Table 1705.3	x	033000

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BC NYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
2b. Reinforcing bar welding-Single-pass fillet welds, maximum 5/16 inches.		X	AWS D1.4; ACI 318: 26.6.4	1705.3.1Table 1705.3	x	033000
2c. Reinforcing bar welding - All other welds.			AWS D1.4; ACI 318: 26.6.4	1705.3.1 Table 1705.3		
3. Cast in concrete anchorage		X	ACI 318: 17.8.2	Table 1705.3	x	033000
4a. Post installed concrete members - Adhesive anchors installed horizontally or upwardly inclined to resist sustained tension loads.			ACI, 318: 17.8.2.4	Table 1705.3		
4b. Post installed concrete members - Mechanical anchors and adhesive anchors not defined in 4a.		X	ACI, 318: 17.8.2	Table 1705.3		
5. Verify use of design mix.		X	ACI 318: Ch. 19, 26.4.3, 26.4.4	Table 1705.3, 1904.1,1904.2, 1908.2, 1908.3	x	033000
6. Sampling fresh concrete, slump, air content, temperature, strength test specimens.	X		ASTM C172, ASTM C31; ACI 318: 26.4, 26.12	Table 1705.3, 1908.10	x	033000
7. Inspect concrete and shotcrete placement for proper application techniques.	X		ACI 318: 26.5	Table 1705.3 1908.6 1908.7 1908.8		033000
8. Inspection for maintenance of specified curing temperature and techniques.		X	ACI 318: 26.5.3-26.5.6	Table 1705.3, 1908.9	x	033000
9. Inspection of prestressed concrete.			ACI 318: 26.10.	Table 1705.3		
10. Erection of precast concrete members.			ACI 318: Ch. 26.9	Table 1705.3		

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BC NYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
11. Verification of in-situ concrete strength prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and slabs.			ACI 318: 26.11.2	Table 1705.3		
12. Inspect formwork for shape, location and dimensions of the concrete member being formed.		X	ACI 318: 26.11.1.2(b)			
13. Material Tests - In absence of sufficient data or documentation for materials.		X	ACI 318 Ch.19 and 20.			
C. Masonry Construction						
1. Masonry construction		X	ACI 530 /ASCE 5/ TMS 402 and ACI 530.1 / ASCE 6 / TMS 602 Ch.3	1705.4	x	042200
2. Empirically designed masonry, glass unit masonry and masonry veneer in Risk Category IV.			TMS 402 / ACI 530 / ASCE 5 Level B Ch. 3	1705.4.1 2109 2110 or Ch. 14		
3. Vertical masonry foundation elements				1705.4 1705.4.2		
D. Wood Construction				1705.5		
1. Wood construction - Fabrication of wood structural elements and assemblies.		X		1705.5, 1704.2.5		
2. High-load Diaphragms.				1705.5 1705.5.1 2306.2 1704.2		
3. Metal-plate-connected wood trusses spanning 60 feet or greater (temp. and permanent installations)				1705.5.2		
E. Soils				1705.6		

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BC NYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
1. Subgrade inspection		X		1705.6 Table 1705.6	x	312323
2. Classification and testing of compacted fill materials		X		1705.6	x	312323
3. Evaluation of in-place density and lift thickness.	X			1705.6	x	312323
F. Driven Deep Foundations				1705.7		
1. Installation and load tests (if applicable)				1705.7 Table 1705.7		
G. Cast-In-Place Deep Foundations				1705.8		
1. Installation, end bearing strata, and load tests (if applicable)				1705.8 Table 1705.8		
H. Helical Pile Foundations				1705.9		
1. Installation and load tests (if applicable)				1705.9		

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BC NYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
I. Fabricated Items		X		1705.10 1704.2.5		
J. Wind Resistance				1705.11		
1. Applicable in Exposure Category B with a basic wind speed of 120 mph and Exposure Categories C or D with basic wind speed of 110 mph or greater.				1705.11		

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BC NYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
1a. Structural wood - Field gluing operation of elements of main wind force-resisting system (MWRS).				1705.11.1		
1b. Structural wood - Nailing, bolting, anchoring, and fastening elements of the MWRS.		X		1705.11.1	x	061000
2a. Cold formed steel - Welding operations of elements of MWRS.				1705.11.2		
2b. Cold formed steel - Screw attachments, bolting, anchoring, and fastening of elements of MWRS.				1705.11.2		
3. Wind-resisting components - Roof covering, roof deck, and roof framing connections. Exterior wall covering and wall connections to roof and floor diaphragms and framing.				1705.11 1705.11.3	x	061000
K. Special Inspections for Seismic Resistance: Applicable to specific structures, systems, and components.				1705.12		
1. Structural steel - Seismic force-resisting systems & elements.			AISC 341 Chapter J	1705.12.1.1 or 1705.12.1.2		
2a. Structural wood - Field gluing operation of elements of seismic force-resisting system (SFRS).				1705.12.2		
2b. Structural wood - Nailing, bolting, anchoring, and fastening of elements of SFRS.		X		1705.12.2		
3. Cold-formed steel framing - welding and fasteners.				1705.12.3		

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BC NYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
4. Designated seismic systems - verify that label, anchorage, and mounting conforms to the certificate of compliance.		X	ASCE 7 Section 13.2.2	1705.12.4		
5. Architectural components.				1705.12.5		
6. Plumbing, Mechanical and Electrical components.		X		1705.12.6		
7. Storage racks and access floors				1705.12.7		
8. Seismic isolation systems.				1705.12.8		
9. Cold-formed steel special bolted moment frames.				1705.12.9		
L. Structural Testing for Seismic Resistance: Applicable to specific structures, systems, and components.				1705.13		
1. Structural steel.			AISC 341 Chapter J	1705.13.1		
2. Nonstructural components.			ASCE 7 Section 13.2.1	1705.13.2		
3. Designated seismic systems.			ASCE 7 Section 13.2.2	1795.13.3		
4. Seismic isolation systems			ASCE 7 Section 17.8	1705.13.4		
M. Sprayed Fire-Resistant Materials [BF]				1705.14		
1. Physical and visual tests. Applicable to specific structures.		X		1705.14.1		
2. Structural member surface conditions		X		1705.14.2		
3. Application.		X		1705.14.3		
4. Thickness.		X	ASTM E 605	1705.14.4		
5. Density.		X	ASTM E 605	1705.14.5		
6. Bond strength.		X	ASTM E 736	1705.14.6		
N. Mastic and Intumescent Fire-Resistant Coatings [BF].		X	AWCI 12-B	1705.15		

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BC NYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
O. Exterior Insulation and Finish Systems (EIFS).		X	ASTM E 2570	1705.16		
P. Fire-Resistant Penetrations and Joints [BF] High rise building or buildings assigned to Risk Category III or IV.			ASTM E 2174 ASTM E 2393	1705.17		
Q. Testing for Smoke Control [F]		X		1705.18		

END OF SECTION 014500.11

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Asbestos and lead-based paint certification.

B. Moisture control.

1.02 RELATED SECTIONS

A. Section 014100 - Regulatory Requirements

B. Section 015719 - Temporary Environmental Controls

1.03 ASBESTOS AND LEAD-BASED PAINT CERTIFICATION

A. Contractor shall submit the enclosed "Asbestos and Lead-Based Paint Certification" upon completion of all work.

1.04 MOISTURE CONTROL

A. The Contractor shall maintain a strict policy and protocol for the control of water infiltration and moisture build-up during the course of the project. The plans and specifications are not intended to depict each and every condition or detail of construction. As the knowledgeable party in the field, the Contractor is in the best position to verify that all construction is completed in a manner which will provide a watertight structure. The Contractor has the sole responsibility for ensuring the watertight integrity of the structure. The Contractor's contractual obligations include, but are not limited, to the following:

B. Water Infiltration: If the Contractor observes water infiltration (unintended) into a completed building or an ongoing construction site, he must immediately report the condition to the Owner and Engineer, and shall immediately take steps to investigate the source of the water infiltration, identify the responsible party (person who performed work that resulted in water infiltration) and devise a procedure to promptly eliminate water infiltration into the building.

C. Handling of Water-Damaged Building Materials and Construction:
   1. Contractor shall inspect all building materials delivered to the site for pre-existing water damage, as well as existing mold growth.
   2. If in-place construction becomes wet, notify the Owner and Engineer immediately. The Owner and Engineer will determine whether or not the work shall be removed and replaced, or if the type of material can be permitted to dry.
   3. Under no circumstances may new or additional construction be placed over, or otherwise enclose, wet building materials.

D. Visible Mold/Mildew:
   1. If the Contractor observes any substance that appears to be mold or other fungal growth and/or an unidentified substance within a completed building or the ongoing construction site, he shall immediately suspend construction operations in the area, and report the condition to the Owner and Engineer.
   2. No person shall be allowed back into the affected area without permission of the Owner.

1.05 SUBMITTALS

A. Contractor shall submit completed and notarized "Certification of Asbestos and Lead-Based Paint" form.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

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Certificate of Asbestos and Lead-Based Paint
(New Work)

Client's Name:_____

Project Location:_____

Project Address:_____

Project Name:_____

Project Number:_____

CERTIFICATION:

This Contractor hereby certifies that no asbestos-containing material and lead-based paint, as defined by applicable federal and state regulations, has been furnished or installed at the referenced project:

Contractor Name:_____

Signature:_____

Address:_____

_____

Telephone:_____ Date Executed: _____

This Form Shall Be Notarized

END OF SECTION 014536

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section supplements the General Conditions.

B. The Work of this Section includes temporary facilities, utilities, and controls to be furnished by the Contractors for this project as it is specified herein.

C. This Section is made a part of all Construction Contracts associated with the project. It contains specific references to the particular Contractor supplying said product or service. If no reference is provided then the requirement applies to all Prime Construction Contractors.

D. Temporary electric shall be provided by the Prime Electrical Contractor as specified in Section 015113 located in the Contract Documents for Contract E except as required herein.

1.02 CARE AND PLACEMENT

A. All temporary and permanent facilities and controls and all other elements on the project site shall meet all standards of the Occupational Safety and Health Act of 1970 and subsequent revisions. Each Contractor shall comply with all requirements of the Act.

B. Each Contractor shall take every precaution and shall provide such equipment and facilities as are necessary or required for the safety of its employees and persons at the site.

C. In the event of damage to existing and/or temporary facilities then immediately make all repairs and replacements to an equal condition prior to the event.

1.03 QUALITY PERFORMANCE

A. Comply with and perform all work in accordance with the requirements of local authorities and utility companies having jurisdiction, and all applicable codes, regulations and ordinances.

B. Secure approvals from the appropriate jurisdictions and utility companies on all repairs, relocations, connections, disconnections and the Work.

C. All barricades, warning signs, lights, temporary signals and other protective devices shall conform with "Manual on Uniform Traffic Control Devices for Streets and Highways", US Government Printing Office.

1.04 SUBMITTALS

A. Each Contractor shall provide a list of contact numbers as follows:
   1. Contractor's superintendent and office project manager (home, beeper, cellular, office, fax, trailer, and email address).
   2. All subcontractors.
   3. All utility companies.
   4. Emergency services such as fire department, police, and ambulance.
   5. Contractor shall also submit the following:
      a. Name and qualifications of person or persons who shall be available to render first aid.
      b. Names, addresses and telephone numbers of personnel who can be telephoned and act on behalf of Contractor in the event of emergencies or other problems requiring prompt attention during winter shutdown, holidays, nights and other periods when the Contractor's superintendent may be absent from the project site.

B. The General Contractor shall provide a sketch showing routing of temporary water service for construction purposes and for exfiltration tank testing. Provide cuts and plumber's certification for backflow device(s).

1.05 CONTRACTOR'S RESPONSIBILITY

A. Each Contractor shall be responsible for the installation, performance, maintenance, and repair of all temporary facilities and controls specified herein this Section as originally provided.

B. The Owner reserves the right to immediately correct a Contractor caused action, if in the opinion of the Owner, the situation may result in the immediate loss of life, property, and degradation of the environment. The costs for actions taken by the Owner shall be deducted from money due or to become due the Contractor. Amounts in excess shall be paid by the Contractor.

C. If the Contractor caused situation is not deemed immediate, then the Contractor shall, within 24 hours of receipt of written and/or verbal notice, correct the defect or unsatisfactory condition.

D. The Owner may repair, correct, replace, or install temporary facilities to correct the situation if the Contractor fails to perform within the allowed time. The costs to make the corrections shall be deducted from money due or to become due the Contractor. Amounts in excess shall be paid by the Contractor.

PART 2 - PRODUCTS

2.01 GENERAL

A. The Owner may use temporary power lines, pipes, roadways or other facilities that each Contractor furnishes, installs, and maintains (then removes at the completion of the work), during the period of construction.

B. The location of all temporary power lines, roadways, and other necessary temporary facilities shall be subject to the approval of the Engineer, and these shall be located and operated so as not to interfere with the operation of the facilities.

2.02 WATER FOR CONSTRUCTION PURPOSES

A. Each General Contractor shall obtain water from the nearest potable water source as designated by the Owner.

B. The Owner will pay for water usage for general construction activities such as dust control and for sanitary purposes, like hand washing.

C. Potable water, used for pipe exfiltration testing, process tank testing, storage tank testing, or elevated water storage tank testing, will not be paid for by the Owner. The Contractor shall include the costs for water for this purpose in the price as-bid.

D. Each General Contractor shall install his or her own backflow prevention device at the supply point where it is connected to the Owner's system.
   1. The water purveyor shall approve the device.
   2. The device shall be tested and certified as functioning properly.
   3. Post the certification in a location acceptable to the water purveyor.

E. A water meter shall also be installed on any water service lines used to supply water for exfiltration testing.

F. Each Contractor shall exercise measures to conserve water.

G. Provide insulation and heat tracing to prevent freezing of temporary piping. Drain hoses at the end of each use.

H. All Contractors, subcontractors, and personnel involved in the project shall be permitted to use water for construction purposes as provided under this paragraph.

2.03 SANITARY FACILITIES

A. Each General Contractor shall provide and maintain his or her own temporary toilet facilities and enclosures.

B. These facilities shall be maintained in a strictly sanitary manner and be screened from the general public.

C. All facilities shall be in accordance with the Occupational Safety and Health Act (OSHA) standards and all other applicable local codes.

D. The locations of such facilities shall be determined by the Engineer or the Owner and be shown on the General Contractor's Site Utilization Plan.

E. All applicable codes and regulations regarding the maintenance and method of waste disposal for these facilities will be strictly enforced. These facilities shall be of the portable type.

F. The Owners sanitary facility will not be available for use by any contractor.

G. Comply with the requirements also contained in Section 015719 - Temporary Environmental Controls.

H. The temporary toilet facilities and enclosures shall be maintained on the premises until final payment is issued.

2.04 HEAT

A. Each General Contractor shall provide and pay for heating devices and fuel as required to maintain adequate heat for specific construction operations; i.e. painting, application of coatings, etc. where so specified elsewhere in these specifications.

B. The General Contractor shall heat buildings to properly apply paint in accordance with Section 099100 requirements.

C. Maintain minimum ambient temperature of 40 degrees F in areas where construction is in progress, unless otherwise indicated in specifications or as required by proposed working conditions and manufacturer's installation/application instructions.

2.05 VENTILATION

A. Each Contractor shall ventilate enclosed areas to assist in the curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.

B. The General Contractor shall ventilate buildings to safely apply paint in accordance with Section 099100 requirements.

2.06 BARRIERS AND PROTECTION

A. Each Contractor shall provide railings, barricades, signs, fences and other protective devices to prevent unauthorized entry to construction areas, to allow for the Owner's safe use of the site and to protect existing facilities and adjacent structures from damage from the work.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing buildings.

C. Provide protection for plant life designated to remain.

D. Protect vehicular traffic, stored materials, public utilities, site and structures from damage.

E. Provide warning signs, detour signs and other traffic control devices to insure the safety of plant operators and to adequately direct traffic around the work. Illuminate barricades, obstructions, and warning signs from sunset to sunrise.

2.07 TEMPORARY FENCING

A. Each Contractor is responsible for performance compliance with OSHA standards.

B. Each Contractor shall provide temporary safety fence around all open excavations or other dangerous conditions on the construction site.
   1. All temporary safety fencing shall be designed and erected in compliance with OSHA standards, but in no case less stringent than these specifications for fencing.
   2. Fence is to be bright orange in color, a minimum of 4 feet high, and properly secured using 1" diameter steel pipe at 4'-0" on-center as support posts.
   3. Stake each support post to a depth of 18" and tamp securely into place.
   4. Each post shall be plumb.
   5. Secure fencing to posts using heavy-duty 12" long cable ties or tie wire.
   6. The fence and supports shall remain the property of the Contractor and be promptly removed at the appropriate time.

2.08 TEMPORARY HANDRAILS AND SCAFFOLDS

A. All temporary handrailing and scaffolds shall be designed and erected in compliance with OSHA standards. Each Contractor is responsible for performance compliance with OSHA standards.

B. Handrails shall be securely installed and maintained in accordance with OSHA regulations until the permanent railing or grating has been permanently installed and approved by the Engineer.

C. All scaffolding and platforms shall be erected in a safe and substantial manner complying with OSHA requirements.

D. All temporary handrails and scaffolds shall be designed by a professional engineer licensed in the state where the project is being constructed.
   1. The design drawings and details shall be stamped by the licensed engineer and submitted for record purposes.
   2. The Contractor's design engineer shall visit the site to certify that the handrailing and/or scaffolds have been erected pursuant to the stamped design.

2.09 EROSION CONTROL

A. Each Contractor shall provide measures to keep the ground surface well drained, but avoid erosion of embankments, excavations, the project site, and adjacent areas.

B. Each Contractor shall comply with all local codes, rules, and regulations concerning soil erosion.
   1. Use hay bales or silt fences to control erosion to the satisfaction of the Engineer and regulatory agencies. Use hay bales or silt fences to stop silt and sediment from reaching surface waters, parking lots and roads.
   2. Leave erosion control methods in place until ground cover is established or until date of substantial completion.

C. The General Contractor shall install erosion control measures as shown on the Drawings.

D. Comply with the requirements also contained in Section 015719 - Temporary Environmental Controls.

2.10 DUST CONTROL

A. Each Contractor shall provide measures to control dust resulting from the work.

B. Control dust at locations and in such quantities and frequencies as required to prevent dust from becoming a nuisance to the surrounding area.

C. In the event the Contractor does not adequately provide for dust control, or should insufficient quantities of dust control agents be placed and Contractor fails to place additional quantities within 4 hours after Engineer's direction, Owner will perform the required work by whatever means deemed expedient and all expenses incurred by Owner will be charged to and paid by Contractor.

D. Take care in selecting and applying dust control agents so as not to make roadways or walkways slippery, muddy or hazardous. Dust control agents shall be acceptable to the Engineer.

E. The General Contractor shall provide all roadways with dust control.

2.11 RUBBISH REMOVAL

A. The General Contractor shall be responsible for overall rubbish removal.

B. Burning of rubbish and trash will not be permitted.

C. The General Contractor shall clean up trash as specified in Section 011400 - Work Restrictions or more often if the trash interferes with the work of others, presents a hazard or if directed by the Engineer.

D. Dispose of rubbish and waste materials in accordance with state regulations and local ordinances.

E. The General Contractor shall also place rubbish containers at locations selected by the Engineer.
   1. Furnish adequately sized rubbish containers from the date of initial mobilization to the date of final payment.
   2. As a minimum, the Contractor shall furnish two (2) 55-gallon general trash containers. Secure the top of each container to the container.
   3. Secure the container itself so that it does not get blown about the site.

F. The General Contractor shall be responsible for maintaining the site free of trash.

G. Each Contractor shall assist the General Contractor in maintaining the site free of trash and debris.
   1. It shall be the sole responsibility of the General Contractor to prevent trash from being blown about the site.
   2. Provide a worker to police the site at least for 1 hour at the end of each day that work is being undertaken by the General Contractor.

2.12 SNOW REMOVAL

A. The General Contractor shall be responsible for maintaining roads, walkways, sidewalks, and parking areas/lots free of snow. Provide snow plowing during and after each snow fall equal to or greater than 1.0 inch as reported by the local weather service.

B. Any damage resulting from the Contractor's snow clearing operations shall be immediately repaired at no additional cost to the Owner.

2.13 ENCLOSURES

A. Each Contractor shall provide and maintain temporary enclosures, sheds, or fenced-in areas to accommodate protection for products, material and equipment.

B. Store equipment that cannot be exposed to outdoors in accordance with Section 016500 - Product Delivery, Storage and Handling.

2.14 SECURITY

A. Each Contractor shall provide security and facilities to protect work from unauthorized entry, vandalism and theft.

B. Coordinate with Owner's security program, if applicable.

C. Each Contractor has full responsibility for the working area until final acceptance and payment.

D. The General Contractor shall maintain the perimeter fence that pre-existed prior to the start of construction. A temporary perimeter fence shall be required at all times during the construction and until the new perimeter fence is installed, or until the project is accepted by the Owner.

E. It shall be the General Contractor's responsibility to lock all gates to the site, and on the access road, at the end of each work day.

F. All on-site employees shall bear, at all times, an identification badge, conspicuously worn, which shall include, at a minimum, a passport or similar size photograph, the name of the employee and the name of the company.

G. Any employee working on site without a photo identification badge will be instructed to leave the site.

H. All company vehicles shall be conspicuously identified, through sufficiently sized lettering on both the passenger and driver sides, with the company name, address and telephone number.
   1. All employee owned vehicles shall have an 8-1/2 inch by 11 inch sign with the company name, address and telephone number placed on the dashboard on the driver side.
   2. Vehicles may be subject to search by the Owner or owner's representatives.
   3. Any vehicle that does not have the company name, address and telephone number will not be permitted on the Owners' property.

I. Submit to the Owner a complete listing of all employees that will or might be performing work at the project site.
   1. Furthermore, provide sufficient information as may be required for the Owner to conduct background checks, in accordance with the Fair Credit Reporting Act.
   2. Background checks may be performed at the discretion of the Owner due to the sensitive nature of the work and the extensive, and sometimes unsupervised, access to Owner property and buildings.
   3. The Contractor shall be required, on request from the Owner, at any time prior to or during the work, to provide releases from its employees and officers to the Owner, H2M, and a background search firm, hired by either the Owner or H2M, to conduct background checks in accordance with the Fair Credit Reporting Act and applicable state law.

2.15 PARKING

A. Do not allow heavy construction vehicle parking on existing pavement, if existing pavement is not scheduled for replacement or restoration.

B. Provide and maintain access to fire hydrants, building entrances, process tanks, doors and the work in general.

C. Each Contractor shall have his or her employees and subcontractors park in areas designated by the Owner/Engineer.

D. If designated on the Contract Drawings, then only use those areas for parking.

E. Where trades work from their trucks, then coordinate the parking of trucks with other prime contractors.

F. If a Site Utilization Plan has been specified, then parking shall be as sited in the plan.

2.16 DAMAGES

A. Each Contractor, with the prior approval of the Owner/Engineer, shall promptly repair any damage, directly or indirectly caused by the Contractor's operations.

B. All repairs shall be to the complete satisfaction of the Owner and equal in quality to that which pre-existed.

2.17 FIRST AID FACILITIES & EMERGENCY TELEPHONE NUMBERS

A. Each Contractor shall provide and maintain adequately equipped first aid facilities in a location or at locations that are readily accessible to workers, Engineer and visitors to the site.

B. Provide at least one on-site employee who is properly trained in first aid and who shall be available to render first aid whenever construction is in progress.

C. Provide a list of emergency telephone numbers as specified above.

D. Post the list of emergency telephone numbers as directed by the Engineer.

2.18 POLLUTION CONTROL

A. Do not permit pollutants, such as chemicals, fuels, lubricants, calcium chloride, sewage, water containing sediments and other deleterious, poisonous, toxic or oxygen demanding substances

to enter or leach into streams, lakes, wetlands, other surface waters, into groundwater, or into the air.

B. In waters used for public water supply or used for trout, salmon or other game or forage fish spawning or nursery, control measures must be adequate to assure that turbidity in the receiving water will be increased not more than 10 standard turbidity units (s.t.u.) in the absence of other more restrictive locally established limitations, unless otherwise permitted by the State.

C. In no case shall the classification for the surface water be violated, unless otherwise permitted by the State.

D. In water used for other purposes, the turbidity shall not exceed State limits.

2.19 TEMPORARY SECONDARY CONTAINMENT

A. Provide secondary containment for all fuel operated equipment. Capacity shall be 110% of the fuel capacity of the equipment being serviced.

B. Containment shall be cleaned on a weekly basis.

C. Containment shall be drained of water and/or snow after a corresponding weather event.

PART 3 - EXECUTION

3.01 PROTECTION OF EXISTING UTILITIES AND PUBLIC WORKS

A. Maintain and protect existing utilities and public works including, but not limited to, conduits, sewers, water mains, electric and telephone conductors or conduits, and gas mains encountered during the construction.

B. In the event that it is not possible to cross over, under, around or otherwise avoid the existing utility, the owner of the utility shall be notified that the utility must be altered or moved.

C. In the event that damage shall result to any service pipe for water or gas, or any private or public sewer or conduit, the Contractor shall immediately, and at its own expense, repair same to the satisfaction of the Engineer.

D. Any contents from the pipes, sewers or conduits shall be immediately removed and disposed in accordance with applicable laws.

3.02 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities and materials, immediately following substantial completion and prior to release of retainage.

B. Remove underground installations to a minimum depth of 2 feet.

C. Regrade site to restore to existing slope and elevation, and restore the surface.

D. Clean and repair damage caused by installation or use of temporary work.

E. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

F. Remove temporary parking and access roads.

G. Regrade area to existing slope and elevation and restore the surface to its existing condition.

H. Final payment will not be processed until all removals have been completed to the satisfaction of the Owner/Engineer.

3.03 PROTECTION OF EXISTING PROPERTY

A. Protect existing structures and finishes during performance of the work.

B. Protect existing trees and plants during performance of the work.

C. Do not deposit excavated materials or store materials around trees or plants or attach guy wires to trees.

END OF SECTION 015000

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Prime Electrical Contractor shall install temporary light and electricity for use by others.

B. Temporary exit signs shall also be installed as work of this Section.

C. Temporary electricity shall be installed within fifteen (15) calendar days from the date of the pre-construction conference to all areas of the site where new work is planned or where temporary electric facilities are shown on the Contract Drawings, except as specified herein below.
   1. Temporary electric shall be installed to the Engineer's trailer within two (2) days from the date that the trailer is on-site and is ready for power as notified by the Engineer.
   2. Temporary light and electric for all buildings being constructed or renovated as work of this project shall be installed within five (5) days from the date that the building's deck (roof) is installed as notified by the Engineer.

1.02 SERVICE

A. Provide 100-amp temporary power to the Engineer's trailer.

B. Provide 100-amp temporary electrical services for each area requiring electric.

C. Furnish means for connection of small power tools.

D. Furnish five (5) 100 foot high capacity, heavy-duty power extension cords for use throughout the site by others.

E. Applications for electrical service shall be completed by the Electrical Contractor.

F. The cost for installations, including labor, material, tools, removals, and supplies shall not be eligible for payment under any cash allowance and shall be included in the price as bid.
   1. Provide Wire and electrify the trailer.
   2. Maintain the service throughout the project up to final completion.
   3. Remove the service prior to the last day of final completion.

1.03 TEMPORARY LIGHT AND ELECTRICITY

A. The Prime Electrical Contractor shall make all necessary arrangements for temporary electric service at the site of the Work.
   1. Install all temporary light and power in accordance with the National Electrical Code.

B. At the Contractor's option, a properly sized generator may be provided during this period with all costs associated with its operation and maintenance being paid for by the Contractor.

C. Provide wiring and other equipment for temporary light and power in accordance with recognized industry standards.
   1. Wiring for temporary light and single-phase power shall, in general, consist of 3 wire, 120/240 volt with branch circuits of #12 conductors minimum.
   2. Provide branch circuits with weatherproof medium base type lamp holders for temporary lighting as required to maintain a minimum of 10 foot candles in the work areas of all buildings being constructed or renovated as work of this project.
   3. Provide branch circuits with fused ground type receptacle outlet for single-phase power.
   4. Provide lamps and fuses, including replacements.

5. Provide new materials for temporary light and power, except that transformers need not be new if they are in satisfactory operating condition.
6. Provide ground fault protection (such as portable plug-in type ground fault circuit interrupters) on single-phase 15 and 20 amp receptacle outlets.
7. Provide receptacle outlets, portable cord connectors and attachment plugs with standard NEMA configurations.

D. Upon completion of the project, remove all temporary electric light and power work and restore all affected finishes and connections.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 015113

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes the furnishing of the Engineer's Field Office (Trailer).
   1. The Engineer's Field Office shall be furnished by the General Contractor.
   2. It shall be provided within the time period specified hereinafter.

B. The General Contractor shall also furnish the following to the Owner/Engineer all in accordance with the specifications contained herein as follows:
   1. Miscellaneous equipment and supplies
   2. Services as may be specified herein.

1.02 CARE AND PLACEMENT

A. Field offices shall be placed where directed by the Engineer in accordance with site utilization requirements.

B. All field offices shall be installed to meet all standards of the Occupational Safety and Health Act of 1970 and subsequent revisions.

C. In the event of damage to existing facilities, including but not limited to: tanks, driveways, walks, pavement, buildings, pipes, conduits, valves, and electrical facilities then immediately make all repairs and replacements to an equal condition prior to the event.

1.03 QUALITY PERFORMANCE

A. Comply with and perform all work in accordance with the requirements of local authorities and utility companies having jurisdiction.

1.04 SUBMITTALS

A. The General Contractor shall submit the following:
   1. Floor plan of the proposed Field Office of the Engineer.
   2. Catalog cuts of miscellaneous equipment and supplies if they are different from that specified.

B. The Contractor shall also provide a listing of the companies providing specified services with telephone number and contact name. Provide references for each company when requested.

PART 2 - PRODUCTS

2.01 MATERIALS, EQUIPMENT AND SERVICES FURNISHED TO THE OWNER BY THE GENERAL CONTRACTOR

A. The General Contractor shall also furnish the following equipment and services that shall not be eligible under any cash allowance. All items specified herein shall be new and remain the property of the Owner unless otherwise stated. The following shall be furnished:
   1. Two (2) 5-gallon plastic wastepaper basket.
   2. New 50-person industrial first aid station, OSHA approved, by Acme United or equal, order no. ACM-1403 (Huntington Business Products) or equal.
   3. Thermometer, with indoor and outdoor sensing bulbs, and high, low instantaneous reading, with magnetic reset function by Radio Shack or equal.
   4. Two U.L. and F.M. approved fire extinguishers with a minimum rating of 4A-60B:C.
   5. One (1) 30" x 60" desk.
   6. Two (2) 48" x 60" reference tables.

7. Ten (10) folding chairs.

B. Janitorial Services - Provide janitorial services one (1) times each week. Thoroughly clean and dust entire office and leave in a condition satisfactory to Engineer. Provide this service through final completion.

C. Ownership of Furnishings - All items to be provided by Contractor under this paragraph shall remain the property of the Owner unless otherwise stated.

D. Internet Access Service - The General Contractor shall also pay for monthly Internet access fees for the length of the contract up to the date of final completion.
   1. This cost shall be included in the price as bid and shall be billed directly to the General Contractor.
   2. The service provider shall be selected by the Engineer. The General Contractor shall arrange for the service.
   3. The Contractor may use this service at the discretion of the Engineer. Only project related transmissions will be allowed.
   4. If high speed DSL or cable service is available, then the Contractor shall arrange for this service in lieu of a dial up service.

E. All items specified herein are subject to the approval of the Engineer.

F. Equipment shall be delivered to the site and turned over to the Engineer via a type written transmittal form.

G. All equipment that is to remain the property of the Contractor shall be new.
   1. Equipment that is to remain the property of the Owner shall also be new and be provided in it's factory packaging, unopened until delivered to the Owner/Engineer.
   2. Maintenance of all supplied equipment shall be the Contractor's responsibility up to substantial completion.

H. All items shall be delivered prior to the first application for payment, but no later than the day the Engineer's Trailer is delivered.

I. Engineer's Field Trailer:
   1. Office - The General Contractor shall furnish, equip, and maintain a field office at the site for the exclusive use of Owner/Engineer.
      a. The field office shall be of substantial weatherproof construction, with a usable floor space of not less than 8' x 25' overall.
      b. Office may be in an approved, near new condition, independent trailer, completely skirted with insulation and with sufficient landings and stairs at each door.
      c. Submit a scaled floor plan of the trailer.
   2. Duration - Provide office by no later than 30 calendar days from the date of the Notice To Proceed and maintained during the life of the Contract, up to the date of the Final Certificate.
   3. Location - As directed by Owner/Engineer. Relocate during the progress of the work, without additional cost to Owner, as may be required by the Owner/Engineer.
   4. Utilities - Provide the following in sufficient size, quantity, and capacity, as approved by the Owner/Engineer.
      a. Windows for natural light and ventilation, with locks, screens, and shades or curtains.
      b. Lighting acceptable to the Owner/Engineer.
      c. Door with screen, with hasp and padlock and five keys for Owner/Engineer's use. Two (2) doors minimum. Provide two (2) commercial grade foot mats at each door.
      d. Air conditioning unit and heater in each room, sized to maintain an indoor temperature of 60 deg. F with an outdoor temperature range of 10 deg. F to 90 deg. F.

e. 110 volts, 100-amp electric service with sufficient receptacles spaced around the room.

2.02 REMOVALS

A. Remove all items provided under this Section except as otherwise specified.

PART 3 - EXECUTION

3.01 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities and materials.

B. Remove underground installations to a minimum depth of 2 feet or as specified elsewhere.

C. Regrade area to existing slope and elevation and restore the surface to its existing condition or to the condition shown on the Contract Drawings.

D. The General Contractor shall inventory all equipment that has been turned back to the Contractor prior to agreeing to final payment.

END OF SECTION 015213

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Control of environmental pollution and damage that the Contractor must consider for air, water, and land resources in preparing a bid and while constructing the project. This Section includes management of site aesthetics, noise, solid and liquid waste and wastewater, and other pollutants that may be generated by the Contractor.

B. Include all costs associated with environmental protection as specified herein and as specified in other Sections of these specifications in the total price bid.

1.02 DEFINITIONS

A. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
   1. Adversely effect human health or welfare,
   2. Unfavorably alter ecological balances of importance to human life,
   3. Impact wetlands,
   4. Effect other species of importance to man, or;
   5. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.

B. Definitions of Pollutants:
   1. Sediment: Soil and other debris that has been eroded and transported by runoff water.
   2. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
   3. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
   4. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
   5. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalies, herbicides, pesticides, organic chemicals, and inorganic wastes.

C. Sanitary Wastes:
   1. Sewage: Domestic sanitary sewage and human and animal waste.
   2. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PROTECTION OF ENVIRONMENTAL RESOURCES

A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this Contract. Confine activities to areas defined by the Contract Documents.

B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Engineer. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.

C. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
   1. Box and protect from damage existing trees and shrubs to remain on the construction site.
   2. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
   3. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.

D. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
   1. Temporary Protection of Disturbed Areas: Construct diversion ditches and berms to retard and divert runoff from the construction site to protected wetlands areas as defined in the Clean Water Act and federal, state and local regulations.
   2. Erosion and Sedimentation Control Devices:
      a. Construct or install all temporary and permanent erosion and sedimentation control features as shown or specified in the Contract Documents and as required by the Owner pursuant to direction of the regulatory authority.
      b. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, hay bales, erosion control fencing, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
   3. Manage borrow areas on and off Owner property to minimize erosion and to prevent sediment from entering nearby property, watercourses and local streets.
   4. Manage and control spoil areas on and off Owner property to limit spoil to areas shown on the Environmental Protection Plan and prevent erosion of soil or sediment from entering nearby property, watercourses or streets.
   5. Protect adjacent areas from degradation by temporary excavations and embankments.

E. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment.
   1. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule.
   2. Transport all solid waste off Owners' property and dispose of waste in compliance with Federal, State, and local requirements.
   3. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
   4. Handle discarded materials other than those included in the solid waste category as directed by the Engineer.

F. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this Contract.

G. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.

H. Control movement of materials and equipment during construction to prevent violation of water pollution control standards of the Federal, State, or local government.

I. Monitor water areas affected by construction.

J. Protection of Fish and Wildlife Resources:
   1. Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife.

K. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources.
   1. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State and Federal emission and performance laws and standards.
   2. Maintain ambient air quality standards set by the Environmental Protection Agency and State, for those construction operations and activities specified.

L. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.

M. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinkle, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.

N. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.

O. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.

P. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified in accordance with OSHA and local ordinances, whichever is more restrictive.
   1. Perform construction activities involving repetitive, high-level impact noise only between 7:00 a.m. and 5:00 p.m unless otherwise permitted by local ordinance or by the Engineer.
   2. Repetitive impact noise on the property shall not exceed the dB limitations.
   3. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this Contract, consisting of, but not limited to, the following:
      a. Use shields or other physical barriers to restrict noise transmission.
      b. Provide soundproof housings or enclosures for noise-producing machinery.
      c. Use efficient silencers on equipment air intakes.
      d. Use and maintain efficient intake and exhaust mufflers on internal combustion engines.
      e. Line hoppers and storage bins with sound deadening material.
      f. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.

END OF SECTION 015719

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes the general requirements for products that are to be furnished, installed, or otherwise incorporated into the project.

1.02 QUALITY ASSURANCE APPLIES TO ALL PRODUCTS

A. In addition to the Contractor's warrantees and guarantees on materials and equipment required under the General Conditions of the Contract and the Technical Specifications contained hereinafter, the Contractor shall also be responsible for all materials, equipment, and products that have or is planned to be incorporated into the work.
   1. The Contractor shall be responsible for the finished work and that it accurately and completely complies with these Contract Documents.
   2. The Contractor shall be responsible for work performed by subcontractors, equipment suppliers, and material vendors.
   3. The Contractor shall be satisfied as to the product's performance before it is ordered for installation. At the Contractor's option, he/she shall have tested each product to determine compliance with these specifications.

B. The Engineer may check all or any portion of the work and the Contractor shall afford all necessary assistance to the Engineer in carrying out such checks.
   1. Such checking by the Engineer shall not relieve the Contractor of any responsibilities for the accuracy or completeness of the work.
   2. Such checking is a courtesy service being provided by the Owner and does not relieve the Contractor of his/her responsibilities under this Construction Contract.

C. If witnessed shop tests or inspections are required at the point of manufacture, the Contractor shall keep the Engineer advised as to the progress of the work to allow inspection at the proper time and place. Provide at least two (2) weeks advance notice before scheduled shop tests.

D. Should a dispute arise as to the quality of workmanship, equipment or material performance, then the final decision regarding acceptability with these Contract Documents shall be that of the Owner.

E. At the request of the Engineer, the Contractor shall promptly provide the services of a competent representative of the manufacturer at the project site, fully equipped and prepared to answer questions, perform tests, make adjustments and to prove compliance with the Contract Documents free of all additional charges. Proof of compliance shall be the responsibility of the Contractor, and such special visits to the project site by the manufacturer shall not be eligible under any cash allowances or stipulated man-hours necessary to startup the system and/or train the Owner as may be specified in the Technical Specifications.

1.03 QUALITY ASSURANCE - EQUIPMENT

A. Erect and install products under the supervision of a competent and experienced superintendent. The method of installation, including anchorage, clearances, and tolerances for rotating assemblies, methods of support for equipment and adjacent piping, shall be as recommended by the equipment manufacturer unless detailed on the Drawings or specified.

B. All material furnished shall be new, and guaranteed free from defects in workmanship, installation, and design.

C. Design and fabricate equipment in conformance with ANSI, ASTM, ASME, ASHRAE, IEEE, NEC and NEMA Standards.

1. Equipment shall withstand the stresses that may occur during fabrication, testing, transportation, installation and conditions of operation.
2. Pumps shall conform to the requirements of the Hydraulic Institute.
3. Equipment shall comply with the latest OSHA regulations and the ANSI Safety Standards.

D. Equipment shall be products of manufacturers who produce evidence of their ability to promptly furnish any and all interchangeable replacement parts as may be needed at any time within the expected life of the equipment.

E. Manufacturers shall also have readily available access to suitable and accurate testing facilities for performing the required shop tests.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Equipment shall have been in successful regular operation under comparable conditions for a period of at least five (5) years.
1. This time requirement does not apply when the manufacturer posts an Owner/Engineer acceptable Performance Bond or Letter of Credit for the duration of the time period that will guarantee replacement of the equipment in the event of failure.
2. The bond shall be in a form that is acceptable to the Owner's legal council.

B. The Owner reserves the right to reject any material or equipment manufacturer who, although he appears to be qualified and meets the technical requirements, does not provide satisfactory evidence indicating adequate and prompt post-installation repair and maintenance service, as required to suit the operational requirements of the Owner.

C. Whenever it is required that the Contractor furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable on the market from firms of established good reputation, or, if not ordinarily carried in stock, shall conform to the usual standards for first-class materials or articles of the kind required.

D. Perform work in full conformity and harmony with the intent to secure the best standard of construction and equipment of the work as a whole or in part.

E. Items of any one type of material or equipment shall be the product of a single manufacturer.
1. For ease of the Owner in maintaining and obtaining service for equipment and for obtaining spare parts from as few places as possible, to the maximum extent possible, use equipment of a single manufacturer.
2. The Engineer reserves the right to reject any equipment from various manufacturers if suitable equipment can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.

F. Substitute equipment shall not be fabricated nor installed until after written decision to accept request is received from the Engineer.

2.02 CONTROL PANELS, MCC'S AND SWITCHBOARDS

A. All control panels, motor control centers, and switchboards shall be fabricated with pilot lights, selector switches, PLC, graphics display panels, elapsed time meters and other components that shall match.
1. This does not require that all components be one manufacturer, but does require that the like components be of the same manufacturer.

2. The Contractor shall coordinate the shop drawing submittals to indicate that all components have been selected on this basis.
3. This requires the Contractor to advise each control panel supplier that product options are limited in this regard.

B. Replacement of unlike products delivered to the job site shall be the responsibility of the Contractor.

C. All costs associated with the replacement shall be borne by the Contractor.

2.03 NAMEPLATES

A. Each unit of equipment shall have the manufacturer's name or trademark on a stainless steel nameplate securely affixed in a conspicuous place.

B. The manufacturer's name or trademark may be cast integrally with stamp, or otherwise permanently marked upon the item of equipment.

C. Such other information as the manufacturer may consider necessary for complete identification shall be shown on the nameplate.

2.04 FABRICATIONS

A. Insofar as possible, shop prefabricate all items complete and ready for installation.

B. Accurately fabricate all items to the details shown on the Drawings and on the shop drawings found in compliance with the Contract Documents.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to work under any Section, carefully inspect the work of all other prime trades and verify that all such work is in conformance with the Contract Documents and is complete to the point where the work under that Section may properly commence.

B. Avoid the need to remove and replace work and to avoid unnecessary cutting and patching.

C. Inspect all surfaces to be sure that they have been properly prepared before applying new work to such surfaces.

D. Verify that all work can be installed in strict accordance with the drawings and the approved shop drawings. Immediately report discrepancies to Engineer.

E. Do not proceed with the work under any Section until these conditions are obtained.

3.02 INSTALLATION

A. Furnish and install materials and equipment in accordance with the instructions of the applicable manufacturer, fabricator or processors, except as otherwise provided in the Contract Documents.

B. All work shall be done in a workmanlike manner and set to proper lines and grades. The work shall be square, plumb and/or level as the case may be.

C. Where performance criteria are specified, do all work necessary to attain the required end results.

3.03 FIELD QUALITY CONTROL

A. Neither observations by Engineer nor inspections, tests or approvals by other persons shall relieve the Contractor from his obligations to perform the work in accordance with the requirements of the Contract Documents.

B. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any work to specifically be inspected, tested or approved by some public body, the Contractor shall assume full responsibility therefore, pay all costs in connection therewith, and furnish the Engineer with the required certificates of inspection, testing or approval.

C. The Owner reserves the right to independently perform laboratory tests on random samples of material or performance tests on equipment delivered to the site.
   1. These tests, if made, will be conducted in accordance with the appropriate referenced standards or specification requirements.
   2. The entire shipment represented by a given sample, samples or piece of equipment may be rejected on the basis of the failure of samples or pieces of equipment to meet specified test requirements.
   3. All rejected materials or equipment shall be removed from the site, whether stored or installed in the work, and the required replacements shall be made, all at no additional cost to Owner.

3.04 ADJUST AND CLEAN

A. Upon the completion of installations, and as a condition of its acceptance, visually inspect all work, adjust all components for proper alignment and touch-up abrasions and scratches to make them completely invisible.

B. Thoroughly examine all materials and equipment with protective or decorative finishes for defects and damage prior to being covered.
   1. In the case of buried items of work, restore protective surface covers so as to conform to the Contract Documents prior to being backfilled, buried or embedded, as the case may be.
   2. In the case of exposed items of work, for which a decorative finish is required, all scratches, discoloration's, unmatched colors, disfigurations and damages shall be repaired and touched-up so as to provide a neat, clean finish, and be uniform in color.

3.05 UNCOVERING WORK

A. Tie distances to above ground physical structures as reference points to all underground utilities, conduits, pits, manholes, valves, and pipelines shall be obtained by the Contractor prior to covering the work. Immediately comply with the Engineer's direction to uncover the work if tie distances were not obtained.

B. If any work has been covered with Engineer's consent and Engineer considers it necessary or advisable that covered work be observed or tested, the Contractor, at Engineer's request, shall uncover, expose or otherwise make available for observation, or testing as Engineer may require, that portion of the work in question, furnishing all necessary labor, material and equipment.
   1. If it is found that such work is defective, the Contractor shall bear all the expenses of such uncovering, exposure, observation, and testing of satisfactory reconstruction, including

compensation for additional engineering services and an appropriate deductive change order shall be issued.

2. If, however, such work is not found to be defective, the Contractor shall be allowed an increase in the contract price or an extension of the contract time, or both, directly attributable to such uncovering, exposure, observation, testing and reconstruction if he makes a claim therefore as provided in the General Conditions.

3.06 DEFECTIVE WORK

A. The repair, removal, replacement and correction of defective work is a part of this Contract and shall be promptly performed in accordance with the requirements set forth in the General Conditions or other portions of the Contract Documents. All costs in connection with the correction of defective work shall be borne by the Contractor.

B. Products that fail to maintain the performance or other salient requirements of the Contract Documents, shows undue wear, or other deleterious effects during the maintenance period, shall be considered defective.

END OF SECTION 016100

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Section includes the transportation, handling, storage and protection of products that are to be incorporated into the work.

B. The procedures for turning equipment over to the Owner for installation by others is also included herein.

1.02 GENERAL

A. Items shall be delivered as complete assemblies direct from the manufacturer with all internal wiring, piping, valving, and control devices intact except where partial disassembly is required by transportation regulations, protection of components, or where physical constraints may exist or be created for the setting of the item.

B. Coordinate the disassembly and reassembly requirements with the manufacturer. Determine the need and extent of reassembly prior to bid.
   1. All labor, material and equipment costs associated with the disassembly and reassembly of the product shall be included in the Contract Price.
   2. Where reassembly of equipment is necessary, then the manufacturer shall provide reassembly instruction at the project site.
   3. A technician shall be present during the entire reassembly procedure and the manufacturer shall certify, in writing, that the unit was reassembled properly in accordance with instructions provided by the manufacturer and that all as-specified warranties remain in effect.
   4. The manufacturer's reassembly inspection time shall be in addition to the field service time specified and shall be included in the Contract Price. This time shall not be eligible for payment under any cash allowance item.

C. In the case where equipment is to be installed by others, then the supplying contractor shall be responsible for its reassembly. If reassembly is necessary and the unit(s) are to be set inside an enclosure or building, reassemble the equipment inside said enclosure. The equipment once reassembled shall be turned over to the installing contractor as specified below.

1.03 PACKING

A. Transport products in containers, crates, boxes or similar means such that the products are protected against damage that may occur during transportation.

B. All parts shall be packaged separately or in container where parts of similar systems are grouped.

C. Part numbers shall be indicated on the individual part. Use indelible ink to mark part numbers.

D. All equipment shipments shall be included with a parts list showing a description (name) of the part and the manufacturer's part number.
   1. The parts list shall be shipped in a plastic zippered envelope with the words "Parts List" lettered on it in indelible ink.
   2. The parts list shall be placed inside the shipping container so that it is on the top of the contents.

E. Equipment shall be shipped with storage, handling and installation instructions.

1. The Engineer reserves the right to withhold payment for equipment delivered to the site until such time as the storage, handling and installation instructions are supplied by the manufacturer.
2. In the case where operation and maintenance manuals have been provided by the manufacturer, which includes the installation instructions, then the installation instructions shall also be included with the equipment shipment.

F. All control panels shall be wood crated.
1. All sides of the control panel shall be covered with 3/4" plywood.
2. The control panel number or name shall be printed on all sides of the crate in 1' high black lettering.
3. The manufacturer's name, Contractor's name and project name shall also be printed on the front of the crate.
4. All control panels and centers shall be packaged with three (3) copies of the approved wiring diagram inside the control panel enclosure in a separate plan holder attached to the inside door. The words "APPROVED FOR CONSTRUCTION" shall be indicated on each page of the wiring diagram.

G. Delicate instruments and devices, reagents, chemicals, and glassware shall be shipped in packaging normally provided by the manufacturer.

H. The Contractor shall require the manufacturer to be responsible for the proper packing of all products.

1.04 SHIPPING AND DELIVERY

A. Product deliveries shall be accompanied with a bill of lading indicating the place of origination and the Contractor's purchase order number.

B. Inspect shipments immediately upon delivery, to assure compliance with requirements of the Contract Documents and those products are undamaged.

C. Promptly remove damaged material and unsuitable items from the job site.

D. Provide equipment and personnel to handle products by methods to prevent soiling; disfigurement or damage.

1.05 STORAGE

A. Store sensitive products and all spare parts in weather tight, climate controlled enclosures in an environment favorable to product.

B. Store and protect products in accordance with the manufacturer's instructions.

C. All other products that are to be installed underground or products such as pipe, valves, and fittings shall be stored outdoors but shall be blocked off the ground and covered with impervious sheet coverings.

D. Store fabricated products above the ground on blocking or skids.

E. Store loose granular materials in well-drained areas on solid surfaces to prevent mixing with foreign matter.

F. Provide adequate ventilation to avoid condensation.

G. In accordance with manufacturer's instructions protect bearings, couplings, shafts, rotating components, and assemblies. Protection of said equipment shall be continuous until the time the equipment is placed into permanent service.

H. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

I. Do not store volatile liquids in any building on site.

J. Storage of products shall be the responsibility of the supplying contractor. The installing contractor shall take all necessary precautions to protect the equipment being furnished by others.

K. Store with seals and labels intact and legible.

1.06 EQUIPMENT INSTALLED BY OTHERS

A. All products, except products noted on the Drawings or specified, shall be furnished and installed under this Contract.
   1. Only noted or specified products shall be furnished under this Contract for installation by others.
   2. If it is not noted on the Drawings or specified, then the product shall be furnished and installed under the Contract.

B. The Contractor shall furnish these products to the Owner. These products shall be stored as specified above.

C. The Owner will then advise the installing contractor that the product(s) are ready for installation.
   1. In the case where the product is stored in a proper enclosure, but not stored inside the building to be constructed under this project, then the installing contractor shall move the product into the building to a location adjacent to the final location shown on the Drawings.
   2. In all cases, the installing contractor shall be responsible for moving from storage, uncrating, anchoring, mounting and installing the product as required by the Contract Documents.

D. The Contractor and installing contractor(s) shall be present at the time the equipment is turned over to the Owner. Immediately thereafter, the Owner will turn the product over to the installing contractor for installation.

E. The Owner, Contractor, Engineer and the installing contractor shall inspect the condition of the product at this time.
   1. Any defects in the product will be noted and the Contractor will be advised to make all repairs immediately.
   2. The installing contractor shall still be required to install the product if the damage is deemed cosmetic by the Engineer.
   3. The manufacturer's installation instructions or wiring diagram shall be turned over to the installing contractor at this time by the Contractor.
   4. Any damage occurring to the product during moving, setting and mounting the unit(s) shall be the responsibility of the installing contractor.
   5. The Contractor is advised to take photographs to document the condition prior to it being turned over to the installing contractor.
   6. The installing contractor is advised to take photographs to document the condition prior to its acceptance.

F. The supplied unit(s) remain the property of the Contractor until final acceptance of the work.

G. Any damage caused to the unit(s) due to improper installation, workmanship, and non-compliance with the manufacturer's written installation instructions shall be the responsibility of the contractor who caused said damage. The burden of proof shall rest with the supplying Contractor.

H. In the event the Contractor discovers misuse, abuse or improper installation of the unit(s) by the installing contractor, then he shall immediately notify the Engineer in writing. The Engineer will investigate the accusations and make a determination. The Engineer's determination shall be binding and agreed to by both parties.

I. If the Engineer's determination substantiates the accusations of the Contractor, then the Contractor shall install the unit(s), the costs for which will be paid for as extra work. All costs associated with the extra work change order, including engineering and attorney fees of the Owner and Contractor will be deducted from money due the installing contractor.

1.07 PROTECTION OF WORK

A. The Contractor shall protect the installed work. All costs for protection shall be borne by the Contractor. Provide coverings as necessary to protect installed products from damage, from traffic and subsequent construction operations. Remove when no longer needed.

B. Cover and protect equipment from dust, moisture or physical damage. Protect finished floor surfaces prior to allowing equipment or materials to be moved over such surfaces. Maintain finished surfaces clean, unmarred and suitably protected until accepted by the Owner.

C. Additional time required to secure replacements and to make repairs will not be considered by the Engineer to justify any extension in the Contract Time of Completion. In the event of the damage, promptly make replacement and repairs to the approval of the Engineer at no additional costs.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 016500

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Cleaning during the progress of the work

B. Cleaning prior to final payment

1.02 SCHEDULING

A. Sequence, schedule, and coordinate final cleaning work with the final cleaning work to be performed by other prime contractors.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cleaning materials shall be appropriate to the surface and materials being cleaned.

B. Provide pads to protect finished surfaces from cleaning materials.

PART 3 - EXECUTION

3.01 PREPARATION

A. Post signs to advise building occupants if wet and/or slippery floor conditions exist during cleaning operations.

3.02 PROGRESS CLEANING

A. Keep all buildings, enclosures, and confined areas where work is being performed under the Contract free from unattended combustible materials.

B. Remove rust spots as they develop.

3.03 FINAL CLEANING

A. Remove dust, dirt, grease, stains, paint drips and runs, plastic, labels, tape, glue, rope, and other foreign materials from visible interior and exterior surfaces.

B. Do not move dust from spot to spot. Remove directly from the surface on which it lies by the most effective mean such as appropriately treated dusting cloths or vacuum tools. When doing high cleaning, do not allow dust to fall from high areas onto furniture and equipment below.

C. Dismantle and remove all temporary structures, scaffolding, fencing, and equipment. Remove waste materials, rubbish, lumber, block, tools, machinery, and surplus materials.

D. Perform the following prior to final payment:
   1. Broom clean all exterior concrete surfaces and vacuum clean all interior concrete surfaces.
   2. Clean and polish all unpainted metal on doors such as trim, hardware, kickplates and doorknobs.
   3. Vacuum clean acoustic ceilings.
   4. Repair, patch, and touch-up marred surfaces to specified finish and to match adjacent surfaces.
   5. Remove foreign material from brick.

6. Replace all damaged insect screens.
7. Wash and clean interior and exterior window surfaces. All glass shall be clean and free of dirt, grime, streaks and excessive moisture. Wipe drippings and other marks from windowsills, sashes and woodwork. Do not use windowsills in lieu of ladders.
8. Polish bright metal by damp wiping and drying with a suitable cloth. If a polished appearance is not thereby produced, apply appropriate metal polish.
9. Clean and polish all stainless steel surfaces, including control panels supplied under this Contract.
10. Clean all paved roads, lots and drives which were paved as work under this Contract and all existing paved surfaces using a mechanical street cleaner.
11. Clean supply vents and exhaust grilles. Clean gutters and downspouts.
12. Remove all rust spots and stains from new and pre-existing concrete, painted surfaces, and all other surfaces.
13. Inspect interior and exterior surfaces, and all work areas, to verify that the entire work is clean and ready for use by the Owner. The project will not be considered substantially complete until all final cleaning has been performed.
14. Vacuum the inside of all control panels provided under this Contract after the panel has been wired.

END OF SECTION 017423

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work of this Section includes the following:
   1. Starting systems
   2. Testing, adjusting, and balancing

1.02 STARTING SYSTEMS

A. The Contractor shall coordinate, schedule, and sequence the start-up of various equipment and systems.

B. Where the start-up of a system or piece of equipment is dependent upon the start-up of other system(s) or equipment, then the Contractor shall schedule and sequence the start-ups to coincide.

C. Notify the Engineer at least 14 calendar days prior to the start-up of each item or system so that he can schedule the startup with the Owner, utilities, and other Prime Contractors.

D. Where applicable, verify that each piece of equipment or system has been checked for proper:
   1. lubrication,
   2. drive rotation,
   3. belt tension,
   4. motor starter heater size,
   5. fuse size,
   6. water pressures,
   7. terminal connections,
   8. control sequence,
   9. for conditions which may cause damage or delay the start-up procedure.

E. Verify that the equipment has been installed in accordance with the manufacturer's requirements.

F. Complete all pre-startup checklists that may be required by the system vendor.
   1. In the event that start-up activities are delayed as a result of the Contractor's failure to properly check the completed installation and a manufacturer's representative is on the job site waiting for corrections to be made, then the Engineer may, at his/her sole discretion, postpone start-up until such time as the corrections have been made without any extra costs.
   2. The Owner may deduct from money due the Contractor the excess cost of engineering associated with having the Engineer present during the start-up.
   3. The deduction shall be equal to the Engineer's effective billing rate times the total number of hours delayed during the start-up activities.

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

H. Verify that wiring and support components for equipment are complete and tested.

I. Execute start-up under supervision of applicable Contractor's personnel in accordance with manufacturer's instructions.

J. The Contractor shall have the job site superintendent present during all start-up activities.

K. Provide manufacturer's authorized technician at the site when specified and in accordance with the requirements contained in Section 014500 - Quality Control.

L. Submit manufacturer's start-up reports (MSR's) in accordance with Section 013300.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017500

PART 1 - GENERAL

1.01 SUMMARY

A. Testing of piping.

B. Testing of tanks vented to atmosphere.

C. Pipe leakage testing shall comply with the conditions noted in the Schedule.

1.02 DEFINITIONS

A. Leakage (or exfiltration) - The quantity of water to be supplied into the newly laid pipe, any valved section thereof, manhole, or other appurtenance, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

B. Infiltration - The quantity of water that enters into any pipe, manhole, or other appurtenance when the static groundwater elevation is at the maximum elevation above the pipe or appurtenance as specified hereinafter.

1.03 QUALITY ASSURANCE

A. Prior to Substantial Completion, pressure pipes and non-pressure pipes shall meet specific leakage requirements. These leakage requirements shall be satisfied by the basic materials alone. Where joint fillers and the like have been specified, primarily to protect jointing materials, and secondarily to provide a factor of safety, they shall not be applied until after leakage tests have been completed and have been accepted by Engineer.

B. Engineer will witness tests. Tests not witnessed will be considered as not having been performed.

C. Do not close or cover up work until it has been observed for proper and satisfactory construction and installation in compliance with the Contract Documents. Should incomplete or unacceptable work be covered, the Contractor shall, at his/her own expense, uncover all work so that it may be properly observed. After such observations, repair and replace the work that was found defective, unsatisfactory, and not in accordance with the Contract Documents. After such repair and replacement, bring all work to completeness and status as it was before it was closed and covered, all at the Contractor's own expense. Submit for review and approval proposed corrective action to correct failed systems.

D. Successful completion of required tests shall be in no way interpreted as relieving the Contractor of responsibility for defects that become apparent subsequent to the time of testing. It shall be the sole right of the Engineer to determine whether defects exist. Retest all portions of the work deemed necessary by the Engineer prior to Substantial Completion.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Provide details and specifications on testing apparatus.

C. Provide certified test results on forms approved by the Engineer.

1.05 SEQUENCING AND SCHEDULING

A. Notify Engineer and governing agencies, if necessary, at least 48 hours in advance of a scheduled test so that the test may be witnessed.

B. Test underground pipe after backfilling.

C. At Engineer's discretion, additional sections of pipelines may be required to be tested as soon as pipe is laid and prior to backfilling when working conditions or the standard of workmanship have been altered.

PART 2 - PRODUCTS

2.01 TESTING APPARATUS

A. Provide labor, plugs, measuring equipment, and other apparatus, complete, to perform testing.

B. Provide clean water, air, nitrogen, and other materials as required to accomplish testing.

C. Provide plugs and caps capable of withstanding test pressures.

D. Provide temporary flanges, plugs, bulkheads, thrust blocks, weighing, bracing and other items necessary to prevent joints from separating, and to prevent injuries or damage.

PART 3 - EXECUTION

3.01 PREPARATION

A. Plug open ends, adequately block bends, tees, ends, and other fittings, and do whatever is necessary to brace piping system so that it will safely withstand the pressures developed under the tests and so that no damage or injury shall occur to the pipeline, people or property.

B. Before tests are conducted, isolate, or remove any regulator, gauge, trap, or other apparatus or equipment that may be damaged by test pressures.

3.02 GENERAL

A. Trapped Air: Trapped air may cause a false indication of the rate of leakage. Points of concern include ends of lines, stubs, house connections and high points in pipelines. No credit will be made for this condition and no adjustment will be made to the allowable leakage. When trapped air is suspected of causing a test failure, do whatever is necessary to evacuate the air and repeat tests until the actual leakage is equal to or less than allowable rate of leakage.

B. Water Absorption: No credit will be given for absorption of water in pipe and manhole walls. If necessary, fill pipes and manholes with water well in advance of testing and allow them to soak in order to eliminate or minimize the effects of absorption.

3.03 TESTS FOR PRESSURE PIPES

A. Leakage testing shall include the main exiting pipe, service connections, and other appurtenances on the section of pipeline being tested.

B. Test pipes prior to applying insulation and before they are concealed or furred-in.

C. Provide all necessary gauges. Gauges shall be standard pressure type with a minimum 4-1/2 inch diameter dial and a pressure range not in excess of 150% of the maximum required test pressure. Gauges shall be liquid-filled.

D. Provide and maintain at the site a gauge stand with an approved laboratory calibrated test gauge. Periodically check test gauge used for testing against the test gauge, and whenever requested by Engineer.

E. Where it is necessary for testing, tap pipes and insert approved plugs after testing is completed.

F. Provide a hand or motor driven compressor to maintain the required test pressure constant throughout the duration of the test. If a water pump is used, pump water from a container with a known volume of water. If an air or inert gas pump is used, leakage shall be determined and calculated by the cycling of the pump.

G. Provide test gauges at each end of the line being tested.

H. Conduct leakage test in accordance with the requirements contained in the Schedule.

3.04 ALLOWABLE LEAKAGE

A. The maximum allowable leakage for the various piping systems is presented in the schedule.

B. It is the intent of this Contract to secure piping systems without leakage.
   1. Each section of pipe and within each structure shall not exceed the allowable leakage.
   2. It is also the intent to secure a piping system free from visible drips, streams and leaks. Therefore, even if a portion of the system meets the requirements for allowable leakage, visible leaks are not permitted and shall be repaired.

C. Leakage tests will be considered satisfactorily passed when the rate of leakage is equal to or less than the stipulated allowances, there is no evidence of visible leaks, and there is no evidence of other system defects.

3.05 TEST FOR TANKS VENTED TO ATMOSPHERE

A. Prior to testing liquid holding tanks open to the atmosphere, backfill to finished grade. Piping and equipment within the tank that might affect the watertightness of the tank shall be completely installed and operable.

B. Isolate each individual tank for testing.
   1. Fill with clean, potable water to the maximum operating level.
   2. After a suitable stabilization period, the maximum operating level shall be reestablished and a twenty-four (24) hour leakage test shall be performed.
   3. During the test, no water shall be added to or taken from the tank. The drop in the water level shall be recorded at the end of the period.
   4. The allowable loss is no more than 1/4-inch per eight hours.
   5. Leaks shall be repaired by methods and materials approved by the Engineer prior to the start of the corrective action.
   6. Leakage shall be corrected prior to the performance of equipment testing.
   7. During the testing of each individual tank, as outlined in this paragraph, all immediately adjacent tanks shall be empty of water.

C. After each individual tank has passed the leakage test, all tanks within each complex shall be filled with water to the normal operation level to check complex structural integrity and the hydraulics of operation.

3.06 RETESTING

A. Pipes, tanks and manholes not passing the tests shall have all defects corrected with methods approved by the Engineer to the inspection and satisfaction of Engineer, and shall be retested and re-corrected as often as is necessary until the test requirements have been met.

B. It is the intent of this Contract to obtain work meeting test requirements on their own and solely through the use of the normal integral sealing components.
   1. Joint leaks shall not be stopped using concrete, caulking, mortar, or other patching materials.
   2. Leaking pipe joints shall be re-jointed and leaking manhole joints shall have joints reset, or replaced if necessary.

C. Methods other than rejoining, resetting or replacing joint seals shall require the written approval of Engineer.

3.07 SCHEDULE

LEAKAGE TESTING REQUIREMENTS

SERVICE	**FLUID**	**PRESSURE**	**DURATION (HRS.)**	**ALLOWABLE LEAKAGE (NOTE 1)**		
				UNDERGROUND		**EXPOSED**
				INFIL.	**EXFIL.**	
NON-PRESSURE PIPING	WATER	4FT.	6	100	100	NONE
PRESSURE PIPING	WATER	(NOTE 2)	(NOTE 2)	0	0	0

SCHEDULE NOTES:
1. Maximum allowable leakage in gallons/day/inch diameter/mile of pipe, or gallons/day/inch diameter/mile for manholes. Where a percentage is shown, the loss shall not exceed the percentage of the starting test pressure.
2. Maintain 100 psi or two times operating pressure, whichever is greater, for 2 hours.

END OF SECTION 017550

PART 1 - GENERAL

1.01 SUBMITTALS

A. Submit the following documents to the Engineer before Substantial Completion:
   1. Project Record Documents as specified in Section 017839.
   2. Operations and Maintenance Manuals prepared in accordance with Section 017823 and be updated as a result of start-up activities.
   3. Manufacturer's Start-up Reports (MSR's) for all equipment and systems where manufacturer field time is specified.
      a. Each MSR shall be signed by the field technician(s) who attended the start-up.
      b. If the manufacturer is taking exception to the installation or if the warranty is voided, he shall provide a statement to that effect and provide reasons and justification to explain the company's position.
   4. One binder containing original counterparts of all warranties, guarantees, bonds, or affidavits as specified in the Technical Specification Sections. These documents shall contain the original signatures and be placed in a plastic sheet protector, one document per protector.
   5. Spare parts checklist itemizing all spare parts furnished under the Contract summarized by Section.
   6. Electrical Underwriter's Certificate where the prime construction contract includes electrical construction or where this Contract is for a Prime Electrical Construction Contract.

B. Submit the following items to the Engineer with the final application for payment:
   1. Final Application for Payment prepared by the Engineer for Contractor's execution showing final amount of Contract including change orders.
   2. Maintenance Bond prepared in accordance with the Contract or General Conditions.
   3. Utility company signoffs and inspection approvals, if applicable.
   4. Federal, state, county, town and local signoffs and inspection approvals, where applicable.

C. All documents shall be complete, signed, dated, and notarized (where applicable) and be subject to the Engineer's acknowledgment of receipt or approval.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017800

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for Operations and Maintenance Manuals required to be prepared by system suppliers and equipment manufacturers.

B. The Contractor shall submit Operations and Maintenance Manuals for all equipment.

C. Where the technical specifications call for the submission of manuals, said manuals shall be prepared in accordance with the requirements contained herein. It being understood that manuals shall be submitted for all equipment even if it is not specifically called out in the specifications.

1.02 MANUAL CONTENTS AND FORMAT

A. All Operations and Maintenance Manuals shall be as specified hereinafter.

B. The binder shall be 8 1/2" x 11", metal hinge, vinyl, large capacity by National or Equal. It shall show the name of the manufacturer or supplier and project name on the spine of the binder.

C. A cover shall be provided showing the names of the Owner, Engineer, Contractor, and Manufacturer.
   1. It shall show the Contractor's order number and manufacturer's project number.
   2. The address of the manufacturer, service station telephone number, project title, contract number, and year shall also be shown.

D. Provide tabbed color dividers for each separate product and system.
   1. The name of the product shall be typed on the tab.
   2. A separate tab shall also be provided for information such as troubleshooting instructions, spare parts list, etc.

E. An index shall be provided in the back of the binder, with a separate tab, providing a quick way for the operator to find key and important topics contained in the manual.

F. A separate listing for all charts, graphs, tables, figures and shop drawings shall be provided directly following the table of contents.

G. Each manual shall contain one (1) copy of all shop drawings deemed in compliance with the Contract Documents by the Engineer submitted for the equipment or system for which the manual is prepared.
   1. Only these shop drawings shall be included in the manual.
   2. All shop drawings larger than 8 1/2" x 11" shall be folded and placed in a heavy duty, top loading plastic sheet protector with the title of the drawing showing; one (1) drawing per protector page.

H. For systems being furnished with control panels, each manual shall contain a catalog cut for every electrical device installed inside the control panel or motor control center.

I. Where emergency generator(s) are included as work of this Contract, the manufacturer's standard manual will be allowed if the manual clearly shows the instructions for the particular model of generator. Cross out chapters and paragraphs that do not apply to the Owner's generator.

J. Where manuals are prepared for treatment systems for water, a process chapter, written in plain language for the operators, shall be prepared by the manufacturer providing the following:

1. A general discussion regarding the theory of the process.
2. A specific discussion relating the theory to the project as designed and constructed. Provide capacities, sizes, loading rates, application criteria, design values, and design assumptions.
3. Provide model numbers for equipment comprising the system.
4. Provide figures, tables, and graphs to assist the operator in understanding the operation of the treatment system.
5. Where operator interfaces are provided, provide step-by-step instructions for changing a process control variable such as set points.
    a. The instructions shall be numbered and written such as "press", "hold" "scroll", etc.
    b. Each operator interface instruction sheet shall be laminated and placed in the binder.
    c. Another laminated sheet shall be provided and placed inside the control panel.

K. Each manual shall contain the following as a minimum:
1. Table of contents
2. Final version of the warranty statement approved by the Engineer
3. Nameplate data of each component, year of installation, contract number and specification number
4. Name, address and telephone number of the manufacturer and the manufacturer's local representative(s)
5. Installation instructions
6. Operation instructions including adjustments, the interrelation of components and the control sequence describing break-in, start-up, operation and shutdown
7. Emergency operating instructions and capabilities
8. Maintenance requirements include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair and reassembly instructions; and alignment, adjusting, balancing, and checking instructions
9. Troubleshooting guide and corrective maintenance (repair) procedures for all electrical and mechanical equipment. These guides shall list the most frequent and common problems, together with the symptoms, possible causes of the trouble, and remedies
10. Drawings (pictures or exploded views) which clearly depict and identify each part, suitable for assembly and disassembly of entire system and each component
11. Wiring and control diagrams, if applicable
12. Panelboard circuit directories including electrical service characteristics, if applicable
13. Part list with current prices; ordering information; and recommended quantities of spare parts to be maintained in storage
14. Charts of valve tag numbers, with location and function of each valve, keyed to the process and instrumentation diagram prepared as part of the Contract Documents
15. Name, address, and telephone number of nearest parts supply house and nearest authorized repair service center.
16. List of recommended spare parts and the recommended number of each per unit and per group of units.

L. All electronic Operations and Maintenance Manuals shall be as specified hereinafter.
1. All files shall be in Adobe PDF format and submitted on USB drives.
2. Files shall be organized by specification section and then by product.
3. An electronic index and list of all charts, graphs, tables, figures, and shop drawings shall be included.
4. All information provided in the paper Operations and Maintenance Manual shall be included in the electronic version.

M. Submit one (1) copy of a preliminary draft manual at least fourteen (14) calendar days prior to the date set for start-up.
1. The Engineer will review the manual for content and compliance with these specifications.
2. Written comments will be provided, but the manual will not be returned.

3. The manual will be used at start-up, to record changes that should be made to the final manual.
4. The manual will be retained on the site until such time as the final, updated manual is provided.

N. Two (2) weeks after the date the unit was placed into service and the Owner has gained beneficial use, submit three (3) paper copies and two (2) electronic copies of the final updated Operations and Maintenance Manual. Refer to Section 017500 - Starting and Adjusting for requirements related to updating the manual(s).

O. Where installation instructions are not included with the manual, they shall be shipped at least ten (10) days prior to the date the equipment is scheduled for installation.

1.03 RETAINAGE

A. The Engineer will retain from payment due the Contractor, for failure to submit manuals as specified, an amount equal to 2% of the scheduled value for the equipment or system for which the manual applies. This Contract requirement only applies when a manual is specified to be provided in the Technical Specifications for a particular system or piece of equipment.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017823

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes:
   1. Maintenance of documents
   2. Recording of record information
   3. Submission of record documents

B. Work of this section also includes the furnishing of underground pipeline documentation.

1.02 PLANS AND SPECIFICATIONS FURNISHED TO THE CONTRACTOR

A. One (1) complete set of Contract Documents (plans, specifications and addenda) will be furnished to the Contractor in electronic portable document format (PDF).

1.03 MAINTENANCE OF DOCUMENTS

A. The Contractor shall maintain at the site one (1) set of the following: drawings, specifications, addenda, change orders, approved shop drawings, test reports, operations and maintenance manuals, and shop drawing log.

B. The Contractor shall make these documents available for use by the Owner, Engineer, regulatory agencies and other parties designated by the Owner.

C. Provide a drawing rack for storage of plans.

D. Maintain these documents in a clean, dry, legible condition throughout the entire contract period.

1.04 RECORDING OF RECORD INFORMATION

A. Affix a stamp to each Contract Drawing and Shop Drawing reading as follows: "RECORD DOCUMENT" - "NAME OF PROJECT" - "CONTRACTOR NAME" in 2-inch high printed letters. The stamp shall be specifically prepared for this project.

B. Keep the record documents current as the work progresses. Record information concurrent with construction progress.

C. Do not permanently conceal any work until required information has been recorded.

D. Legibly mark the Contract Plans to record actual construction, including, but not limited to the following:
   1. All as-built work.
   2. All approved field changes and conditions.
   3. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
   4. Location of underground conduits, boxes, devices. Wire sizes (AWG) and types installed. Number of active and spare wires in each conduit and conduit size (applicable where work involves electrical construction).
   5. Tied-down location of all underground process lines and buried valves.

E. Shop Drawings: Maintain as record documents. Legibly mark-up to show changes made due to field conditions encountered during construction.

1.05 PROJECT RECORD DOCUMENTS

A. Maintain a complete and accurate log of control and survey work as it progresses.

B. The General Contractor shall on completion of major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction, site work and underground facilities installed as work of Contract G.

C. The Contractor's surveyor site drawings shall also show the location of property line perimeter fence. The property line of the site shall be indicated on the plans.

D. The primary electric service installed by LIPA shall also be located on the record drawings prepared by the Contractor's surveyor.

E. If applicable, the primary electric service, gas service, and communication lines installed by the respective utility shall also be located on the record drawings prepared by the Contractor's surveyor.

1.06 SUBMITTAL OF RECORD DOCUMENTS

A. The Contractor shall deliver to the Engineer three (3) full-size sets of drawings and one (1) PDF electronic copy detailing as-built chemical treatment installations, one (1) month prior to the date of startup of the plant site as outlined in the construction schedule. These shall be submitted to the Health Department by the Engineer for certification of installation and inspection. Drawings shall be submitted by the Contractor to the Engineer in accordance with the requirements of this Section.

B. At Substantial Completion, the Contractor shall deliver one (1) preliminary record set of as-built documents to the Engineer with all changes conspicuously ballooned or otherwise emphasized.

C. The work will not be considered substantially complete until such time as the preliminary record documents are delivered and acceptable to the Engineer. Mark this set "Preliminary Record Drawings".

D. Prior to Final Completion, the Contractor shall conform the preliminary record drawings to the comments made by the Engineer. The Contractor shall provide one (1) set of full-scale paper as-built drawings and one (1) electronic copy in portable document format (PDF).

E. As-built drawings shall be the same size as the Contract Drawings, with 1/2-inch margins space on three sides and a 2-inch margin on the left side for binding.

F. Each drawing shall bear in the title box the words "FINAL RECORD DRAWINGS" and the name of the Contractor in heavy black lettering 1/2 inch high and be certified as complete and accurate.

G. As a convenience, Engineer will make available to the Contractor electronic media of the Contract Drawings for the sole purpose of the Contractor preparing as-built drawings.

H. Electronic media made available is without guarantee of compatibility with the Contractor's software or hardware.
   1. If the Contractor wishes to take advantage of this offer, the Contractor will be required to execute an indemnification and hold harmless agreement with the Engineer.
   2. Electronic media will be provided free of charge on disc in a zipped format.
   3. Electronic media shall be returned to the Engineer upon acceptance of the as-built drawings by the Owner.

1.07 RELATED DOCUMENTS

A. Provide certificate of release of liens if requested by the Engineer.

1.08 UNDERGROUND PIPELINE DOCUMENTATION

A. The installing Contractor shall document the location of all underground pipelines by taking digital photographs of the installed pipelines prior to backfilling. At least 3 digital photographs shall be taken of each pipe section before it has been backfilled.

B. The Contractor shall provide each pipe installation crew with a digital camera capable of a 3 mega-pixel quality picture using Smart Media, Compact Flash Media, or Memory Stick cards as the media within the camera.

C. At the end of each day that pipe has been installed, the crew foreman shall hand deliver to the Engineer the removable media.
   1. The Engineer will then download the photographs and delete the photographs from the media.
   2. The media will be returned to the crew foreman within two working days from the date it was delivered.
   3. The Contractor shall have at least three (3) 256 MB media cards available for this purpose to be used on a rotating basis.

D. Installed work will not be eligible for payment until documentation is provided.

E. In addition, the underground piping shall be marked with construction grade spray paint before the photos have been taken to indicate the pipelines in the pictures.
   1. The Contractor shall assign a separate paint color to each line to be shown in the picture.
   2. The paint color, once selected by the Contractor, shall be used for the entire run of piping.
   3. The marks shall be large and long enough to be visible in the picture. Where practical, spray paint the name of the contents that will be conveyed in the pipe, e.g. "POTABLE WATER", "BACKWASH EFFL.".
   4. This requirement is necessary so that the pipe lines shown in the pictures can be easily named and referenced at a later date.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017839

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Section includes the requirements for delivering spare parts specified to be furnished under the provisions of the Contract Documents.

1.02 QUALITY ASSURANCE

A. Spare parts shall be delivered as complete assemblies direct from the manufacturer such that the part is fully functional and ready to be installed.

1.03 DELIVERY, STORAGE AND HANDLING OF SPARE PARTS

A. Comply with the requirements of Section 016500 for packing, delivery, storage and handling requirements for all parts delivered to the site of the work.

B. All spare parts required to be furnished under a Section of the Specifications shall be packaged in one separate box, crate or container with the words "SPARE PARTS" lettered on all sides of the container.

C. The equipment name or system name for which the spare parts are being provided shall also be lettered on the container.

D. A separate packing list for the spare parts shall be included in the container.

E. The Contractor shall store all spare parts indoors immediately upon delivery of the spare parts to the site. Spare parts will not be accepted by the Owner/Engineer if the spare parts have been stored outdoors for more than 8 hours upon delivery to the site.

F. The storage location shall be secure.

1.04 TURN OVER OF SPARE PARTS

A. Spare parts shall be turned over to the Owner/Engineer approximately two (2) weeks prior to the Engineer's preparation of the Final Punch List.
   1. Spare parts will not be accepted until this time.
   2. The Certificate of Substantial Completion will not be issued until all spare parts are delivered.

B. The following procedure shall be followed:
   1. The Contractor shall provide a formal letter of transmittal listing the name or description of the part, part number, model number, manufacturer (or supplier), and system component name and the Section where it was specified to be provided.
   2. Two (2) counterparts of the letter shall be provided.
   3. The Contractor shall turn each part individually over to the Owner/Engineer.
   4. The Owner/Engineer will initial next to the part description on each counterpart of the transmittal letter.
   5. The initials represent that the part was received.
   6. One transmittal counterpart will be returned to the Contractor.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017843

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work of this Section includes the requirements for demonstrating and training of installed systems, equipment, and products.

1.02 MANUFACTURER'S FIELD SERVICES

A. When specified in individual specification sections require field services to be provided, said services shall be provided by qualified, authorized and factory trained representative(s) of the manufacturer (supplier).

B. Field services shall generally consist of:
   1. installation supervision,
   2. verify terms of the manufacturer's warranty,
   3. equipment and system calibration,
   4. startup supervision,
   5. and operation and maintenance instructions to the Owner's employees.

C. Such services do not include service time to correct a factory fault, correct problems resulting from a factory wiring or control logic error, or errors caused by poor or improper installation by the Contractor.

D. Sale representatives are not acceptable.

E. The times specified to be provided by the manufacturer does not relieve the manufacturer from providing sufficient service time to place the equipment or systems into satisfactory operation and to obtain the specified performance. The manufacturer shall provide, as a minimum, the times specified in the Specification Sections.

F. Where manufacturer services are specified for control panel or control center startup, the representative shall be experienced and trained to work on and field rewire such devices.
   1. Field representatives for control panel startup shall understand the control sequence specified and, in the case of programmable logic controllers, are able to make revisions to the factory program using handheld programming devices or laptop computers.
   2. The time spent by the representative to correct a PLC program shall not be included in the time specified for startup.

G. Submit manufacturers' startup reports (MSR's) in accordance with the requirements contained in Section 013300 - Submittals.

1.03 SUBMITTALS

A. Manufacturer's Startup Reports

1.04 QUALITY CONTROL

A. The Contractor shall adhere to all instructions provided by the manufacturer's authorized representative.

B. All verbal instructions necessary to satisfy performance of the equipment or the system shall be immediately provided by the Contractor. The manufacturer shall document all verbal orders in writing at a time suitable to the Contractor.

C. All written instructions provided in operation, maintenance, and installation guides and manuals, provided by the manufacturer of such equipment and or system, shall be complied with by the Contractor.

D. The Contractor shall comply with all manufacturer requirements such that written or implied warranties remain in full force during the time period so specified elsewhere in the technical specifications.

E. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

F. Actions and/or non performance by the Contractor that may void manufacturer warranties shall not constitute a release of the specified warranty, and all warranty claims made by the Owner shall be paid for by the Contractor as if the manufacturer's warranty was still in effect.

1.05 SCHEDULING - FIELD SERVICES

A. The Contractor shall arrange field service on dates acceptable to the Owner and Engineer.

B. The service visits shall be scheduled at least 2 weeks in advance so that the Owner and Engineer can adequately staff the date.

C. Operator training will not be allowed until such time as the Manufacturer's Operation and Maintenance Manuals have been supplied and approved by the Engineer.
   1. The field service technician shall review the contents of the manual with designated employees of the Owner.
   2. Field services will not be deemed provided until the MSR is provided.

1.06 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel prior to date of Substantial Completion.

B. Utilize manufacturer's and vendor's Operation and Maintenance Manuals as basis for instruction. Review contents of the manual with the Owner's personnel in detail to explain all aspects of operation and maintenance.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of the equipment or of the system.

D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

E. The Contractor shall arrange to have the manufacturer's Operation and Maintenance Manuals updated with information that has been added during start-up activities.

F. The final manual shall contain the most recent information and reflect all operational and maintenance aspects of the final installed and functioning system or equipment component of the system.

G. Any changes to control panel wiring diagrams or interconnection wiring schematics shall be made and new prints provided as an update to previously approved manuals.

H. Manufacturer field time shall be as specified in individual Sections of the Technical Specifications.

I. For control panels, explain the control sequence, timing structure, and safety precautions when working inside the panel, terminal wiring system, PLC program, if applicable, operator interface(s) and control logic.

J. Explain PLC LED input and output numbering system, if applicable. If control relays are used, explain technique for their replacement.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017900

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Footings.
   2. Foundation walls.
   3. Slabs-on-grade.
   4. Underslab vapor retarder.

1.02 REFERENCES

A. ACI 117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

C. ACI 301 - Specifications for Concrete Construction; 2020.

D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

F. ACI 305R - Guide to Hot Weather Concreting; 2020.

G. ACI 306R - Guide to Cold Weather Concreting; 2016.

H. ACI 308R - Guide to External Curing of Concrete; 2016.

I. ACI 318 - Building Code Requirements for Structural Concrete; 2019, with Errata (2021).

J. ACI 347R - Guide to Formwork for Concrete; 2014 (Reapproved 2021).

K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

L. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2022.

M. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2019.

N. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

O. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).

P. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2020.

Q. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

R. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

S. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2017.

T. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.

U. ASTM C192/C192M - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory; 2019.

V. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

W. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

X. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2022.

Y. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

Z. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.

AA. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

AB. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2022.

AC. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2022.

AD. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars; 2022.

AE. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.

AF. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.

AG. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016.

AH. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2012 (Reapproved 2017).

AI. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2020.

AJ. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

AK. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 2017.

AL. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars; 2018, with Amendment (2020).

AM. PS 1 - Structural Plywood; 2009 (Revised 2019).

AN. ACI 350 - Concrete Sanitary Engineering Structures.

AO. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.04 ACTION SUBMITTALS

A. The contractor shall comply with the requirements of Division 01 Specification of the Project Manual, Section 013300 - SUBMITTALS.

B. Product Data: For each type of product indicated.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.
   2. Submit mix design mixtures for each type of concrete to be used on the Project at least 30 calendar days prior to the first scheduled concrete pour. The Contractor's testing laboratory shall develop concrete mix designs and test all materials and mixes for conformance with ACI 301 and these specifications. The costs associated with development of the design mix and testing of samples shall be included in the bid price.
   3. Submit the following:
      a. Name, address, and telephone number of Contractor's laboratory.
      b. Mix proportions.
      c. Source of cement, type, brand, and certified copies of mill reports, including physical and chemical analysis.
      d. Sources of fine aggregates and results of test made in accordance with ASTM C33/C33M and ASTM C40.
      e. Source of coarse aggregates and results of tests made in accordance with ASTM C33/C33M.
      f. Catalog cuts of all admixtures.
      g. Furnish test results of slump, air entrainment and water-cement ratio for each mix design.
   4. For each mix proposed, make and cure four (4) standard 6 inch concrete test specimens to the laboratory in accordance with ASTM C192/C192M. Furnish compression test results made in accordance with ASTM C39/C39M. Break two (2) cylinders at seven (7) days and two (2) at 28 days.
   5. If the concrete is intended to be pumped, design mix accordingly and submit certification that it has been tested for pumping.
   6. If adopted mix fails to produce concrete meeting the requirements for strength and placibility, the Architect may order additional cement or adjustments to mix proportions at no extra cost to the Owner.

D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, spacing, locations, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement including steel bars and wire fabric.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer licensed in the state where the project is located; detailing fabrication, assembly, and support of formwork. Shop drawings shall bear the signature and seal of the same licensed Professional Engineer.
   1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal
   2. Shop drawings shall indicate formwork dimensioning, materials and arrangement of joints and ties.
   3. Manufacturer's instructions: Indicate installation procedure and interface required with adjacent work

F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
   1. Location of construction joints is subject to approval of the Architect, if not shown on the drawings.

G. Samples: For waterstops, vapor retarders, and vapor retarder tape.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, provided by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Curing compounds.
   6. Adhesives and Vapor retarders.
   7. Semi rigid joint filler.
   8. Joint-filler strips.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

G. Furnish transit-mix delivery slips to Owner's Representative.

1.06 QUALITY ASSURANCE

A. Comply with Referenced Standards specified in Division 01 Section "References" in addition to ACI 301.

B. Perform testing under the provisions of Division 01 Section "Quality Requirements" and the "FIELD QUALITY CONTROL" Article of Part 3 listed in this specification.

C. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

E. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
   1. The contractor shall provide an adequately sized, insulated curing box to house concrete cylinders at the discretion of the Architect, for the 48-hour period between concrete pour and sample collection pick-up by the Testing Laboratory (ASTM C31/C31M). As directed by the Architect, the contractor shall cure additional cylinders in the same fashion as the in-place concrete.
   2. Curing box shall be located away from the main construction area and shall be blocked up off the ground.
   3. A log sheet shall be provided in a waterproof sheet protector to log in the placement and removal of the concrete test samples by the testing laboratory.
   4. Minimum information to be logged for each pour date shall include: date of pour, date of pick-up, weather conditions at the time of pour, testing

F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer. To further insure consistency, coloration, finish and quality; all aggregates, cement, water and other ingredients shall each be secured from the same source for the duration of the project.
   1. The batching plant and raw materials may be subject to inspections and test performed by the Architect.

G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

H. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301, "Specifications for Structural Concrete", Sections 1 through 5.
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
   3. ACI 304R - "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".

I. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Store cement off the ground in a dry, weatherproof, adequately ventilated structure with provisions to prevent the absorption of water.

C. Transport dry concrete batches from the central plant to the site in approved truck mixers conforming to the requirements of the Truck Mixer Manufacturer’s Agitating Standards. Each truck shall contain a plate stating the capacity, drum speeds and be provided with a revolution counter.

D. Packaged material shall be delivered and stored in the original packages until ready for use. Packages or materials showing evidence of water or other damage shall be rejected.

E. Protect all materials from freezing.

1.08 COORDINATION

A. Coordinate work under provisions of Division 01 Specification of this Project Manual.

B. The Contractor shall provide at least five (5) working days advance notice prior to formwork closure to the Architect.

C. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

D. Notify Architect a minimum of three (3) working days prior to commencement concrete pours.

1.09 REGULATORY REQUIREMENTS

A. Conform to ACI 304R and all applicable codes for placement of concrete and related work.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when the ambient temperature is below 40 deg. F. or when the concrete temperature exceeds 85 deg. F. Under certain circumstances, the Engineer may approve the placement of concrete under the above conditions, provided that the procedures of ACI 305R and ACI 306R are strictly adhered to.

B. Do not place concrete when the conditions may adversely affect the placing, curing or finishing of concrete, or its strength.

C. Comply with the requirements contained in Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Steel forms: Minimum 16 gage thick, stiffened to support weight of concrete with minimum deflection.
   3. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. Douglas Fir Species, solid one side grade and sound

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum unless indicated otherwise on the drawings.

C. Form-Release Agent: Commercially formulated, colorless, water based, non-toxic, V.O.C. compliant, environmentally safe material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete; manufactured by DAYTON SUPERIOR or equal. Agent shall not be detrimental to the environment.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
   3. For Concrete Tanks: Furnish snap-ties with 1 inch plastic cone and waterseal washer.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 ; ASTM A706/A706M, deformed bars, assembled with clips.

2.03 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
   2. Provide load bearing pad on bottom to prevent vapor barrier puncture.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
   2. Provide load bearing pad on bottom to prevent vapor barrier puncture.

2.04 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C150/C150M, Type IA, gray. Supplement with the following:
      a. Fly Ash: ASTM C618, Class F or C.
      b. Ground Granulated Blast-Furnace Slag: ASTM C989/C989M, Grade 100 or 120.
   2. Silica Fume: ASTM C1240, amorphous silica.
   3. Normal-Weight Aggregates: ASTM C33/C33M, No. 57 or 67 crushed stone coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
      a. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
      b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
   4. Water: ASTM C94/C94M, clean and not detrimental to concrete.

2.05 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260/C260M.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
   2. Retarding Admixture: ASTM C494/C494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

2.06 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E1745, Class C or polyethylene sheet, ASTM D4397 not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400
      b. Grace Construction Products, W. R. Grace & Co.; Florprufe 120
      c. Insulation Solutions, Inc.; Viper VaporCheck 10.
      d. Meadows, W. R., Inc.; Perminator 10 mil.
      e. Reef Industries, Inc.; Griffolyn 10 mil Green.
      f. Stego Industries, LLC; Stego Wrap 10 mil Class A.
      g. Or approved equal.

B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C33/C33M for fine aggregates.
   1. Depth Requirements:
      a. Slab on grade: 6 inches (unless otherwise noted in the Geotechnical Report).
      b. Footings: 12 inches (unless otherwise indicated in the Geotechnical Report).

2.07 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 4 sieve.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dayton Superior Corporation; Emery Tuff Non-Slip
      b. Lambert Corporation; EMAG-20
      c. L&M Construction Chemicals, Inc.; Grip It
      d. Metalcrete Industries; Metco Anti-Skid Aggregate

2.08 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 8 oz. /sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet weighing approximately 8 oz. / sq. yd. bonded to prevent separation during use.

C. Membrane curing compound: Moisture Retention complying with ASTM C309. Products: EUCOCURE VOX by Euclid Chemical Company or equal.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
   1. Products: Eucocure VOX as manufactured by Euclid Chemical Company or approved equal.

2.09 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, 1/2" asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: three-component, solvent-free, moisture tolerant, epoxy modified cementitious product.
   1. Product: Armatec 110 EpoCem as manufactured by Sika Corporation or specifically approved equal.
   2. Types I and II, non-load bearing Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Non-Shrink Grout: Premixed compound, free of chlorides, with non-metallic aggregate, cement water reducing and plasticizing agents; capable of minimum compressive strength of 2400 psi at 48 hours and 7000 psi at 28 days. Grout shall be suitable for contact with potable water. For equipment bases and pipe supports, use non-shrink grout by Master Builders, Embeco 636, Unisorb V-1 or equal.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 211.1 and ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
   1. Fly Ash: 25 percent.
   2. Combined Fly Ash and Pozzolan: 25 percent.
   3. Ground Granulated Blast-Furnace Slag: 50 percent.
   4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent Portland cement minimum, with fly ash or Pozzolan not exceeding 25 percent.
   5. Silica Fume: 10 percent.
   6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
   7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
   8. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

C. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: Spread Footings; foundation walls, and slab on grade: 4000 psi at 28 days.
   2. Maximum Water-Cementitious Materials Ratio: 0.50 for all concrete building elements.
   3. Slump Limits (Conventional Mix):
      a. Slabs: 3 inches plus or minus one inch.
      b. Foundation Walls and Footings: 4 inches plus or minus one inch.
   4. Slump Limits (Pump Mix):
      a. Final slump (Slabs): 6 1/2 inches plus or minus one inch.
      b. Final Slump (Foundation, walls and footings): 7 1/2 inches plus or minus one inch
   5. Air Content:
      a. Spread Footings: 5.5 percent, plus or minus 1.0 percent. at the point of delivery.
      b. Slabs: 3 percent, plus or minus 1.0 percent at point of delivery. Do not allow air content of trowel finished concrete floors to exceed 3 percent.
   6. Large Aggregates: 3/4" crushed stone; ASTM C33/C33M, No. 67.
   7. Use Admixtures only when approved by the Engineer.
   8. Mix Grout in accordance with the manufacturer's instructions and specifications.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
   1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
   2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
   3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and measurements before proceeding with formwork. Ensure that dimensions agree with the plans.

B. Inspect the formwork and reinforcing that it has been properly set and secured and that all items to be embedded, built-in or pass through concrete are at their proper locations and elevations.

C. The General Construction Contractor shall verify that all other prime contractors have installed concrete inserts, sleeves, and embedded elements of the project, such as conduit, and their work has been totally completed and inspected by the Architect.

D. Ensure that all points of contact with new grout are free from oil, grease and scale.

3.02 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
   1. Class A, 1/8 inch for smooth-formed finished surfaces.
   2. Class B, 1/4 inch for rough-formed finished surfaces.
      a. Hand trim sides and bottom of earth forms and remove loose soil to the satisfaction of the Architect.
      b. Remove water from forms and excavations and divert water flow to avoid washing over, under or though freshly placed concrete.

D. Construct forms tight enough to prevent loss of concrete mortar. Align form joints.

E. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.

F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer: Provide 3/4" inch chamfer on all exterior horizontal and vertical corners and edges of permanently exposed concrete.

J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.

N. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-metallic/ non-shrink grout.

O. Prepare previously placed concrete by cleaning with steel brush and apply a Bonding Agent in accordance with the manufacturer's specifications and instructions.

3.03 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. Ensure that all inserts and embedded items are not disturbed during concrete placement.

3.04 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. 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 for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.05 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions.
   1. Lap joints 6 inches and seal with manufacturers recommended tape.

B. Granular Course: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

3.06 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars. Use reinforcing splices at minimum of locations and only at locations of minimum stress. Review locations of splices with Architect. Splice locations shall be approved during shop drawing review phase. Rebar splice overly shall be the minimum length as per ACI 318.
   1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced t minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Take necessary measures to ensure that reinforcement is not disturbed during the placement of concrete.

3.07 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated or at 20' o.c. maximum. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction / Control Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 3/16"-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 - JOINT SEALANTS are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

F. Ensure joint fillers and devices are not disturbed during placement of concrete.

G. Install all joint fillers and devices in accordance with the manufacturer's instructions and specifications for floor and wall finish.

H. Install joint device anchors. Maintain correct position to allow joint cover flush with floor and wall finish.

I. Install joint covers in one-piece length when adjacent construction activity is complete.

J. Apply sealants in joint devices in accordance with the manufacturer's specifications and instructions.

3.08 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
2. Place concrete with the aid of mechanical vibrators which are capable of transmitting to the concrete not less than 3,000 impulses per minute. Maintain at least three (3) vibrators in good working condition, ready for use when concrete placement begins in any one area.
3. Do not interrupt successive placement. Do not permit cold joints to occur.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and ACI 305R and as follows:
1. Maintain concrete temperature below 95 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
3. Maintain records of concrete placement. Record date, locations, quantity, air temperature and test samples taken.
4. In areas with floor drains, maintain floor elevations at walls; pitch surfaces uniformly to the drains maintaining a 1% slope.
5. Cure floor surfaces in accordance with ACI 308R.
6. Apply curing compound in accordance with the manufacturer's specifications and instructions in two (2) coats with the second coat at right angles to the first.

3.09 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch 6 mm in one direction.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, and ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E1155, for a randomly trafficked floor surface:
   a. Specified overall values of flatness, F (F) 30; and of levelness, F (L) 20; with minimum local values of flatness, F (F) 24; and of levelness, F (L) 15; for suspended slabs.
3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. This surface shall be used for interior and exterior walking surfaces unless noted otherwise. Finish edges of exterior walkway flags with steel tooled radius edge.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, equipment pads, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
1. Uniformly spread 25 lb. /100 sq. ft. of dampened slip-resistive over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
2. After broadcasting and tamping, apply float finish.
3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aluminum granules.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. All exposed horizontal and vertical wall and slab corners shall have a ¾” wide chamfered edge.

3.11 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 and ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb./sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after

loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308R and ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
      a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
      b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
      c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

F. Liquid sealer/hardener to be applied on exposed concrete cured with moisture retentive or absorptive covers. The following materials provide varying levels of protection, sealant and hardness. Review products for project appropriateness.
   1. Euclid: Euco Diamond Hard (Liquid Sealer and Hardener)
   2. L&M Construction Chemicals: Seal Hard (Liquid Sealer and Hardener)
   3. Curecrete Chemical Company: Ashford Formula (Liquid Sealer and Hardener)
   4. Midwest Floor Care: Structure Formula (Liquid Sealer and Hardener)
   5. Or approved equal.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least three month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semi rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Immediately remove all rust spots that have developed during the construction period as soon as directed by the Architect. Remove all rust spots that have formed by the use of temporary handrails.

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and/or qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Contractor is responsible to notify the Owners representative at least 72 hours prior to the scheduled work that requires inspection / testing. The presence of the Inspector engaged by the Owner does not relieve the contractor of Quality Control Requirements.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:
   1. Steel reinforcement placement.
   2. Headed bolts and studs.
   3. Steel reinforcement welding.
   4. Concrete placement, including conveying and depositing.
   5. Curing procedures and maintenance of curing temperature.
   6. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:
   1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
      a. Frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
      b. One (1) additional test cylinder shall be taken during cold weather and be cured under the same conditions as the concrete it represents.
   2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C173/C173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
   5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   6. Compression Test Specimens: ASTM C31/C31M.
      a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
      b. Cast and field cure two Insert number sets of two standard cylinder specimens for each composite sample.
   7. Compressive-Strength Tests: ASTM C39/C39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
      a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
      b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
   8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7 and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E1155 within 72 hours of finishing.

END OF SECTION 033000

PART 1 GENERAL

1.01 SUMMARY

A. Related Documents:
   1. Drawings and general provisions of the Subcontract apply to this Section.
   2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:
   1. Grout for uses other than masonry.
   2. Pressure Grouting.

C. Related Sections:
   1. Division 01 Section "General Requirements."

1.02 REFERENCES

A. General:
   1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
   2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
   3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

B. ASTM International:

1.	ASTM C33	Concrete Aggregates
2.	ASTM C40	Organic Impurities in Fine Aggregates for Concrete
3.	ASTM C88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
4.	ASTM C117	Material Finer Than 75µm Sieve in Mineral Aggregates by Washing
5.	ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
6.	ASTM C150	Portland Cement
7.	ASTM C289	Potential Reactivity of Aggregates (Chemical Method)
8.	ASTM C494	Chemical Admixtures for Concrete
9.	ASTM C881	Epoxy-Resin-Base Bonding Systems for Concrete
10.	ASTM D2419	Sand Equivalent Value of Soils and Fine Aggregate
11.	ASTM E329	Inspection and Testing Agencies for Concrete, Steel, Bituminous Materials as Used in Construction

1.03 SUBMITTALS

A. Submit under provisions of Section 013300 - SUBMITTALS.

B. Manufacturer's data shall be provided for bonding compounds, dry pack , nonshrink, pressure grout, retardants, epoxy grout, and polymer concrete.

C. Test reports, accompanied by a manufacturer's statement that previously tested material is of similar type, quality, and manufacture as that which is proposed for use on this projects, shall be submitted for:
   1. Cement.
   2. Aggregates.
   3. Retardants.

4. Bonding compounds.
5. Epoxy resin.

D. The subcontractor's testing laboratory shall provide evidence of the most recent inspection of its facilities by the Cement and Concrete Reference Laboratory of the National Bureau of Standards and evidence of correction of deficiencies noted in the inspection report before materials specified in this section are delivered to the job site.

1.04 QUALITY ASSURANCE

A. Conformance with the specified requirements will be demonstrated testing performed by an independent testing laboratory retained by the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cement: Portland cement shall be ASTM C150/C150M, Type II or Type V, containing less than 0.6 percent alkali.

B. Aggregate:
1. General: Aggregate shall be non reactive and shall be washed before use. When sources of aggregate are changed, test reports shall be provided for the material from the new source prior to commencing grout work.
2. Fine Aggregate: Fine aggregate shall be sand or crushed stone conforming to ASTM C33/C33M as modified herein. When tested in accordance with ASTM C136/C136M, gradation shall be such that 100 percent by weight passes a standard No. 8 sieve and not less than 45 percent by weight pass a standard No. 40 sieve. Variation from the specified gradation in individual tests will be accepted if the average of three consecutive tests is within the following variation:

Standard Sieve	Permissible variation in individual test
No. 30 or coarser	2 percent by weight
No. 50 or finer	0.5 percent by weight

C. Admixtures:
1. Water Reducing Retarder: Water reducing retarder shall comply with ASTM C494/C494M, Type D and shall be Master Builders Pozzolith 300-R, Sika Corporation Plastiment or approved equal.
2. Lubricant: Lubricant additive for cement pressure grouting shall be Intrusion Prepakt Intrusion Aid, Sika Intraplast N, or approved equal.

D. Water:
1. Waste for washing aggregate, for mixing and for curing shall be potable, shall not contain more than 1000 mg/l of chlorides as Cl, nor more than 1300 mg/l of sulfates as SO4, and shall not contain impurities which may change the setting time by more than 25 percent or a reduction of more than 5 percent of the compressive strength of the grout at 14 days when compared to the results for grout made with distilled water.

2.02 GROUT

A. Drypack Grout:
1. Drypack grout shall be one of the following:
a. a mixture of approximately one part cement, 1-1/2 parts sand, water reducing retarder and sufficient water to make a stiff workable mix.

b. W.R. Meadows Wedjroc Dry Pack.
c. Euclid Chemical Dry Pack.
d. or approved equal.

B. Cement Grout:
1. Cement grout shall be a mixture of one part cement, two parts sand proportioned by volume admixtures for pressure grouting and sufficient water to form a workable mix.

C. Nonshrink Grout:
1. Nonmetallic aggregate nonshrink grout shall be one of the following:
a. U.S. Grout Five Star grout.
b. Master Builders Masterflow 713.
c. Burke Company Non-Ferrous, Non-Shrink Grout.
d. or approved equal.

D. Epoxy Grout for Crack Repair and Dowel Anchorage:
1. Except for applications involving pressure grouting or crack injection, epoxy shall be a high modulus, moisture insensitive, two component, 100 percent solids, thermosetting modified polyamide epoxy compound. The material shall conform to ASTM C881/C881M, Type I, Grade 3 such as Sika Corporation Sikadur Hi-Mod series, Adhesive Technology Corporation Solidbond 200, or approved equal which is capable of not sagging in horizontal or overhead anchoring applications.
2. Epoxy for applications involving pressure grouting or crack injection, shall be a high modulus, moisture insensitive, two component, injection grade, 100 percent solids blend of epoxy resin compounds. The material shall conform to ASTM C881/C881M, Type I, Grade 1 such as Sika Corporation Sikadur 52, Adhesive Technology Corporation SLV 300 series, or equal which is capable of achieving complete penetration of hairline and larger cracks.

E. Polymer Concrete for Resurfacing and Patching:
1. Polymer concrete shall consist of a liquid binder and dry aggregate mixed together to make a flowable mortar. The liquid binder shall be a chemical and oil resistant, stress relieved, low modulus, moisture insensitive, two component epoxy resin compound. The binder material shall conform to ASTM C881/C881M, Type 3, Grade 1 such as Sika Corporation Sikadur Lo-Mod series, Adhesive Technology Corporation 400 series, or equal with a consistency similar to light weight oil for proper mixing with the aggregate. The aggregate shall be oven dry, kept in sealed packages until the time of mixing and be of size and consistency compatible with recommendations of the manufacturer of the liquid binder for the intended application.

F. Adhesive Resin for Dowel Anchorage:
1. ICC approved, structural epoxy; prepackaged in cartridges for manually or pneumatically operated caulk gun and automatically mixed at nozzle. Subject to compliance with current ICC evaluation report provide one of the following: HIT RE500-SD Adhesive Anchoring System, Hilti, Inc. (ICC ESR-2322), HIT-HY 200 MAX-SD Adhesive Anchoring System, Hilti, Inc. (ICC ESR-3013), SET-XP Adhesive Anchoring Systems, Simpson Strong-Tie Co. (ICC ESR-2508).

2.03 PRESSURE GROUTING EQUIPMENT

A. Pressure grouting equipment shall include a mixer and holdover agitator tanks designed to place grout at pressures up to 50 psi (0.345 MPa). Gauges indicating grouting pressure shall be provided and the mixer shall be equipped with a meter capable of indicating to within 1/10 cubic foot (0.003 m^3) the volume of grout placed.

PART 3 EXECUTION

3.01 GENERAL

A. Bonding compounds for use with grout is specified in Section 004550 - QUALIFICATION OF BIDDERS. Primer, if required for polymer concrete, is to be provided and installed per the manufacturer's recommendations.

3.02 DRYPACK GROUT

A. Drypack grout is to be used for built-up surfaces, setting miscellaneous metal items and minor repairs.

B. Surfaces required to be built-up with drypack grout are to be roughened by brushing, cleaned and coated with the bonding compound before application of grout. The grout is to be applied to the required thickness and cured in accordance with Section 004550 - QUALIFICATION OF BIDDERS.

3.03 CEMENT GROUT

A. Cement grout is to be used for filling nonbearing portions of equipment pads and pressure grouting.

B. Except for the specialized requirements for pressure grouting, grout is to be mixed and placed in the same manner as cast-in-place concrete. Grout is to be mixed for at least one minute and diluted grout is to agitated until placed.

3.04 NONSHRINK GROUT

A. Nonshrink, nonmetallic aggregate grout is to be used under equipment, bearing plates and column base plates. Nonshrink, metallic aggregate grout is to be used under rotating equipment where high strength and fatigue are of concern, to grout anchor bolts and to grout reinforcing steel. Grout is to be placed and cured in accordance with the manufacturer's recommendations.

B. Holes required for grouting shall be blown clean with compressed air and are to be free of dust or standing water. Horizontal holes for grouting are to be drilled at a slight downward angle and with the inserted dowel or bolt bent to match.

3.05 EPOXY GROUT

A. Epoxy grout shall be used for repairing cracks by pressure grouting or gravity, repairing structural concrete and may be used for setting dowels or bolts in holes. Concrete is to be primed in accordance with the grout manufacturer's recommendations.

B. The use of epoxy grout must comply with the following restrictions:
   1. Limited to areas where exposure, on an intermittent or continuous basis, to acid, chlorine gas or to machine or diesel oils, is extremely unlikely.
   2. Limited to applications where exposure to fire or to concrete temperatures above the product heat deflection temperature or 120 deg F (40 deg C)(whichever is less) is extremely unlikely. Overhead applications are not allowed.
   3. Holes for the anchors shall be drilled (not cored), shall be blown clean with compressed air and shall be free of dust or standing water.
   4. The anchor type, size and embedment depth shall be as shown on the drawings and the anchor must be installed in accordance with the manufacturer's recommendations.
   5. The anchor must not be loaded until after the full curing period has elapsed.

3.06 PRESSURE GROUTING

A. Prior to grouting, cracks and holes to be grouted shall be washed clean. Washing is not required for grouting soil voids. Once started, grouting shall be continuous until completed. In case of a mechanical failure or other stoppage of the work, the grout equipment shall be washed out sufficiently to ensure that fresh only grout is pumped when the work is restarted.

3.07 FIELD QUALITY CONTROL

A. The Testing Laboratory will:
   1. Special Inspect installation of anchors in accordance with applicable ICC Evaluation Report, where special inspection is indicated on Contract Documents or where Subcontractor's design engineer has used ICC anchor capacities that require Special Inspection.
   2. Subcontractor will reimburse Owner for cost of Special Inspection, where anchors are sized by Subcontractor's design engineer using ICC Special Inspection values.
   3. Develop and utilize an effective method of field marking anchor and dowel test locations and results.

B. Testing of grout mixes for conformance to manufacturer’s specified strength: The Owner's independent testing laboratory shall take four test samples of each day's grout mix and test grout mix samples at 7 and 28 days. Test reports shall be submitted to the Owner / Architect for review under the provisions of Division 01 Section "General Requirements."

C. Test 25 percent of reinforcing steel dowels installed with adhesive resin on a given day in tension using pullout procedure. Test to 80% of specified yield strength of the dowel or 150% of the ICC rated static capacity whichever is the lesser with special inspection. Dowels specifically noted on the drawings as “No test required” do not require tension testing.

D. If the failure rate of dowels exceeds 10 percent, testing will be increased to 100 percent of that day’s installation of similar anchors or dowels. Testing will be reduced to 25 percent of that day’s installation when the failure rate is reduced to 10 percent or less. Failed dowels will be replaced at no additional cost to the Owner . Subcontractor will reimburse Owner for cost of additional testing. The testing agency will produce daily reports of all testing activities: copies of daily reports will be submitted to the Owner / Architect in a timely manner.

END OF SECTION 036000

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Concrete Block.

B. Mortar and Mortar Coloring.

C. Anchors and Reinforcement.

D. Control Joints.

E. Cavity Wall Drainage System.

F. Joint Filler.

G. Installation of Steel Lintels, Door Frame Anchors and items furnished by other sections in Masonry.

H. Cleaning of Masonry.

I. Related Masonry Accessories.

1.02 APPLICABLE STANDARDS

A. ACI 530 - Building Code Requirements for Masonry Structures.

B. ACI 530.1 - Specifications for Masonry Structures.

C. ANSI/ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.

D. ANSI/ASTM C55 - Specification for Concrete Building Brick.

E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.

F. ASTM C129 - Specification for Non-Load Bearing Concrete Masonry Units.

G. ANSI/ASTM C216 - Facing Brick (solid masonry units made from clay or shale).

H. ASTM A525 - Steel Sheet, Zinc-Coated (galvanized) by the Hot-Dip Process.

I. ASTM A615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

J. ASTM C145 - Solid Load Bearing Concrete Masonry Units.

K. IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

L. UL - Underwriters' Laboratories.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Submit samples in duplicate of masonry units, ties, and reinforcing for Architect/ Engineer’s approval.

C. Submit product data, installation instructions (and samples if requested) of the cavity wall drainage system for Architect/ Engineer's approval.

D. Submit concrete block certifications and test reports from block manufacturer indicating that concrete masonry units meet or exceed project specifications.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

F. Shop drawing: Layout of control joint placement.

G. Submit hot/cold weather masonry construction procedures including a detailed description of methods, materials and equipment to be used to comply with requirements.

H. Submit samples of mortar mix and color to architect/engineer for preliminary approval prior to building sample wall.

1.04 QUALITY ASSURANCE

A. Special Inspections required, refer to Section 014500.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

E. Build a sample wall of concrete unit masonry, which will be exposed to view in the finished project for approval by the Architect/Engineer. Follow these guidelines:
   1. Each sample wall shall be a corner approximately 4'-0" long by 4'-0" wide by 3'-0" high, showing the proposed color range, texture, bond, special masonry coursing (if any), special masonry shapes (if any), flashing, reinforcing, mortar and workmanship. All units shipped for the sample shall be included in the panel. Sample panel shall include a window jamb 24" high and sill 24" long with all associated flashing.
   2. Erect panel in the presence of the Architect/Engineer before installation of materials.
   3. When required, provide a separate panel for each type of concrete unit masonry or mortar.
   4. Prior to start of masonry construction work obtain the Architect/Engineer and Owner approval of the sample wall.
   5. Should sample be rejected, provide additional sample walls until acceptance is obtained from Architect/Engineer and Owner.
   6. Use panel as standard of comparison for all masonry work built of same material.
   7. Do not destroy or move panel until work is completed and accepted by Architect/Engineer.

1.05 DELIVERY AND STORAGE

A. Materials shall be delivered and stored under the provisions of 016500 so as to avoid breakage, moisture, staining or damage of any kind.

B. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.06 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

B. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.

C. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

E. No masonry work shall be installed in an atmosphere with temperature less than 40°F or more than 99°F unless work is protected in a manner previously approved by the Architect/Engineer.

F. For cold weather masonry construction, submit to Architect/Engineer for review and approval, a cold weather masonry construction plan, identifying all measures contractor shall take for cold weather masonry construction. Conform to IMIAC – Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

G. Hot Weather Construction - Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 99°F or more (37°C) in shade with relative humidity less than 50%. Conform to IMIAC – Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Northeast Architectural Products, Ashley, PA.

B. The Proudfoot Company, Inc., Monroe, CT.

C. Westbrook Concrete Block, Westbrook, CT.

D. Kings Building Materials, Roslyn Heights, NY

E. Or approved equal.

2.02 CONCRETE MASONRY UNITS

A. Concrete Masonry Units: Architectural load-bearing masonry units shall meet ASTM C-90, Type I, Grade N.
   1. Unit Compressive Strength: Provide units cast from high strength concrete with a minimum average net-area compressive strength of 1900 psi. Provide units meeting fire resistance rating as required.
   2. Density Classification: Normal weight.
   3. Types:
      a. Type A = 8" standard masonry unit.
      b. Type B = 8" bond beam masonry unit.
      c. Type C = 12" solid masonry unit.
      d. Type D = 4" split face solid masonry unit.
   4. Units to be left exposed shall be colored with integrally mixed, light fast, weather-resistant pigment. Color shall be maintained uniformly throughout the job, within normal manufacturing tolerances.
   5. All exposed exterior units shall be manufactured with integral water repellant.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide 5/8 inch radius bull nose units for all outside corners unless otherwise indicated.
   3. Special shaped units shall meet same specifications as adjacent units. Split multiple faces of units where more than one face is exposed.

2.03 MORTAR

A. Mortar and grout materials and mix proportions shall meet applicable requirements of ASTM C270-866, Type N made with lime. Color shall be close to that of masonry units involved and shall be approved by the Architect. Mortar coloring shall be factory added and mixed into mortar. Hand mixing of color mortar at the jobsite is prohibited. Contractor to submit color samples to Architect/Engineer for selection. Once color selection is made, Contractor shall provide design mix to Architect/Engineer.

B. Mortar Materials:
   1. Portland cement: Cement shall conform to ASTM Specification C150-61, Type 1.
   2. Lime: Hydrated lime shall be Type S or Type N, conforming to ASTM Specification C207-49. Quicklime shall conform to ASTM Specification C5-59. It shall be slaked in accordance with the manufacturer's directions.
   3. Lime Putty: Putty shall be a stiff mixture of lime and water. Keep putty moist until used. Putty made from quicklime shall be slaked and allowed to soak at least 24 hours before using. Putty made from Type S hydrated lime may be used immediately after mixing.
   4. Sand shall conform to ASTM Specification C144-(52T) except that sand for mortar in 1/4 inch wide joints shall pass a No. 16 sieve.
   5. Mixing Water: Water shall be clean and potable.

C. Storage of Materials: Store materials under cover in a dry place and in a manner to prevent damage or intrusion of foreign matter. During freezing weather protect all masonry units with tarpaulins or other suitable material. Store cement, lime and air-setting mortars in watertight sheds with elevated floors. Protect reinforcement from the elements; immediately before placing, reinforcement shall be free from loose rust, ice, or other foreign coatings that will destroy or reduce the bond.

D. Mortar for Masonry Units: Mortar shall be mixed in the proportions of 1 part Portland, 1/2 to 1-1/4 parts hydrated lime or lime putty, and 4-1/2 to 6 parts of sand by volume to meet the requirements of ASTM C270-866.

E. Mixing Mortar: Mix all cementitious materials and sand in a mechanical batch mixer for a minimum of 5 minutes. Adjust the consistency of the mortar to the satisfaction of the mason but add only as much water as is compatible with convenience in using the mortar. All mortar shall be used within 2-1/2 hours of the initial mixing. It shall not be used after it has begun to set.

F. At exterior walls integrally mix mortar manufacturer's approved water repellent admixture compatible with masonry sealant into the mortar.

2.04 REINFORCING

A. Exterior Multi-Wythe Walls: Horizontal reinforcing for concrete masonry units shall be hot dip galvanized, ladder-mesh type with 9 gauge parallel wires in each face and 9 gauge cross members, butt welded to 9 gauge deformed side rods not more than 16" o.c., Type #270 Lox-All Ladder Adjustable Eye-Wire with S.I.S. as manufactured by Hohmann and Barnard or approved equal. Provide prefabricated corners and tees. Reinforcement shall be completely embedded in mortar or grout.

B. Single Wythe Wall: Horizontal reinforcing for concrete masonry units shall be hot dip galvanized, Lox-All #220 ladder-mesh 9 gauge parallel wires in each face and 9 gauge cross members a maximum of 16" o.c., butt welded to side rods as manufactured by Hohmann & Barnard, Inc., or approved equal. Provide prefabricated corners and tees. Reinforcement shall be completely embedded in mortar or grout.

C. Tie Bars at intersecting walls shall be rigid partition anchor Model #344, hot dip galvanized, as manufactured by Hohmann & Barnard, Inc., or approved equal.

D. Steel reinforcement bars: ASTM A615, 60 ksi (414 Mpa) yield grade billet steel deformed bars; uncoated finish, size and dimensions as indicated on plans.

2.05 CONTROL JOINTS

A. The joint filler material shall be the thickness as required for the width of joint intended and recessed deep enough allowing for the rod and sealant at the exposed face of the masonry.

B. Vertical control joints shall be generally be located:
   1. At major changes in wall height.
   2. At changes in wall thickness.
   3. At control joints in foundations, in roof, and in floors.
   4. At chases and recesses for piping, columns, fixtures, etc.
   5. At one or both sides of wall openings.
   6. Near wall intersections.
   7. Near return angles in L, T, and U-shaped structures.
   8. Maximum spacing of control joints should in no case exceed 24'-0".

2.06 ACCESSORIES

A. Cavity Wall Drainage System: Total Flash System as manufactured by Mortar Net USA, Limited or equal. All-inclusive flashing/drainage system 12-inches high, 45 mil EPDM membrane with adhered cavity drainage/mortar collection material and weep tabs, preformed inside/outside corner boots and end dams, 28 gauge stainless-steel drip edge and preformed corners, 16 gauge stainless-steel termination bar, and BTL-1 sealant. This system replaces the separate requirements for flashing, weeps, mortar collection products, drip edge and termination bar and entire system shall be provided by the manufacturer.

B. Cavity Wall Drainage Insert: WallNet as manufactured by Mortar Net USA; CavClear Masonry Mat as manufactured by Archovations, Inc., PO Box 241, Hudson, WI 54016, or equal. Install masonry drainage mat continuously along base of all exterior masonry cavities and at all heads of masonry openings during construction of exterior wythe.

C. Masonry Cleaner: All masonry work shall be thoroughly cleaned with Vana Trol Sure Klean as manufactured by the Process Solvent Co., Inc.

D. Joint filler shall be equal to WillSeal 150 as manufactured by Willseal, 34 Executive Drive, Hudson, NH 03051; Telephone 800-274-2813; Website www.willseal.com. The joint filler material shall be the thickness as required for the width of joint intended and recessed deep enough allowing for the rod and sealant at the exposed face of the veneer masonry. Joint filler shall be a preformed, pre-compressed polyurethane foam system impregnated with an acrylic based, flame-resistant, and weatherproof sealant. The product is non-drying, non-shrinking, and self-expanding, with a 5-year manufacturer's warranty.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine conditions for compliance with installation tolerances and other conditions affecting performance of the Work. Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify that foundations are within tolerances specified.
   2. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

B. Report in writing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 GENERAL

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations

B. Mortar shall be thoroughly mixed and kept moist but shall not be re-tempered for use after initial set.

C. Lay only dry masonry units. Lay each unit in full joint of mortar on its bed and ends. Slush and fill each joint with mortar each course of masonry as work progresses.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Cut units to provide a uniform 1/8" clearance around electrical boxes and similar items.

F. Do not use chipped, cracked or broken units.

G. Set units straight, plumb, true to line, and level.

H. Adjust units to final position while mortar is soft and plastic. If unit is displaced after mortar has stiffened, remove unit, clean joints and unit of mortar and reset with fresh mortar.

I. When joining fresh work to set or partially set masonry clean exposed surface and remove loose mortar before laying fresh masonry.

J. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.

K. Unless indicated otherwise partitions shall extend from floor to bottom of floor or roof construction above.

L. Locate control joints as indicated on the contract drawings. Install expansion material and apply sealant.

M. Protect all freshly constructed masonry from injury of any kind. Replace injured work in a manner satisfactory to the Architect/Engineer. Completely point and thoroughly wash all finished exposed masonry surfaces down with masonry cleaner in accordance with manufacturer's printed instructions.

N. Construct interior wythe of concrete unit masonry exterior walls prior to masonry veneer construction. Do not construct concrete unit masonry and veneer masonry in the same construction sequence.

O. Flashing System and Weep-Vents: Set flashing system and weep vent filler in place, aligning front of weep vent with exterior face of CMU. Install flashing and weep vent filler at drainage courses at base of wall and at all lintels and bond beams where through-wall flashing is required. Install weep vent filler (Hohmann & Barnard QV Quadro-Vent or apporved equal) at top of wall below bond beams to provide continuous air ventilation within wall. Install all materials in accordance with manufacturer’s instructions.

P. Install masonry drainage mat continuously along base of all exterior masonry cavities, during construction of exterior wythe.

Q. Apply block filler and paint finish to masonry units.

3.03 BOND

A. Lay units in running bond with vertical joints centered on unit in course below unless indicated otherwise on drawings. Provide all reinforcement indicated. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

3.04 MORTAR BEDS

A. Lay hollow units with full mortar coverage on horizontal and vertical face shells. Provide full mortar coverage on horizontal and vertical face shells and webs where adjacent to cells or cavities to be filled with grout and on starting courses.

B. Lay block with full horizontal and vertical joints.

C. Tool joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated in surfaces to be exposed or painted.

D. Strike joints flush in surfaces to be covered.

3.05 REINFORCEMENT

A. Wire Reinforcement
   1. Place wire reinforcements as follows:
      a. All concrete block walls shall have continuous hot-dip glavanized horizontal reinforcement at 16" o.c. vertically.
      b. Wire reinforcement shall be completely embedded in mortar or grout. Joints with wire reinforcement shall be at least twice the thickness of the wire.
      c. Wire reinforcement shall be lapped at least 8" at splices and shall contain at least one cross wire of each piece of reinforcement in the lapped distance.
      d. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
      e. Provide continuity at wall intersections by using prefabricated T-shaped units and at corners by using prefabricated L-shaped units.

B. Steel Reinforcement Bar
   1. Steel reinforcement bars, unless otherwise detailed on plans, shall be placed as follows:
      a. Install #5 bars, vertically at all corners and at door and window jambs and 32" o.c., typically, unless otherwise noted on the contract drawings.
      b. Fill all concrete masonry unit cells containing reinforcement bars solid with mortar.
      c. Remove pre-molded insulation from masonry cores at location of vertical reinforcing bars.
      d. Reinforcement bars shall be lapped at splices as follows:

Bar Size	**Min. Lap Distance**
#4	24 inches
#5	30 inches
#6	36 inches
#7	42 inches

C. Weld all vertical reinforcement interrupted by steel lintels/beams to top of steel member, typical.

3.06 CONTROL AND EXPANSION JOINTS

A. Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:
   1. Fit bond-breaker strips into hollow contour in ends of units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.

2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Nominal thickness shall be 3/8" (9 mm) and uniform. Shove or rod all vertical joints tight.

3.07 BUILT-UP WORK

A. Cooperate with other trades in building in items in masonry work.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items. Grout solid around built-in items and within door frames.

E. Install steel reinforcing straps, or as otherwise detailed, where interior walls meet perpendicular to exterior walls. Grout cores solid.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

3.08 LINTELS AND BOND BEAMS

A. Steel lintels shall extend into side walls at jambs, minimum 8" bearing on each side.

B. Install rebar and grout solid lintel blocks and bond beams as indicated. Provide temporary shoring for openings wider than 36".

C. Lintel blocks shall extend into side walls at jambs, minimum of 8" bearing on each side.

D. Fill cores in hollow CMU with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.09 REPAIRING, POINTING AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints. Dry brush masonry surfaces after mortar has set, at end of each day's work and after final points.

D. Leave work and surrounding surfaces clean and free of efflorescence, mortar spots and droppings.

E. Clean masonry with approved masonry cleaner. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.10 TOLERANCES

A. Maximum Variation from Unit to Adjacent Unit: 1/32 inch.

B. Maximum Variation from Plane of Wall: Not to exceed 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Maximum Variation from Plumb: Not to exceed 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

END OF SECTION 042200

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Structural steel.
   2. Grout.

B. Related Requirements:
   1. Division 01 - "Quality Requirements" for independent testing agency procedures and administrative requirements.
   2. Section 055000 - "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame not defined as structural steel.

1.03 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.04 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.
   1. Shop drawings and required calculations shall bear the seal and signature of a registered Professional Engineer licensed in the state in which the project is located. Structural steel shop drawings will not be reviewed without said seal and signature.
      a. A full set of engineered calculations for all beam to column moment connections shall be submitted to the engineer of record for approval. The steel fabricator drawings shall not be reviewed without said engineering calculations affixed with a seal and signature of a professional engineer licensed in the state in which the project is located.
   2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   3. Include embedment Drawings.
   4. Indicate profiles, sizes, spacing and locations of structural members, openings, attachments, fasteners, connections, cambers, holes and other pertinent data. Include locations of structural members, openings, attachments and loads.

5. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
7. For structural steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer / fabricator.

B. Welding certificates: Submit certificates certifying that welders employed in the work have met AWS qualifications within in the previous 12 months.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties. Indicate structural strength, destructive and non-destructive test analysis.

E. Product Test Reports: For the following:
1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Shop primers.
4. Non-shrink grout.

1.08 QUALITY ASSURANCE

A. Fabricator shall have a minimum of five (5) years documented experience with performing the work of this section.

B. Installer Qualifications: A qualified installer specializing in performing the work of this section with a minimum of three (3) years of documented experience.

C. Delegated Connection Designer: Connections not fully detailed on the contract drawings shall be designed under the direct supervision of a professional structural engineer experienced in the design of this work and licensed in the state in which the work is located. The shop drawings shall bear the seal and signature of same professional engineer.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
2. Welders who are welding structural members fabricated in the shop or in the field, in the five boroughs must have a NYCDOB issued welder licence.

E. Comply with applicable provisions of the following specifications and documents:
1. AISC Code of Standard Practice for Steel Buildings and Bridges - AISC 303.
2. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings - AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts."

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products to/at the site under the supervision of Division 01 of this Project Manual.

B. Schedule deliveries of materials to the site at intervals which will ensure uninterrupted progress of the work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

D. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and experience. who bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

1.10 COORDINATION

A. Coordinate the work under Division 01 specification of this Project Manual.

B. Coordinate the selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturer's recommendations to ensure that shop primers and topcoats are compatible with one another.

C. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions and directions for installation.

D. Coordinate the work of this section with utility installations and all other adjacent work.

E. Coordinate the work of this section such that general progress of the Work in not interrupted.

1.11 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on the plans and approved shop drawings.

B. The contractor is responsible for the proper location and elevations of the work.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated where beam end reactions are not shown on drawings. Connection designer shall design shear connections to resist the reaction resulting from the maximum allowable uniform load of the beam found in the AISC Specification being applied along its full length.

1. Select and complete connections using AISC 360.
2. Use Load and Resistance Factor Design; data are given at factored-load level.

B. Moment Connections: Type FR, fully restrained. Provide design and details of moment connections to resist forces shown on the contract drawings.

C. Construction: Moment frame and Braced frame.

2.02 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Channels, Angles, M-Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS, CONNECTORS, AND ANCHORS

A. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
   1. Finish: Hot-dip zinc coating.
   2. Direct-Tension Indicators: ASTM F959/F959M, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with mechanically deposited zinc coating finish.

B. Anchor Bolts: ASTM F1554, 36 and 55 ksi yield strength for moment resisting anchor rods.
   1. Nuts: ASTM A563 heavy-hex carbon steel.
   2. Plate Washers: ASTM A36/A36M carbon steel.
   3. Washers: ASTM F436/F436M, Type 1, hardened carbon steel.
   4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

C. Threaded Rods: ASTM A 36/A 36M.
   1. Nuts: ASTM A563 ASTM A563M heavy-hex carbon steel.
   2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
   3. Finish: Plain.

2.04 PRIMER

A. Primer: Comply with Division 09

B. Primer: SSPC-Paint 15, Type I, red oxide.

C. Ensure primer is compatible with required topcoat.

D. Galvanizing Repair Paint: ASTM A 780/A 780M.

2.05 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

B. Grout shall consist of a premixed compound with cement, water reducing and plasticizing additives capable of developing a minimum compressive strength of 7000 psi at 28 days.

2.06 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel according to ASTM A6/A6M and maintain markings until structural steel has been erected.
   4. Mark and match-mark materials for field assembly.
   5. All wide flange structural steel members shall be fabricated in accordance with ASTM A992/A992M. All miscellaneous steel members including channels, angles, S, HP, and M shapes shall be fabricated in accordance with ASTM A36/A36M.
   6. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
   7. All shop connections shall be welded or high strength bolted.
   8. Bearing surfaces shall be planed true to provide full bearing over the entire surface.
   9. Continuously seal joined members by intermittent welds and plastic filler. Grind welds smooth where exposed or where interference with other building materials is encountered,
   10. Splicing is not permitted unless indicated on the Contract Documents or accepted on the final approved Shop Drawings.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces. Mechanically thermal cut bolt holes shall not be permitted unless prior approval by the Architect is obtained in writing.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning." or SSPC-SP 3, "Power Tool Cleaning." unless a more stringent cleaning method is required for selected primers and / or other coatings.

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Shop prime non-exposed steel members after fabrication in accordance with SSPC- PA. Do not prime surfaces that will be fireproofed, field welded or are in contact with concrete or high strength bolts.

H. Paint exposed structural steel members in accordance with the applicable Division 09 Specification section.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning unless approved by the Architect in writing.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.07 SHOP CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.08 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
   2. Surfaces to be field welded.
   3. Surfaces of high-strength bolted, slip-critical connections.
   4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
   5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.09 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M.
   1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
   2. Galvanize lintels, shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
   1. Inspection and Tests will not relieve the contractor of responsibility for providing materials, fabrication and erection procedures in compliance with the specified requirements. The contractor shall verify that all materials meet or exceed the requirements specified in these

specifications, Contract drawings and related references. Materials not in compliance with the specified requirements will be rejected and required to be removed from the site.

C. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M , Grade A325 or Grade A490 Bolts."

D. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M type required for materials being welded and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E165/E165M.
   2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   3. Ultrasonic Inspection: ASTM E164.
   4. Radiographic Inspection: ASTM E94.

E. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other drawings for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other drawings showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.
   2. Clean bearing surfaces and other surfaces which will be in permanent contact with the work.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Proceed with the installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.

C. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.

D. Coordinate placement of anchors in concrete or masonry construction for securing bearing plates.

E. Erect all components in accordance with the approved shop drawings.

F. Field weld components and shear studs as indicated on approved shop drawings and in accordance with AWS D1.1/D1.1M.

G. Do not field cut or alter structural members without written approval of the Engineer.

H. Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
   5. Coordinate placement of anchors in concrete or masonry construction for securing base plates.

I. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

J. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

K. Splice members only where indicated.

L. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

M. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

N. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

O. Erect all components in accordance with approved shop drawings. After erection, prime welds, abrasions and surfaces not shop primed or galvanized as required, except surfaces to be in contact with concrete.

P. Field weld components and shear studs as indicated on the approved shop drawings and in accordance with AWS D1.1/D1.1M.

3.04 FIELD CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
   3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.
   4. Connections and abrasions shall be cleaned, prepared and finished in the same manner and with the same materials used in shop finishing.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect and test high strength bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E165/E165M.
      b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      c. Ultrasonic Inspection: ASTM E164.
      d. Radiographic Inspection: ASTM E94.

E. Post Installed Mechanical Anchors, Adhesive Anchors and Screw Anchors: Comply with 2020 New York State Building Code Table 1705.3.
   1. The special inspection shall include the verification of compliance with approved construction documents and standards established by the Commissioner pursuant to Section 28-113.2.2 of the Administrative Code.

F. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

G. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.06 TOLERANCES

A. All members shall be installed within AISC tolerances and as follows:
   1. Maximum variation from plumb: 1/4" (6mm) per story, non-cumulative.
   2. Maximum offset from true alignment: 1/4" (6mm).

3.07 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

D. Touchup Priming: Cleaning and touchup priming as specified in Division 9 "High-Performance Coatings" or compatible primer established at the fabricators shop to be compatible with the final finish.

3.08 ADJUSTING

A. All misfits due to errors in location, fabrication, inaccuracies in the setting of anchor bolts or other items of attachment or support shall be immediately reported to the Engineer and corrected in a manner subject to the approval of the Engineer.

B. Submit method of correction to the Architect under Division 01 Specification provisions.

C. Proceed with corrective work only after receiving written approval from the Architect.

D. All corrections shall be made at no additional cost to the Owner.

END OF SECTION 051200

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Treated Wood Members.

B. Miscellaneous Framing, Blocking, Furring and Sheathing.

C. Fasteners.

D. Framing accessories.

1.02 QUALITY ASSURANCE

A. Lumber Grading Rules and Wood Species to be in conformance with the Voluntary Product Standards PS 20 Grading rule of the following associations apply to materials furnished under this section:
   1. Southern Pine Inspection Bureau (SPB).
   2. Western Wood Products Associations (WWPA).
   3. American Wood Preserves Bureau (AWPB).
   4. American Plywood Association (APA).
   5. National Fire Protection Agency (NFPA).
   6. Lumber Grading Agency by ALSC.
   7. Building Officials and Code Administration (BOCA).

B. Requirements of regulatory agencies. Comply with the following:
   1. Fire retardant treated wood: Testing agency, UL label rating, acceptable to governing Building Officials.
   2. All lumber and plywood shall be grade-marked.
   3. In lieu of grade stamping exposed to view lumber and plywood, submit manufacturer's certificate under provisions of Section 014500 that products meet or exceed specified requirements.

1.03 REFERENCES

A. AITC - American Institute of Timber Construction.

B. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.

C. APA - American Plywood Association.

D. APA/EWS - American Plywood Association - Engineered Wood Systems.

E. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

F. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a (Reapproved 2018).

G. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.

H. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

I. AWPA - (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.

J. BOCA: 2310.2: Fire Retardant Treated Wood (1993).

K. WWPA - Western Wood Products Association.

L. Lumber Grading:
   1. Standard Grading and Dressing Rules No. 16, current edition, for Douglas Fir, Western Hemlock, West Red Cedar, White Fir, and Sitka Spruce, published by West Coast Lumber Inspection Bureau, or
   2. "Current Grading Rules", issued by the Western Wood Products Association.

M. Extended ASTM E84 Fire Test Method, Factory Mutual Research Report J.I. 1R9Q9. AC.

1.04 SUBMITTALS

A. Certification:
   1. Pressure Treated Wood: Submit certification by treating plant stating chemicals and process used, net amount of salts retained and in conformance with applicable standards.
   2. Preservation Treated Wood: Submit certification for waterborne preservative that moisture content was reduced to 19% maximum, after treatment.
   3. Fire-Retardant Treatment: Submit certification by treating plant stating that fire-retardant treatment materials comply with governing ordinances and that treatment will not bleed through finished surfaces.

1.05 PRODUCT DELIVERY, STORAGE AND PROTECTION

A. All materials shall be inspected upon receipt at job site. No faulty or damaged materials shall be accepted. It shall be contractor’s responsibility to produce finished items of work in first-class condition, free from all defects.

B. Do not handle products in a manner which will damage, warp or distort products.

C. Do not store products directly on the ground; protect from elements.

1.06 WARRANTY

A. Provide 30-year manufacturer’s written warranty for pressure treated and fire resistant treated wood items.

B. Provide five-year manufacturer’s warranty for exterior grade sheathing.

PART 2 - PRODUCTS

2.01 MATERIALS – LUMBER AND FRAMING

A. Materials shall meet the Federal specifications, commercial standards, product standards and these specifications, unless more restrictive requirements are indicated on drawings.

B. In Type III construction, fire-retardant-treated wood framing and sheathing complying with Section 2303.2 shall be permitted within exterior wall assemblies of a 2-hour rating or less. All wood for exterior gable end walls shall be fire-retardant treated and be incorporated into a 2-hour fire-rated UL assembly.

C. Non-Structural Light Framing: Douglas Fir Larch species, No. 2 grade, 19 percent maximum moisture content or equivalent stress grade.

D. Miscellaneous Framing: No. 2 species, 19 percent maximum moisture content or equivalent stress grade.

E. All interior lumber to be used for framing, blocking, furring shall be SPIB or WCLB treated with fire retardant to obtain flame spread rating of 25 or less when treated according to ASTM E84. Treat cuts, etc. as recommended by manufacturer of flame retardant materials.

F. Rough hardware, nails, screws, bolts, etc., for securing lumber in place shall be commercial quality, any suitable type and finish for interior dry location, galvanized or nonferrous hardware for all exterior work and for interior work in toilets.

2.02 MATERIALS – SHEATHING

A. Backing panels: APA C-D plugged, exterior type, 3/4 inch and 5/8 inch thick, as indicated on drawings.

B. Finish panels: APA A-B, exterior type, 3/4 inch thick, free of knots and/or plugs on exposed side, as indicated on drawings.

C. All plywood shall comply with APA Standards and be of thickness indicated on drawings.

D. Moisture content of the plywood at the time of installation and at the time roofing is installed shall be less than 19 percent.

2.03 FASTENERS

A. Nails and Fasteners: Hot-dipped galvanized steel in accordance with ASTM A153/A153M for exterior, high humidity and treated wood locations, unfinished steel elsewhere.

B. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.

C. Lumber to lumber: Cement coated or annular threaded nails of sufficient length to penetrate 1.25 inches into adjoining members, except as otherwise indicated.

2.04 ACCESSORIES

A. Construction Adhesive: Waterproof; air cured, rubber based, cartridge dispensed, Liquid Nail 601, manufactured by Macco Adhesives, The Glidden Company, or approved equal.

PART 3 - EXECUTION

3.01 VERIFICATION

A. Verify existing conditions under provisions of Section 013100.

B. Verify that walls and other substrates are at the proper elevations and ready to receive work of this section.

3.02 PREPARATION OF SURFACES

A. Surfaces to receive new wood members shall be free of all dirt, debris, and loose materials. Exposed surfaces shall be mechanically scraped if necessary, to remove projections.

B. Surfaces shall have no free water present in any form (rain, dew, frost, snow or ice).

C. Contractor is responsible to inspect all exposed surfaces to see that conditions are satisfactory for installation of new work.

3.03 WORKMANSHIP

A. Work shall be performed in conformance with good trade practice, recommendations of manufacturers, building codes and these specifications unless specifically indicated otherwise on the drawings and shall be well fitted and securely fastened in its proper location with nails, screws, bolts or other approved fastening devices.

3.04 FIRE RETARDANT

A. Required for wood blocking and nailers.

B. Treat to flame spread rating of 25 or less and fuel contribution of 30 or less when tested in accordance with ASTM E84. Re-dry to maximum 19 percent moisture content.

C. Each piece of treated wood shall bear UL label of compliance.

3.05 CLEAN-UP

A. Clean or replace any adjacent surfaces of materials damaged by treated lumber.

3.06 INSTALLATION - FRAMING

A. Set structural members level and plumb, in correct position.

B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.

C. Place horizontal members flat, crown side up.

D. Construct load bearing framing and curb members full length without splices.

E. Double members at all openings. Space short members over and under opening to member spacing.

F. Bridge framing in excess of 8 feet span at mid-span.

G. Coordinate installation of adjacent construction.

H. Warped wood members shall not be used unless they can be fastened adequately to permanently hold them in their required alignment.

3.07 INSTALLATION - SHEATHING

A. Nailing pattern and spacing shall be in accordance with APA recommendations or as listed in the 2020 Building Code of New York State.

B. Install telephone and electrical panel back boards with plywood sheathing material where required. Size the back board by 12 inches (25 cm) beyond size of electrical panel.

C. Fasteners:

1. Fastener heads shall be flush with wood surface and shall penetrate adjoining piece minimum 1.25 inches.
2. The installed withdrawal resistance shall be a minimum of 100 pounds per nail.

3.08 SITE TREATMENT OF WOOD MATERIALS

A. Apply preservative treatment in accordance with manufacturer's published instructions.

B. Brush apply two coats of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.09 SCHEDULE

A. Provide nailers, blocking, furring, and reinforcement as called for in all other specified Sections, or as required in the field during construction, in accordance with the requirements of this Section.

END OF SECTION 061000

GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Wood roof trusses.
   2. Wood truss bracing.
   3. Wood Truss bridging.
   4. Metal truss accessories.

B. Related Requirements:
   1. Section 061600 "Sheathing" for roof sheathing and subflooring.
   2. Section 012100 "Allowances"

1.03 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.04 ACTION SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

B. Shop Drawings: Show fabrication and installation details for trusses.
   1. Show location, loads, pitch, span, camber, configuration, framed openings, bracing and spacing for each type of truss required.
   2. Indicate sizes, stress grades, and species of lumber.
   3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
   4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
   5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
   6. Show splice details and bearing details.

C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Shop Drawings shall bear the seal and signature of a licensed Professional Engineer in the State of New York.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For metal connector-plate manufacturer, professional engineer, and fabricator.

B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.

C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.

D. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated lumber.
   2. Metal-plate connectors.
   3. Metal truss accessories.

1.06 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in ANSI/TPI 1 for manufacture of connector plates.
   1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
   2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the state in which the project is located.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in ANSI/TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction. Fabricator shall have a minimum of 5 years documented experience.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in BCSI-B1, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
   1. Store trusses in a vertical position resting on bearing ends flat, off of ground, and adequately supported to prevent lateral bending.
   2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
   3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.08 REGULATORY REQUIREMENTS

A. Conform to applicable code(s) for loads, seismic zoning and other governing criteria.

1.09 COORDINATION

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying the progress of other trades whose work must follow erection of the trusses.

1.10 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on the approved shop drawings.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014500 - QUALITY CONTROL to design metal-plate-connected wood trusses.

B. Design Trusses under the direct supervision of a professional engineer experienced in the design of this work and licensed in the state in which the project is located.

C. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.
   1. Design Loads: Live Load.
   2. Maximum Deflection Under Design Loads:
      a. Roof Trusses: Vertical deflection of 1/240 of span.

D. Comply with applicable requirements and recommendations of the following publications:
   1. ANSI/TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
   2. TPI DSB-89 - "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
   3. SBCA (BCSI), "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

E. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.02 DIMENSION LUMBER

A. Certified Wood: For metal-plate-connected wood trusses and permanent bracing, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Lumber Grading Rules SPIB: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Provide dressed lumber, S4S.
   4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
   5. Wood Members: Single Top and bottom Chords, Southern Yellow Pine Species, No. 2 grade, 19 percent maximum and 7 percent minimum moisture content or equivalent. Stress Grade. Finger scarfing not permitted.

C. Minimum Chord Size for Roof Trusses: 2 by 6 inches nominal for top chords, 2 by 6 inches nominal for bottom chords.

D. Minimum Specific Gravity for Top Chords: 0.50

E. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 016100 - BASIC PRODUCT REQUIREMENTS.

2.03 METAL CONNECTOR PLATES

A. Manufacturers Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Alpine Engineered Products, Inc.; an ITW company
   2. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc
   3. Truswal Systems Corporation; an ITW company

B. Source Limitations: Obtain metal connector plates from single manufacturer.

C. General: Fabricate connector plates to comply with TPI 1.

D. Double Hot-Dip Galvanized-Steel Sheet: ASTM A446, ASTM A653/A653M; Structural Steel (SS), Grade A high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch thick galvanized in accordance with ASTM A525. G 60 coating; Die stamped with integral teeth, minimum 0.036 inch thick.
   1. Use for interior locations unless otherwise indicated.

E. Truss Bridging: Type, Size and spacing recommended by the Truss Manufacturer.

2.04 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
   2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M type to suit application and as recommended by the manufacturer of the truss plates.

B. Nails, Brads, and Staples: ASTM F1667/F1667M.

2.05 METAL FRAMING ANCHORS AND ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Simpson Strong-Tie Co., Inc
   2. USP Structural Connectors

C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

D. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM G653, G60 (Z180) coating designation.
   1. Use for interior locations unless otherwise indicated.

E. Truss Tie-Downs: Bent strap tie for fastening roof trusses to wall studs below, 1-1/2 inches wide by 0.050 inch thick. Tie fastens to one side of truss, top plates, and side of stud or top plate below.

F. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches wide by 0.050 inch thick. Clip is fastened to truss through slotted holes to allow for truss deflection.

G. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches wide by 1 inch deep by 0.040 inch thick, made to fit between two adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

2.06 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M, with dry film containing a minimum of 94 percent zinc dust by weight.

B. Protective Coatings: SSPC-Paint 22, epoxy-polyamide primer or SSPC-Paint 16, coal-tar epoxy-polyamide paint.

2.07 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in ANSI/TPI 1. Position members to produce design camber indicated.
   1. Fabricate wood trusses within manufacturing tolerances in ANSI/TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.08 SOURCE QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.
   1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
   2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.

B. Correct deficiencies in Work that special inspections indicate does not comply with the Contract Documents.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install trusses in accordance with manufacturer's instructions and SBCA (BCSI); maintain a copy of each TPI document on site until installation is complete. Install and brace trusses according to BCSI B1 recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses 24 inches o.c. or as indicated; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

H. Securely connect each truss ply required for forming built-up girder trusses.
   1. Anchor trusses to girder trusses as indicated.

I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
   1. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.

J. Install wood trusses within installation tolerances in SBCA (BCSI).

K. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members without written approval from the Engineer.

L. Replace wood trusses that are damaged or do not meet requirements.
   1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

M. Place headers and supports to frame openings required.

N. Frame openings between trusses with lumber.

O. Coordinate placement of decking with the work of this section.

3.02 REPAIRS AND PROTECTION

A. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

C. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.
   1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

D. Protect Trusses from damage throughout the construction period until the project is accepted by the Owner.

END OF SECTION 061753

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Includes furnishing and installation of non-custom manufactured items, including aluminum clad trim and fascia boards, all necessary mounting clips, etc., required for a complete installation.

B. Includes installation of all finish hardware furnished in Section 087100.

1.02 REFERENCES

A. ALSC - American Lumber Standards Committee.

B. APA - American Plywood Association.

C. ASTM D1761 - Standard Test Methods for Mechanical Fasteners in Wood and Wood-Based Materials; 2020.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

E. AWI - Architectural Wood work Institute.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details and accessories.

C. Samples: Submit two 12 inch long samples of aluminum on trim boards.

D. Product Data: Submit available aluminum trim colors to Engineer for selection.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products under the provisions of Section 016500 - PRODUCT DELIVERY, STORAGE, AND HANDLING and per manufacturer's instructions.

B. Trim materials should be stored on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners. Store materials under a protective covering to prevent jobsite dirt, moisture and residue from collecting on the boards.

C. Protect work from moisture damage.

1.05 QUALITY ASSURANCE

A. Verify that field measurements are as indicated on shop drawings.

B. Allowable Tolerances for trim boards:
   1. Variation in component length: -0.00 / +1.00"
   2. Variation in component width: ± 1/16"
   3. Variation in component thickness: ± 1/16"
   4. Variation in component edge cut: ± 2°
   5. Variation in Density -0% + 10%

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials used in finished work shall be clear, free from cracks, checks, knots and other imperfections that may interfere with the proper completion of the work and, any warped or otherwise imperfect work shall be removed and replaced by parties responsible for same.

B. Lumber Materials:
   1. Softwood Lumber: Pine Species, B or better, maximum moisture content of 19%, ¾ inch thickness.

2.02 ACCESSORIES

A. Adhesive: Type recommended by AWI to suit application.

B. Bolts, nuts, washers, lags, pins and screws: of size and type to suit application.

C. Concealed Joint Fasteners: Threaded Steel.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. First grade workmanship. Finish woodwork free of chatter marks, torn grain short finish, splits, etc. Avoid butt joints and exposed ends or edges of materials.

B. Work shall be scribed and fit to other finished surfaces in a careful manner. Should other work be damaged or disturbed, it shall be made good at the expense of the Contractor.

C. Verify all measurements, reinforcement and blocking at the building and examine all adjoining work on which work is dependent before beginning installation. Beginning of installation implies acceptance of existing conditions and responsibility for the same.

D. Exposed surfaces shall be machine-sanded to an even, smooth surface, nails set, ready for finishing. All woodwork shall be dry, clean and smooth before any finishing materials are applied. All nail holes, cuts, cracks and other defects shall be treated so as to render them unnoticeable.

3.02 INSTALLATION

A. Carefully scribe finish carpentry items. Set and secure finish carpentry items in place rigid, plumb, and square.

B. Use purpose designed fixture attachments for mounted components.

C. Install hardware, fixtures, and accessories supplied under other Sections for installation.

D. Install items in accordance with manufacturer’s instructions; install wood to maximum possible length, cutting and splicing shall be unacceptable.

E. Ensure that mechanical and electrical items affecting this Section of work are properly placed, complete, and have been inspected by the Architect/Engineer prior to commencement of installation.

3.03 PREPARATION FOR SITE FINISHING

A. Site Finishing: Aluminum capping. Before capping installation, prime all surfaces and ends of wood trim - refer to Section 076200.

B. Prime and paint - refer to Section 099100.

3.04 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/16-inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32-inch.

END OF SECTION 062000

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The work described in this Section of the specifications includes but is not limited to cold applied water based emulsified asphalt dampproofing and protective drainage board for exterior below grade foundations.

1.02 REFERENCES

A. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2018).

B. ASTM D1227/D1227M - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2013, with Editorial Revision (2019).

C. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2016).

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Submit copies of manufacturer’s current certification to ISO 9002, primers, and associated auxiliary materials shall be included.

C. Submit references clearly indicating that the materials proposed have been installed for not less than five years on projects of similar scope and nature. Submit references for a minimum of ten projects.

D. Submit manufacturer’s complete set of standard instructions and details for dampproofing.

E. Submit manufacturer's product data for drainage board. Submit 12-inch x 12-inch sample upon request.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and protect products under the provisions of Section 016500 - PRODUCT DELIVERY, STORAGE, AND HANDLING.

B. Deliver materials to jobsite in undamaged and manufacturer's original unbroken containers, dry, undamaged, seals and labels intact.

C. Cold applied elastomeric membrane should be stored in closed containers outdoors.

D. Store membrane at temperature of 5°C (40°F) and above to facilitate handling.

E. Membrane contains petroleum solvents and is flammable. Keep away from open flame or excessive heat. Do not allow smoking or welding in the working area. Use in well ventilated area.

1.05 QUALITY ASSURANCE

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until cured.

B. Protect from rain until coating has set, do not expose to UV. Application shall be protected or covered within 7 days of application.

C. Dampproofing shall be carried out by applicators skilled in this work in strict accordance with manufacturer's printed instruction. Submit proof of minimum five years' applicators experience.

D. Perform Work in accordance with the printed requirements of the manufacturer and this specification. Maintain one copy of manufacturer instructions on site.

E. Components used in this section shall all be sourced from one manufacturer.

F. No installation work shall be performed during rainy or inclement weather and on frost or wet covered surfaces.

G. Ensure continuity of the dampproofing membrane throughout the scope of this section.

H. Work shall be so scheduled as to provide a watertight seal at the end of each working day on the areas worked upon during the day.

1.06 PROTECTION

A. Protect all surfaces not to be treated. Provide adequate protection of materials and work of this section from damage by weather, backfilling operations and other causes.

B. Protect work of other trades from damage resulting from work of this section. Make good such damage at own expense to satisfaction of the Architect/Engineer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. MasterSeal 614 or 615 by Master Builders Solutions Construction Systems, 889 Valley Park Drive, Shakopee, MN 55379. Tel: (800) 433-9517; Web: www.master-builders-solutions.com/en-us.

B. MasterSeal 975 polypropylene drainage board system by Master Builders Solutions Construction Systems, 889 Valley Park Drive, Shakopee, MN 55379. Tel: (800) 433-9517; Web: www.master-builders-solutions.com/en-us.

C. Or approved equal.

2.02 MATERIALS

A. On concrete walls receiving dampproofing, apply one of the following:
   1. Trowel apply one coat of MasterSeal 614 long fiber reinforced complying with ASTM D1227/D1227M, Type 2, Class I and ASTM D1187, Type 1; or
   2. Brush, roller and spray apply two coats of MasterSeal 615 short fiber reinforced complying with ASTM D1227/D1227M, Type 2, Class I, and ASTM D1187/D1187M, Type 1.

B. Drainage Board System: High-impact polypropylene dimpled core with fully bonded geotextile fabric to prevent blockage of water flow rates through the core and die cutting of the dampproofing membrane.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing.
   2. Verify items which penetrate surfaces to receive dampproofing are securely installed.
   3. Surfaces to receive dampproofing shall be fully cured, dry and free of oil, form release agents, curing compounds, grease, laitance and loose material.
   4. Allow the manufacturer’s required minimum cure time for new concrete. Ensure concrete is smooth and free from voids and honeycombing prior to application.

B. Report in writing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's published instructions. Surface should be free of oil, grease, dirt, laitance, and loose material. Dry surfaces shall be dampened with water and kept damp until application.

C. Apply mastic to seal penetrations, small cracks or minor honeycomb in substrate. Remove unnecessary projections and fill voids to provide relatively smooth surfaces.

3.03 INSTALLATION

A. Prime surfaces and apply product in accordance with manufacturer's published instructions.

B. Trowel Grade: Trowel apply at minimum rate of 7 gallons per 100 square feet to produce a minimum dry film thickness of 60 mills.

C. Brush, Roller and Spray Grade: Brush, roll or spray apply at rate of 1.5 to 2.5 gallons per 100 square feet, depending on substrate texture, to produce a minimum dry-film thickness of 15 mils per coat. Apply material in 2 coats by brush, roller or spray for a total minimum dry-film thickness of 30 mils. Allow first coat to dry tacky before applying second coat.

D. Fill in crevices and grooves, providing continuous coating and free from breaks and pinholes. Carry coating over exposed top and outside edge of footing. Spread around joints, grooves, and slots, and into chases, corners, reveals, and soffits. Bring coating to finished grade.

E. Install below grade insulation after protective drainage board in conjunction with material application and curing.

F. Place backfill at least 24 to 48 hours after application, but within 7 days. Do not rupture or damage film or displace coating or membranes.

3.04 CLEANING AND PROTECTION

A. Clean tools and equipment immediately with hot, soapy water. Cured material can be removed with solvent.

B. Clean up and properly dispose of debris remaining on Project site related to application.

C. Remove temporary coverings and protection from adjacent Work areas.

D. Protect application from damage during construction.

3.05 FIELD QUALITY CONTROL

A. Section 014500 - QUALITY CONTROL: Field testing and inspection.

B. Inspect dampproofing application and test for minimum dry film thickness specified.

END OF SECTION 071113

PART 1 - GENERAL

1.01 SECTIONS INCLUDES

A. Clear, water based silane/siloxane sealer for all exposed exterior masonry surfaces.

1.02 REFERENCES

A. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2021.

B. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2021.

C. ASTM D1653 - Standard Test Methods for Water Vapor Transmission of Organic Coating Films; 2013 (Reapproved 2021).

D. ASTM D3278 – Flash Point: >200°F.

E. ASTM D5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments; 1991 (Reapproved 2022).

F. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.

H. ASTM G154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials; 2016.

I. EPA Method 24 – VOC Content <250 grams/liter.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Submit manufacturer's complete product data, technical information and instructions for each product for approval.
   1. Include manufacturer's printed statement of VOC content.
   2. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.

C. Submit manufacturer’s affidavit or certification that the submitted product meets New York State Department of Environmental Conservation (NYSDEC) VOC compliance requirements.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store products under the provisions of Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING, and in accordance with manufacturer’s instructions.

B. Deliver materials to the job site in manufacturer's original, unopened, labeled containers.

1.05 PROJECT CONDITIONS

A. Conform to New York State Department of Environmental Conservation (NYSDEC) - VOC Compliance.

B. Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
   1. Concrete surfaces and mortar have cured for not less than 28 days.
   2. Ambient temperature is above 45°F and below 90°F and will remain so for 24 hours.
   3. Substrate is not frozen and substrate-surface temperature is above 45°F and below 90°F (37.8 deg C).
   4. Rain or snow is not predicted within 24 hours.
   5. Not less than 24 hours have passed since surfaces were last wet.
   6. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.
   7. Protect all surrounding and nearby surfaces not to receive product.

1.06 WARRANTY

A. Manufacturer’s standard form in which manufacturer agrees to repair or replace materials that fail to maintain water repellency within one year from date of application. Applicator shall agree to repair or replace materials that fail to maintain water repellency within five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Penetrating Water Repellent: Clear, consisting of water based silane/siloxane sealer; and with 250 g/L or less of VOC’s. Manufacturers and products include the following:
   1. BASF Construction Chemicals, LLC; MasterProtect H107.
   2. Chemprobe/ Tnemec; Prime-A-Pell H2O Series 633.
   3. Or approved equal.

2.02 EQUIPMENT

A. Tools for applying waterproofing may be brush, spray or roller per manufacturer's instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 013100 - PROJECT MANAGEMENT AND COORDINATION: Verification of existing conditions before starting work.

B. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.

C. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.

D. Verify that required repairs are complete, cured, and dry before applying water repellent.

E. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

G. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 PREPARATION

A. Close off, seal, mask and board up areas, materials and surfaces not receiving work under this section to protect from damage. Protect property and vehicles.

B. Clean substrate of substances that could impair penetration or performance of product according to water repellent manufacturer's written instructions.

C. Surfaces shall be sound, clean, dry and free from oil or dirt for clear waterproofing.

D. Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water repellent treatment has been installed and cured.

3.03 APPLICATION

A. Follow exactly manufacturer's printed instructions for applying minimum two (2) coats of clear water repellent to all exterior exposed building masonry surfaces.

B. Apply a heavy-saturation coating of water repellent, on surfaces indicated for treatment, using 15 psi- (103 kPa-) pressure spray with a fan-type spray nozzle roller or brush to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation.

C. Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats.

D. Coats shall be uniform without drips or runs.

3.04 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water repellent application, as approved by Architect/Engineer.

B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 071900

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Rigid thermal board insulation.

B. Thermal batt insulation.

C. Thermal accessories.

1.02 REFERENCES

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.

B. ASTM C272/C272M - Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions; 2018.

C. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2022.

D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

H. NFPA 255 - Test of Surface Burning Characteristics of Building Materials.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SYSTEM DESCRIPTION

A. Provide continuity of thermal, vapor and air barrier at building enclosure elements.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Submit manufacturer product data and technical information for each product and installation.

C. Manufacturer’s certificate: Certify that products meet or exceed specified requirements.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each product.

1.05 QUALITY ASSURANCE

A. Surface Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. All foam plastic insulation shall meet, and be installed in accordance with, the Building Code of New York State Chapter 26.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources, Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam plastic board as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam plastic bard materials to project site before installation time.
   3. Quickly complete installation and concealment of foam plastic board insulation in each area of constriction.

C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside of manufacturer's absolute limits.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND MATERIALS

A. Rigid thermal cavity insulation shall be Styrofoam CavityMate insulation as manufactured by the Dow Chemical Company, Foamular 250 as manufactured by the Owens-Corning Company, or approved equal, having the following requirements:
   1. The insulation shall be extruded polystyrene board, impervious to moisture and closed-cell structure with no voids between cells.
   2. Insulation shall meet the following specifications as a minimum:
      a. Thermal Resistance per ASTM C518 & ASTM C177 = R-5.0/inch
      b. Flammability per ASTM E84 = less than 25
      c. Moisture Resistance (absorption % by volume) per ASTM C272 = 0.3
      d. Moisture Resistance (absorption % by volume) per ASTM C355 = 0.6
      e. Density (lb/ct) per ASTM C303 = 2.1
      f. Compressive Strength (psi) perpendicular to board face per ASTM C1621 (0.1" Deflection or Yield) = 25
      g. Thermal Expansion (in/in deg F) per ASTM D696 = .00005
      h. Maximum Operating Temperature (F) for continuous use = 165

B. Rigid thermal below grade insulation shall be equal to Styrofoam Highload 40 Insulation as manufactured by the Dow Chemical Company, Foamular 400 high compressive strength insulation as manufactured by the Owens-Corning Company or approved equal, having the following requirements:
   1. The insulation shall be extruded polystyrene board, impervious to moisture and closed-cell structure with no voids between cells.
   2. Insulation shall meet the following specifications as a minimum:
      a. Thermal Resistance per ASTM C518 & ASTM C177 = R-5.6/inch

b. Flammability per ASTM E84 = less than 25
c. Moisture Resistance (absorption % by volume) per ASTM C272/C272M = 0.3
d. Moisture Resistance (absorption % by volume) per ASTM C355 = 0.6
e. Density (lb/ct) per ASTM C303 = 2.1
f. Compressive Strength (psi) perpendicular to board face per ASTM C1621 (0.1" Deflection or Yield) = 40
g. Thermal Expansion (in/in deg F) per ASTM D696 = .00005
h. Maximum Operating Temperature (F) for continuous use = 165

C. Cellular Glass Structural Insulating Block, a high-compressive strength, rigid insulating block composed of inorganic soda lime glass for use in eliminating thermal bridging under masonry veneer walls. FOAMGLAS Perinsul SIB as manufactured by the Owens-Corning Company or approved equal.
1. Insulating block shall meet the following physical properties as a minimum:
a. Thermal Resistance per ASTM C518 & ASTM C177 = R-2.37/inch
b. Compressive Strength per ASTM C165 = 304 psi
c. Flexural Strength per ASTM C203 = 85 psi
d. Dimensional Stability (158 degree F/ 97% R.H.) per ASTM D2126 = 1.0% max
e. Density per ASTM C303 = 10.6 pcf min.
f. Closed Cell Content per helium pycnometer = 98% min.
g. Capillarity = none
h. Hygroscopicity = no increase in weight at 90% R.H.
i. Water Absorption per ASTM C240 = 0.5% by volume
j. Water Vapor Permeability per ASTM C1902 = 0.005 perm in. max.
k. Mold / Mildew Resistance per ASTM C1338 = pass
l. Corrosion Resistance per ASTM C1617 = pass
m. Hydrostatic Resistance per ASTM D5385 = 34.5 feet of water
n. Linear Thermal Expansion per ASTM E228 = 5x10^-6 in./in./F
o. Combustibility per ASTM E136 = non-combustible
p. Surface Burning Characteristic per ASTM E84 = 0 (unfaced)

D. Thermal batt insulation shall be kraft faced thermal batt fiberglass insulation as manufactured by Owens-Corning, Johns Manville, Knauf, or approved equal.
1. Batt insulation shall be a minimum of R-38 above ceiling and R-21 in frame walls unless noted otherwise.
2. Install insulation with kraft facing warm-in-winter side. Fiberglass type batts shall be in conformance with ASTM C665, Type II.

E. Insulation baffles shall be Raft-R-Mate by Owens-Corning, Durovent by ADO Products, or approved equal.

F. Weather Barrier (WRAB) shall be Tyvek Commercial Wrap 'D' by DuPont or approved equal. See Section 072726.

G. Accessories:
1. Tape and Sealants: Type recommended by insulation manufacturer to meet requirements of C402.4.2 of the International Energy Construction Code.
2. Adhesive: Type recommended by insulation manufacturer for application.
3. 1 inch x 2 inch mesh insulation netting: Polypropylene, NT120 by ADO Products or equal, tested in accordance with ASTM D5034.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify site conditions under provisions of Section 013100 - PROJECT MANAGEMENT AND COORDINATION.

B. Verify that substrate, adjacent materials, and insulation are dry and clean and are ready to receive insulation.

3.02 INSTALLATION - GENERAL

A. Clean substrates of substances that may be harmful to insulation or vapor retarders, including removal of projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

B. Comply with manufacturer’s written instructions applicable to products and applications indicated.

C. Install insulation that is undamaged, dry, and unsoiled, and that has not been left exposed to ice, rain, or snow at any time.

D. Extend insulation to envelope entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation.

E. Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using spray polyurethane insulation.

3.03 INSTALLATION - FRAME CONSTRUCTION

A. Install insulation and vapor barrier in accordance with manufacturer's instructions.

B. Foam Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are fastened into place. Fill voids with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Install in exterior walls, roof, and ceiling spaces without gaps or voids. Do not compress insulation.

D. Install baffles to prevent roof insulation from blocking attic venting air flow.

E. Install batts to fill entire cavity. If stud cavity is less than 96" in height, cut lengths to friction fit against floor and ceiling tracks.

F. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

G. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.

H. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

I. Install insulation that is specified with factory applied vapor retarder with the vapor retarder membrane facing warm side of building spaces. Lap or tape ends, butt joints, tears, cuts, and side flanges of membranes.

J. Batts may be friction fit in place until the interior finish is applied.

K. Where walls are not finished on both sides or insulation does not fill the cavity depth, supplementary support must be provided to hold product in place.

L. Repair damaged or defective wall areas that may interfere with installation of insulation.

3.04 INSTALLATION - FOUNDATION & CAVITY WALL PERIMETER

A. Adhere a 6 inch (150 mm) wide strip of polyethylene sheet over joints with double beads of adhesive each side of joint. Tape seal joints. Extend sheet full height of joint.

B. Apply adhesive in three continuous beads per board length, press units firmly against inside substrates. Tape seal all joints.

C. Install boards horizontally. Place boards in a method to maximize contact bedding. Stagger joints. Butt edges and ends tight to adjacent board and to protrusions.

D. Extend boards over control and expansion joints, unbonded to foundation or masonry 3 inches (75 mm) to one side of joint.

E. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

F. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions.

3.05 PROTECTION

A. Protect installed insulation and vapor barriers from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

B. Protect work until placement of backfill or concrete.

3.06 CLEAN-UP

A. Remove all rubbish accumulated in connection with this Section. Coordinate recycling of waste materials.

B. Replace any materials damaged by installation of materials associated with this section.

END OF SECTION 072100

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

B. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls water vapor resistant and air tight.

C. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
   1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.03 REFERENCE STANDARDS

A. AATCC Test Method 127 - Test Method for Water Resistance: Hydrostatic Pressure; 2018, with Editorial Revision (2019).

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.

F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

G. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016, with Editorial Revision (2019).

H. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; 2017.

I. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; 2015.

1.04 SUBMITTALS

A. See Section 013300 - SUBMITTALS, for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Shop Drawings: Provide drawings of special joint conditions.

D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

E. Manufacturer's Installation Instructions: Indicate preparation.

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

H. Testing Agency Qualification Statement.

1.05 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/sle:
   1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
   2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.06 MOCK-UP

A. Install materials in mock-up specified in Section(s) 042200.

1.07 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier Sheet, Mechanically Fastened:
   1. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 5 perms (286 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant procedure).
   3. Water Penetration Resistance: Withstand a water head of 21 inches (55 cm), minimum, for minimum of 5 hours, when tested in accordance with AATCC Test Method 127.

4. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 180 days weather exposure.
5. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
6. Water Resistance: Comply with applicable water-resistive requirements of ICC-ES AC38.
7. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches (50 mm) wide, compatible with sheet material; unless otherwise specified.
8. Products:
    a. DuPont Building Innovations; Tyvek Commercial Wrap D with Tyvek Fluid Applied Flashing - Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap NF, StraightFlash, StraightFlash VF, Tyvek Wrap Caps, and Tyvek Tape: www.dupont.com.
    b. Or approved equal.

B. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
1. Air Barrier Coating:
    a. Material: Acrylic.
    b. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
    c. Water Vapor Permeance: 5 perms (287 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
    d. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 6 months weather exposure after application.
    e. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
    f. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
    g. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
    h. VOC Content: 50 g per L or less.
    i. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
    j. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
    k. Products:
        1) Parex USA, Inc.; Parex USA WeatherSeal Spray & Roll-on: www.parexusa.com/sle.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

C. Flexible Flashing: Sheathing fabric saturated with air barrier coating and complying with the applicable requirements of ICC-ES AC148.
1. Flexible Flashing: use flashing material as recommended by the approved Weather Barrier manufacturer for the various conditions encountered on the project. Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spun-bonded polyolefin to produce an overall thickness of not less than 64 mil.
    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
        1) DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.
        2) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Butyl Self Adhered Flashing.

b. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

D. Liquid Flashing: One part, fast curing, non-sag, gun grade, trowelable liquid flashing.
1. Products:
a. Parex USA, Inc.; Parex USA WeatherTECH with WeatherFlash: www.parexusa.com/sle.

E. Thinners and Cleaners: As recommended by material manufacturer.

F. Fasteners: Provide corrosion resistant fasteners with plastic caps in types and sizes recommended by the approved Weather Barrier manufacturer for the type of construction (metal, wood or masonry) being utilized on the project.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

E. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

F. Mechanically Fastened Sheets - On Exterior:
1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
2. Overlap seams as recommended by manufacturer but at least 6 inches.
3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches (305 mm).
4. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches (305 to 460 mm) on center along each framing member supporting sheathing.
5. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.

6. Where stud framing rests on concrete or masonry, extend lower edge of sheet at least 4 inches (100 mm) below bottom of framing and seal to foundation with sealant.
7. Install air barrier and vapor retarder UNDER jamb flashings.
8. Install head flashings under weather barrier.
9. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

G. Coatings:
1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
2. Mastic Coating: Install by trowel or roller to minimum thickness of 1/4 inch (6 mm); use sheet seal to join to adjacent construction, seal air tight with sealant.
3. Use flashing to seal to adjacent construction and to bridge joints.

H. Openings and Penetrations in Exterior Weather Barriers:
1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto weather barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches (100 mm) wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches (230 mm) wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches (50 mm) beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 014500 - QUALITY CONTROL, for additional requirements.

B. Coordination of ABAA Tests and Inspections:
1. Provide testing and inspection required by ABAA QAP.
2. Notify in ABAA writing of schedule for air barrier work. Allow adequate time for testing and inspection.
3. Cooperate with ABAA testing agency.
4. Allow access to air barrier work areas and staging.
5. Do not cover air barrier work until tested, inspected, and accepted.

C. Do not cover installed weather barriers until required inspections have been completed.

D. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

E. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION 072726

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Granular surfaced fiberglass asphalt shingle roofing.

B. Leak barrier and roof deck protection and all other items essential to the completeness of the roofing installation, though not specifically specified, shall be provided for a watertight installation meeting the manufacturer's warranty requirements.

C. Metal flashings, ridge vents, starter shingles and all accessories essential to the completeness of the roofing installation.

1.02 REFERENCES

A. ASTM A361 - Sheet Steel, Zinc Coated (Galvanized) by the Hot Dip Process for Roofing and Siding.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012 (Reapproved 2019).

E. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.

F. ASTM D2218 – impact Resistance of Prepared Roof Covering materials.

G. ANSI/ASTM D3018 - Class A - Asphalt Shingles Surfaced with Mineral Granules.

H. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2020.

I. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules; 2019.

J. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

K. ASTM D4869/D4869M - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing; 2016a (Reapproved 2021).

L. ASTM D7158/D7158M - Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method); 2020.

M. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2020a.

N. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres; 2020.

O. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

P. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings; Current Edition, Including All Revisions.

Q. National Roofing Contractors Association - NRCA Steep Roofing Manual.

R. Asphalt Roofing Manufacturers Association – ARMA.

S. UL 997 – Wind Resistance of Prepared Roof Covering Materials.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300 - SUBMITTALS.

B. Product Data: Provide data indicating material characteristics, performance criteria, colors, and limitations including Energy Star acceptance.

C. Shop Drawings: Indicate specially configured metal flashings, jointing methods and locations, fastening methods and locations, and installation details.

D. Samples: Submit two sample boards indicating the manufacturer's full line of available colors. Submit two full size sample shingles indicating size, texture, color and overall appearance.

E. Manufacturer's Instructions: Indicate preparation required and installation procedures.

F. Certificate of Compliance: Provide a Certificate of Compliance from an independent laboratory indicating that the asphalt fiberglass shingles made in normal production meet or exceed the following requirements:
   1. ASTM E108/UL 790 Class A Fire Resistance
   2. ASTM D3161/D3161M/UL 997 Wind Resistance.
   3. ASTM D3462/D3462M.

G. Manufacturer's written certification indicating roofing applicator qualifications comply with those necessary to obtain specified warranty.

H. Sample warranty for review.

1.04 QUALITY ASSURANCE

A. Roof system shall be an integrated system providing single source responsibility from the manufacturer.

B. Manufacturer Qualifications: Company specializing in manufacturing the roofing system products specified in this section, with a minimum of 25 years experience.

C. Installer Qualifications: Certified and trained by the shingle manufacturer for steep slope installation, certified to install enhanced warranty projects, such as GAF Master Elite Roofing Contractor, CertainTeed Master Shingle Applicator Wizard or approved equal.

D. Perform work in accordance with NRCA Steep Roofing Manual.

E. A final inspection is to be conducted by a manufacturer's roofing inspector.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code(s) for UL 790 Class A fire resistance and ASCE 7, UL 997 and UL 580 wind uplift for shingle types specified.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store products under the provisions of Section016500 - PRODUCT DELIVERY, STORAGE, AND HANDLING, and in accordance with manufacturer's instructions.

B. Store all products in manufacturers unopened, labeled packaging until they are ready for installation. Store products in a covered, ventilated area, at a temperature not more than 110 degrees Fahrenheit, do not store near stream pipes, radiators, or direct sunlight.

C. Store bundles on a flat surface. Maximum stacking height shall not exceed manufacturer's recommendations. Store rolls on ends.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not install eave edge protection and shingles when ambient temperatures are below 50°F (10°C).

1.08 PROTECTION

A. It shall be the Contractor's responsibility to respond immediately to correction of roof leakage during construction. A four (4) hour time limit shall be given from the time of notification of emergency conditions. In the event of water penetration during rain or a storm, the Contractor shall provide for repair or protection of the building contents and interior. If the Contractor does not respond or cannot be contacted, the Owner will effect repairs or emergency action and the Contractor shall be back charged for all expenses and damages, if any.

B. Protect the building and the contents of the building from all risks resulting from the work. Contractor shall be sufficiently prepared to expediently install a temporary membrane to protect areas of incomplete roofing in the event of rain.

C. Contractor must take every precaution to prevent interior leakage, materials from falling into the interior, or other such occurrences.

D. Do not load or permit any part of structure to be loaded with a weight that will endanger its safety or cause damage. Confine equipment, storage of materials and debris and the operations and movements of workmen within any limits as indicated or as directed by the Owner.

1.09 WARRANTY

A. Provide to the Owner a complete system warranty from the manufacturer such as GAF WeatherStopper Golden Pledge Warranty, CertainTeed SureStart Plus 5-Star Warranty or approved equal. Contractor must be a GAF Certified Master Elite Contractor, CertainTeed Master Shingle Applicator Wizard or approved equal.
   1. Material defects: Warranty shall provide 100% non prorated coverage for materials and labor for 40 years.
   2. Workmanship errors: Warranty shall provide 100% coverage for workmanship errors for the first 20 years.
   3. In addition to the requirements listed above, the installer must register and pay for this warranty. The Warranty will be issued and accepted only if the project passes the manufacturer's final inspection.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Section 016500 - PRODUCT DELIVERY, STORAGE, AND HANDLING.

B. Provide extra shingles of each color specified in unopened packages, capable of covering 2 percent of covered area.

PART 2 - PRODUCTS

2.01 MANUFACTURERS - ASPHALT SHINGLES

A. GAF Materials Corporation, 1361 Alps Road, Wayne, NJ 07470.

B. CertainTeed Corporation, P.O. Box 860, Valley Forge, PA 19482.

C. Or approved equal.

2.02 MATERIALS

A. GAF Timberline UHDZ Lifetime Ultra High Definition Lifetime Shingles, super heavyweight, granule surfaced, self-sealing asphalt shingle, reinforced with fiberglass Micro Weave core and 30-year Stain Guard Plus PRO protection which prevents pronounced discoloration from blue-green algae through formulation/blends of granules. Architectural laminate styling provides a wood shake appearance with a 5” or 5-5/8” exposure and features GAF’s patented High Definition color blends and enhanced dual shadow line effect. Color and pattern as selected by Owner from manufacturer’s full range of colors available.

B. CertainTeed Landmark Premium Shingles, 300 pounds per square, composed of a fiberglass mat base with ceramic coated colored/UV resistant mineral service granules across entire face of the shingle tightly embedded in carefully refined, water resistant asphalt. The two pieces of the shingle are firmly laminated together in a tough asphaltic cement, and are self-sealing, algae-resistant construction. Architectural laminate styling provides a wood shake appearance with a 5” or 5-5/8” exposure and features CertainTeed’s Max Def color blends and enhanced shadow effect. Color and pattern as selected by Owner from manufacturer’s full range of colors available.

C. Or approved equal.

2.03 ACCESSORIES

A. Ridge Shingles: High profile self sealing ridge cap shingle matching the color of selected roof shingle.

B. Starter Strip: Pre-cut self-sealing starter shingle with factory applied adhesive, designed for premium roof shingles matching the color of selected roof shingle.

C. Leak Barrier: Self-adhering, self-sealing, bituminous leak barrier surfaced with fine, skid-resistant granules, Install leak barrier at ridges, eaves, rakes, around curbs, all penetrations, etc.

D. Shingle Underlayment: Premium, water repellant, breather type roofing underlayment meeting ASTM D226/D226M and ASTM D4869/D4869M.

E. Roofing Cement: Asphalt Plastic Roofing Cement meeting the requirements of ASTM D4586/D4586M, Type I or Type II, asphalt type with mineral fiber components, free of toxic solvents, capable of setting within 24 hours at temperatures of 75 F (24 C) and 50% RH.

F. Soffit Vents: As specified in Section 074633 - VINYL & POLYMER SIDING.

G. Nails: Standard round wire, zinc-coated steel or aluminum; 10 to 12 gauge, smooth, barbed or deformed shank, with heads 3/8 inch (9mm) to 7/16 inch (11mm) in diameter. Length must be sufficient to penetrate into solid wood at least 3/4 inch (19mm) or through plywood or oriented strand board by at least 1/8 inch (3.18mm).

H. Metal Flashing: As specified in Section 076200 - FLASHING AND TRIM. 20 inch (510 mm) width minimum; shop precoated with silicone coating of clear color, a non-corroding metal drip edge must be used at eaves and at rake edges.

2.04 FLASHING

A. Form flashings to protect roofing materials from physical damage and shed water.

B. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.

C. Hem exposed edges of flashings minimum 1/4 inch on underside.

D. Apply bituminous paint on concealed surfaces of flashings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing site conditions under provisions of Section 013100 - PROJECT MANAGEMENT AND COORDINATION.

B. Verify that roof penetrations are in place and flashed to deck surface.

C. Verify roof openings are correctly framed prior to installing work of this Section.

D. Verify deck surfaces are clean, dry and smooth, free of moisture, ridges, warps or voids, and suitable for installation of roof system.

E. Beginning of installation means installer accepts existing conditions and substrate.

3.02 PREPARATION

A. Examine existing roof deck surface to receive new roof system for moisture damage, unevenness, irregularities and deflection that would affect quality and execution of work. If deck surface is not suitable for receiving new roofing, or if structural integrity of deck is suspect, immediately notify Architect / Engineer.

B. Areas of existing roof deck that are damaged or deteriorated shall be inspected by Architect / Engineer and roofing manufacturer’s representative. Repair areas as directed in accordance with manufacturer’s instructions.

C. Fill knot holes and surface cracks with latex filler at areas of bonded eave protection.

D. Broom clean deck surfaces thoroughly.

3.03 INSTALLATION – RIDGE VENTS

A. Install ridge vents along entire length of ridges.

B. Cut continuous vent slots through the sheathing, stopping 6 inches from each end of the ridge and hip. On roofs without ridge board, make slot 1 inch wide on either side of the peak (2 inches overall) and on roofs with ridge board, make two slots 1-3/4 inches wide one on each side of the peak (3-1/2 inches overall).

C. Install ridge vent material along the full length of the ridge, including uncut areas. Butt ends of ridge vent material and join using roofing cement.

3.04 INSTALLATION - UNDERLAYMENT

A. Install flat and without wrinkles in accordance with manufacturer’s instructions.

B. Eaves:
   1. Install eave metal flashing tight with fascia boards; lap joints 2 inches and seal with plastic cement or high quality urethane sealant; nail at the top of the flange.
   2. On all roofs install leak barrier up the slope from eaves edge a full 36 inches or to at least 24 inches beyond the interior “warm wall”. Lap ends 6 inches and bond.

C. Ridges:
   1. Install leak barrier along entire lengths. If ridge vents are to be installed, position the leak barrier so that the ridge slots will not be covered.

D. Roof Deck:
   1. Install underlayment over a clean dry deck; install sheets horizontally so water sheds.
   2. Install leak barrier at ridge, eaves, rakes, curbs, all penetrations, and other vulnerable leak areas.
   3. Lay underlayment over deck and overlap 12” at side laps and 12” at end laps. Fasten side and end laps 12” o.c. and middle of the roll 24” o.c. Completely cover all side laps, end laps and fasteners with tape.
   4. Lap underlayment over leak barrier in valley at least 6 inches.
   5. Apply tape over all fasteners at the center of the roll to prevent rain or snow from entering at the fasteners.

3.05 INSTALLATION - METAL FLASHING

A. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.

B. Secure in place with nails at 12 inches on center. Conceal fastenings.

C. Flash and seal work projecting through or mounted on roofing with plastic cement, weather tight.

D. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counter flashings.

E. Install ridge vents per manufacturer’s instructions.

3.06 INSTALLATION - ASPHALT SHINGLES

A. Install shingles in accordance with manufacturer's instructions.

B. Minimize breakage of shingles by avoiding dropping bundles on edge, by separating shingles carefully and by cutting and not breaking over ridge or bundles. Handle carefully in hot weather to avoid scuffing the surfacing or damaging the shingle edges.

C. Placement and Nailing:
   1. Along rakes and eaves install starter strip containing sealant or cement to underlayment and each other in a 4” width of asphaltic roof cement. Secure with 6 nails.
   2. Nails must be driven flush with the shingle surface. Do not overdrive or under drive the nails.
   3. Each shingle shall be securely nailed with six (6) min. 1 inch long, large head galvanized roofing nails. Nailing points shall be one nail (1) one inch, (8) eight inches and (14) fourteen inches from each end and 5-5/8 inches from bottom of shingle.
   4. Consult the application instructions for proper shingle offset. Laterally offset shingles from the existing keyways to avoid waves or depressions caused by excessive dips in the roofing materials. Using the bottom of the tab, align subsequent courses.
   5. Project first course of shingles 3/4 inch beyond fascia boards.
   6. Extend shingles 1/2 inches beyond face of gable edge fascia boards.
   7. At ridges, install ridge cap shingles over vent material, maintaining 5 inches weather exposure. Do not drive nails home, leaving 3/4 inch slot open between ridge and roof shingles. Place ridge cap shingles to avoid exposed nails and in accordance with manufacturer's instructions.

D. Penetrations: All penetrations are to be flashed according to manufacturer, ARMA and NCRA application instructions and construction details.

E. Roof Hatches: Roof Hatches are to be installed with pre-fabricated metal flashings specifically designed for the application of the unit. Consult the roofing manufacturer for specific installation recommendations.

F. Complete installation to provide weather tight service.

3.07 FIELD QUALITY CONTROL

A. Avoid breaking shingles by separating carefully and avoiding dropping. Take extra precautions and handle carefully in hot or cold weather.

B. Field inspection will be performed under provisions of Section 014500 - QUALITY CONTROL. Schedule required manufacturer inspections required for warranty.

3.08 PROTECTION

A. Protect finished work under provisions of Section 015000 - TEMPORARY FACILITIES AND CONTROLS. Provide temporary protective sheeting over uncovered deck surfaces at the end of the day.

B. Do not permit traffic over finished roof surface.

C. Replace any shingles damaged during the course of the work at no additional cost to the Owner.

END OF SECTION 073113

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preformed vinyl polymer clapboard siding.

B. Preformed vinyl polymer soffit panels.

C. Underlayment.

D. Accessories and trim.

1.02 REFERENCES

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

B. ASTM D3679 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding; 2017.

C. ASTM D4477 - Standard Specification for Rigid (Unplasticized) Poly(Vinyl Chloride) (PVC) Soffit; 2016.

D. ASTM D5206 - Standard Test Method for Windload Resistance of Rigid Plastic Siding; 2019.

E. ASTM D7254 – Standard Specification for Polypropylene (PP) Siding.

F. ASTM D779 - Standard Test Method for Determining the Water Vapor Resistance of Sheet Materials in Contact with Liquid Water by the Dry Indicator Method; 2016.

G. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.

J. VSI - Vinyl Siding Institute.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300 - SUBMITTALS.

B. Product Data: Provide manufacturer’s data on each product to be used indicating materials, component profiles, sizes and surface texture, color selection chart and installation methods.

C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations and installation details.

D. Manufacturer's Instructions: Indicate procedures and methods required for proper installation.

E. Samples: For each finish product specified, provide two complete sets of color chips representing manufacturer's full range of available colors and patterns along with two samples minimum size 36 inches long, representing actual product, color, and patterns.

F. Approved installer certification letter(s) from manufacturer documenting current approval and not less than five years of experience with products specified.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall have current 5-star Contractor or Master Craftsman credentials by Georgia-Pacific, CertainTeed or Equal. Provide installer with not less than five years of experience with products specified. In lieu of credentials, the Owner may consider accepting installer who pays to have the manufacturer's technical representative on site for the entire first day of installation and weekly site visits during the course of construction to ensure manufacturer's full warranty for the project.

B. Manufacturer Qualifications: Manufacturer shall not have less than twenty years of experience manufacturing vinyl products and shall be a member of Vinyl Siding Institute (VSI).

C. Mock-Up: Provide a mock-up for evaluation of installation techniques and workmanship.
   1. Finish areas as designated by Architect/Engineer.
   2. Do not proceed with remaining work until workmanship is approved by Architect/Engineer.
   3. Reinstall mock-up area as required to produce acceptable work.

D. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

E. Do not install siding or soffit which is wet or covered with ice or frost. Do not install siding or soffit on wet or frozen substrate. Do not install siding or soffit when precipitation is falling.

F. Fire Resistance: Provide vinyl products that meet or exceed the following ratings:
   1. Flame Spread Index < 25, smoke development rating <450, per ASTM E84.
   2. Fire endurance classification of 1 hour, per ASTM E119 as wall assembly.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016500 - PRODUCT DELIVERY, STORAGE, AND HANDLING.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Do not store products directly on ground. All materials shall be blocked off the ground.

D. Properly support and handle siding and soffit such that the siding and soffit is not subject to any unnecessary bending stress.

E. Reject all damaged material.

1.06 WARRANTY

A. Provide manufacturer's standard lifetime limited warranty on siding products and twenty-five-year color fade warranty, transferable to new owners.

1.07 EXTRA MATERIALS

A. Section 017800 - CLOSEOUT SUBMITTALS.

B. Provide minimum 10 percent of total area of each type of vinyl siding and soffit to Owner in unopened packages.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Georgia Pacific Corporation, Vinyl Siding Products distributed by Blue Linx Corporation, 4300 Wildwood Parkway, Atlanta, Georgia 30339. Tel: (800) 839-2588 or (516) 425-1616; Fax: (516) 764-4818; Email: jmkelly@bluelinxco.com; Web: www.bluelinxco.com.

B. CertainTeed Corporation, Siding Products Group, P.O. Box 860, Valley Forge, Pennsylvania 19482. ASD. Tel: (800) 233-8990. Fax: (610) 341-7940; Email: ctsiding@certainteed.com; Web: www.certainteed.com.

C. Or Approved Equal prior to bid, see Section 012500 – Product Substitution Procedures.

2.02 MATERIALS

A. Vinyl siding, soffit, and components: Provide products made of extruded polyvinyl chloride as specified in this section and manufactured to comply with requirements of ASTM D3679.
   1. Provide elongated nailing slots on nailing flanges to allow for movement.
   2. Factory-notch ends of horizontal panels to form overlapping joints.
   3. Provide products that meet weathering requirements of ASTM D3679.

B. Vinyl polymer clapboard siding:
   1. Georgia Pacific: Vision Pro Double 5 Inch Traditional Lap.
   2. CertainTeed: Monogram 46 Double 5-inch Rough Cedar Clapboard.
   3. Siding shall have a prominent wood grain finish, color through full thickness of material, minimum .040-inch thickness, minimum ½ inch projection and resistant to wind loads up to 165 mph.

C. Vinyl polymer soffit panels:
   1. Georgia Pacific: D5 double 5-inch perforated soffit.
   2. CertainTeed: Ironmax double 5-inch perforated soffit.
   3. Soffit panels shall have a minimum .044-inch thickness.

D. Owner shall select from manufacturers full range of available colors (standard, deluxe, premium and shaded) for all vinyl products.

2.03 VINYL CARPENTRY ACCESSORIES

A. Provide coordinating accessories by same manufacturer for a complete and proper installation, whether or not specifically indicated on the drawings, including but not limited to the following:
   1. Inside and outside corner posts.
   2. J-Channel.
   3. Under sill trim.
   4. Starter Strip per application.
   5. Lineal, band and finish boards.
   6. Wall outlet, faucet, light trim plates, etc.

B. Provide galvanized or other corrosion-resistant nails as recommended by manufacturer of siding products.

C. Soffit clips, eave transition & closure strips, channels, one-piece corners, trim, edging, tracks, fasteners and any other accessories required to install the soffit panels.

2.04 WATER-RESISTIVE BARRIER

A. Spunbonded Polypropylene Weather Membrane with a microporous coating, Non-woven, non-perforated, Tyvek Commercial Wrap 'D' or WRB provided by siding manufacturer.

B. Performance Characteristics:
   1. Gurley Hill sec/100cc >2500.
   2. Water Vapor Transmission 9-15 perms as tested by ASTM E96/E96M, Method A.
   3. Water penetration resistance of 865 cm on hydrostatic head in accordance with AATCC-127.
   4. Trapezoidal Test of 30/33 in accordance with ASTM D5733.
   5. Air-Ins < .02L/S•M2 @ 75 PA.
   6. Dry Indicator Method: ASTM D779 to 24-hour rating.
   7. Manufacturer Warranty: Lifetime product replacement and/or system warranty.

C. Approved Tape & Sealants:
   1. Provided by Tyvek or WRB manufacturer.
   2. Elastomeric polymer based, butyl rubber, rubber based, meeting ASTM C920 evaluation.

D. Recommended Fasteners for Wood, Insulated Sheathing Board, Exterior Gypsum
   1. Plastic cap nails.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces and wall openings are as required by the manufacturer, as indicated on approved shop drawings and ready to receive work. Do not begin installation until substrates have been properly prepared. Notify Architect/Engineer of unsatisfactory preparation before proceeding.

B. Beginning of installation means installer accepts existing conditions and substrate.

3.02 PREPARATION

A. Examine, clean, and repair as necessary any substrate conditions which would be detrimental to proper installation.

B. Do not begin installation until unacceptable conditions have been corrected.

3.03 INSTALLATION - SIDING

A. Install one layer of underlayment horizontally on wood frame surfaces. Weather lap edges and ends minimum 6 inches. Stagger vertical joints and securely fasten in place. Seal seams, joints and penetrations through WRB with specified tape and fasteners prior to installation of finish material. WRB shall be air tight and free from holes, tears, and punctures. All penetrations are to be flashed and sealed with manufacturer approved flashing material per ASTM 2112, AMMA guidelines and manufacturer instructions. Cover with exterior cladding within 24 hours of installation.

B. Install products in accordance with the latest printed manufacturer's instructions. Securely fasten products with all components in place, properly aligned, leveled, true and plumb.

C. Nail horizontal panels by placing nail in center of slot. Nail vertical panels by placing first nail at top of top slot and remaining nails in center of slots. Drive nails straight, leaving 1/16-inch (1.6

mm) space between nail head and flange of panel. (Note: Refer to Installation Manual for latest installation recommendations).

D. Allow space between both ends of siding panels and trim for thermal movement. Overlap horizontal panel ends one-half the width of factory pre-cut notches.

E. Stagger lap joints in horizontal siding in uniform pattern as successive courses of siding are installed.

F. Install J-channel and flashing to accommodate successive courses of siding. Install wood shims at building corners to bring cut edges of vertical siding out to correct plane.

G. Install starter strips, trim boards, etc. as required for a complete and watertight job.

H. Fabrication of component profile on site not permitted.

I. Ensure site cuttings or burred edges do not remain on finish surfaces.

J. Conceal all fasteners.

K. Place sealant or gaskets to arrest weather penetration. Maintain neat appearance.

3.04 INSTALLATION - SOFFIT

A. Install soffit panels, accessories and any required supports per manufacturer's instructions. System shall allow for quick and easy installation and have a special lock which prevents slipping of the panel.

B. Erection of the soffit panels must be started correctly, and the sections held true to line. Horizontal lines are to be straight and level and vertical lines plumb.

C. Soffit panel ribs shall be installed perpendicular to the fascia. Corners shall be mitered.

D. Install flashing and trim as required to achieve positive drainage. Hem all exposed edges of flashing, trim or closer strips.

3.05 TOLERANCES

A. Maximum Variation from Plumb or Level: 1/8 inch in 10 feet, non-cumulative.

B. Maximum Variation for Plan of Wall: 1/16 inch at any point.

3.06 CLEANING AND PROTECTION

A. Protect finished work under provisions of Section 015000 - TEMPORARY FACILITIES AND CONTROLS.

B. Clean adjacent areas and siding of excess sealant.

C. Clean siding soiled during installation with a method approved by the manufacturer.

D. Protect installed products until completion of project and acceptance by Owner.

E. Touch-up, repair or replace damaged products before Substantial Completion at no additional cost to the Owner.

END OF SECTION 074633

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Sheet metal flashing, flashing accessories, flashing sleeves and collars at mechanical and plumbing items, which extend through the roof or wall surfaces.

B. Fastening hardware such as nails, screws, reglet wedge blocks, etc.

C. Sheet metal capping over wood trim.

1.02 REFERENCES

A. ASTM A-446 Specification for Steel Sheet

B. ASTM B-209 Specification for Aluminum Sheet

C. ASTM B-221 Specification for Aluminum Extruded Shapes

D. FS QQ-L-201 Specification for Lead Sheet

E. ASTM A792 Steel Sheet, Aluminum-Zinc Alloy-Coated, by the Hot-Dip Process

F. ASTM B32 Solder Metal

G. ASTM B209 Aluminum and Alloy Sheet and Plate

H. ASTM B486 Paste Solder

I. ASTM D226 Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

J. ASTM D486 Asphalt Roof Cement, Asbestos-free

K. FS O-F-506 Flux, Soldering, Paste and Liquid

L. WH Warnock Hersey International, Inc., Middleton, WI.

M. FM Loss Prevention Data Sheet

N. NRCA National Roofing Contractors Association – Roofing Manual

O. SMACNA Architectural Sheet Metal Manual

1.03 SUBMITTALS

A. Section 013300 Submittal Procedures.

B. Product Data: Submit manufacturer's literature of all materials specified herein to Architect/Engineer for approval in accordance with requirements described in General Requirements. Obtain approval from Architect/Engineer in writing prior to delivery and installation.

C. Shop Drawings: Submit shop drawings for all metal flashing and trim. Submitted shop drawings shall include, but shall not be limited to the following:
   1. Dimensioned drawings of all metal flashing at roof and wall penetrations and at changes and terminations of roofing and wall materials. Indicate proposed material, gauge and accessories.

2. Indicate material profile, jointing pattern, jointing details, method of lapping joints, providing for expansion and turning corners, fastening methods, flashing terminations, and other installation details.

D. Samples: Submit two samples 12 inches long illustrating typical gauge, external corner, internal corner, junction to vertical dissimilar surface, flashing and capping material and finish.

1.04 QUALITY CONTROL

A. Fabricator and Installer: Company specializing in sheet metal flashing work with 6 years' experience. Provide documentation of experience with a minimum of twelve references for custom fabrication work upon request.

B. Reference standards
1. Comply with details and recommendations of SMACNA Manual for workmanship, methods of joining, anchorage, provisions for expansion, etc.

C. Manufacturer's Warranty
1. Pre-finished metal material shall require a written 20-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D-2244 or chalking excess of 8 units per ASTM D-659. If either occurs material shall be replaced per warranty, at no cost to the Owner.

D. Contractor's Warranty
1. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be watertight and secure for a period of five years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

1.05 DELIVERY, STORAGE AND PROTECTION

A. Deliver and store materials in manufacturer's original, unopened containers or packages with labels intact and legible under the provisions of Section 016500.

B. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials, which may cause discoloration or staining. Materials shall be stored in a safe, dry place.

1.06 GENERAL REQUIREMENTS

A. Proper Surfaces: Surfaces to which roofing and flashings are to be applied shall be even, smooth, sound, thoroughly clean and dry, and free from all defects that might affect the application. Report any unsatisfactory surfaces to Architect/Engineer in writing, prior to commencing work.

B. Accessories: All accessories or other items essential to the completeness of the metal flashing installation, though not specified, shall be provided. All such items, unless otherwise indicated on drawings or specified, shall be of same material as the item to which applied. Nails, screws and bolts shall be of the types best suited for the purpose intended and shall be of a composition that is compatible with the metal that it will contact.

C. Dissimilar Materials: Where materials come in contact with dissimilar metals, an insulating paint or tape shall be applied between the dissimilar metals to prevent electrolysis between the two materials.

D. Workmanship: Except as otherwise indicated on drawings or specified, the workmanship of metal flashing work, method of forming joints, anchoring, cleating, provisions for expansion, etc. shall conform to the standard details and recommendations of the following:
   1. The Aluminum Association.
   2. Federal Specifications.
   3. ASTM.
   4. Architectural Sheet Metal Manual, latest edition as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Flashing, counter flashing, flashing associated with mechanical and plumbing items and material for trim capping.
   1. Material: Continuous sheet, ASTM B209, .040 inch thickness. Coil stock will not be permitted. Provide proper size material to cap scheduled items, 20 inch (510 mm) width minimum for roof flashing.
   2. Mill finish for all roof penetration flashing.
   3. Finish – shop precoated with Kynar 500 or Hylar 5000 baked enamel finish.
   4. Flashing Nails: Standard round wire roofing type, hot dipped zinc coated steel; minimum 19/64 inch (7.54 mm) head diameter and 0.104 inch (0.356 mm) shank diameter; of sufficient length to penetrate through roof sheathing into wood substrate. Screws, bolts and nuts for fastening aluminum sheet metal work shall be made of aluminum alloys 6061-T6. Washers of similar material shall be used to prevent tearing of sheet metal.

B. Aluminum Sill: .040 aluminum continuous sheet sill, where indicated on drawings.

C. Aluminum Capping: .032 Aluminum sheet material, color as selected by Owner.

D. Nails for fastening aluminum sheet metal work shall be made of aluminum alloys 6062 or 5056 meeting Federal Specification FF-N-105, Type 2, Style 20. Screws, bolts and nuts for fastening aluminum sheet metal work shall be made of aluminum alloys 6061-T6. Washers of similar material shall be used to prevent tearing of sheet metal.

2.02 ACCESSORIES

A. Sealant: Specified in Section 079200 – Joint Sealants.

B. Slip Sheet: Resin paper.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square and free from distortion or defects.

B. Fabricate cleats, interlockable with sheet.

C. Form pieces in longest possible lengths, in single-length sheets. Short lengths or splices will be unacceptable.

D. Hem exposed edges on underside ¼ inch, miter and seam corners.

E. Fabricate vertical faces with bottom edge formed outward ¼ inch and hemmed to form drip.

F. Form corners from one piece with 18 inch minimum legs. Solder joints.

G. Prime and paint all wood trim scheduled to receive capping.

H. Form flashings to protect roofing materials from physical damage and to shed water. Seal metal joints.

I. Apply bituminous paint on concealed surfaces of flashings.

PART 3 - EXECUTION

3.01 FABRICATION

A. All metal flashing and trim work shall be fabricated in strict accordance with the detailed drawings and with best trade practices. Ends of fabricated sheets shall be fastened to make joints watertight and still provide for expansion and contraction. Lines and angles shall be sharp and true. Plane surfaces shall be free from waves and buckles. No oil canning shall be accepted in finished work. Seams shall be watertight.

3.02 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work. Inspect all surfaces to which metal or metal accessories are to be installed. Do not install metal work unless such surfaces are sound, dry, clean and free of defects that might be detrimental to the metal work. Report any unacceptable conditions to the Architect/Engineer in writing before commencing work.

B. Protect contact areas of dissimilar metals with heavy asphalt or other approved coating, specifically made to stop electrolytic action.

C. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, crickets are in place, and nailing strips located.

D. Beginning of installation means acceptance of existing conditions.

E. Field measure site conditions prior to fabricating work.

3.03 INSTALLATION

A. Flashing shall be installed in strict accordance with trade practices. Completed installation shall be true to line with shapes undistorted, not damaged, and with properly shaped angles. Provide expansion joints and other means for relieving stresses from expansion and contraction of the material.

B. Install work watertight, without waves, warps, buckles, fastening stress, or distortion, allowing for expansion and contraction.

C. All accessories or other items essential to the completeness of sheet metal installation, whether specifically indicated or not, shall be provided and of the same material as item to which applied.

D. Flashing set into masonry shall be sealed with mortar. Tool joints tight and smooth.

E. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Seal joints watertight.

3.04 MANUFACTURED SHEET METAL SYSTEMS

A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations and warranty requirements.

B. Furnish and install manufactured sheet metal systems in strict accordance with manufacturer's printed instructions.

3.05 SHOP FABRICATED SHEET METAL

A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations and warranty requirements.

B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.

C. Hem exposed edges. Angle bottom edges of exposed vertical surfaces to form drip.

D. All corners for sheet metal shall be lapped with adjoining pieces fastened and set in sealant.

E. Install sheet metal to comply with Architectural Sheet Metal manual, Sheet Metal and Air Conditioning Contractor's National Associations, Inc.

3.06 ERECTION TOLERANCES

A. Maximum Variation from Alignment: 1/8 inch.

3.07 GUARANTEE

A. The Contractor shall guarantee that all materials and workmanship provided by this section shall be guaranteed free of defects for a period of five (5) years from date of acceptance. Any defects arising within this period shall be promptly corrected without additional cost. This is in addition to the manufacturer's warranty.

END OF SECTION 076200

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Aluminum gutters, downspouts, and accessories.

1.02 REFERENCES

A. ASTM B32 - Solder Metal.

B. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

C. SMACNA - Architectural Sheet Metal Manual.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Each type of product specified. Submit manufacturer's detailed technical product data, installation instructions and recommendations, dimensions of individual components, profiles, and finishes.

C. Shop Drawings: Show fabrication and installation of commercial gutter system including fully dimensioned roof plans, jointing methods, fastening methods, expansion joint locations, sections and details of components and other related trims.

D. Finish & Color Selection: Furnish manufacturer's technical data for specified finish and color chart showing full range of colors available.

E. Samples: Upon request, submit two samples, 6 inches (150 mm) long, illustrating component design, finish, color and configuration.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable code(s) for size and method of rain water discharge.

1.05 QUALITY ASSURANCE

A. Obtain all components and related accessories from one single source manufacturer.

B. Follow manufacturer's printed instructions for installing commercial gutter system. Follow primary roofing manufacturer's printed instructions for installing associated roof material for flashing gutter system to roof.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016500.

B. Stack preformed and prefinished material to prevent twisting, bending or abrasion, and to provide ventilation. Store in a clean, dry location.

C. Prevent contact with materials during storage which may cause discoloration, staining or damage.

D. Products furnished with strippable protective masking shall not be exposed to direct sunlight for more than 30 minutes without removing masking.

E. Do not install finished materials with scars or abrasions.

1.07 COORDINATION

A. Coordinate work under provisions of Section 013100 and with adjoining work for proper sequencing to ensure protection from inclement weather and to protect materials and their finish against damage.

B. Do not install commercial guttter system during inclement weather. When installing in cold climates, warm adhesives, caulks, and primers to at least 50 degrees fahrenheit prior to application.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum: ASTM B209, 3003 alloy, H14 temper; 0.032 inch-thick; mill finish interior, shop precoated.

2.02 COMPONENTS

A. Gutters: SMACNA style profile seamless, 6” K-style, ogee profile.

B. Downspouts: SMACNA rectangular profile seamless 3”x4”.

2.03 FABRICATION

A. Form gutters and downspouts of profiles and sizes indicated in accordance with approved shop drawings.

B. Fabricate with required connection pieces.

C. Form sections square, true and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.

F. Fabricate gutter and downspout accessories; seal watertight.

2.04 ACCESSORIES

A. Anchorage Devices: Type recommended by fabricator.

B. Gutter Supports: Hidden hangers at 30” o.c. maximum

C. Downspout Supports: Straps, 60" maximum spacing (minimum 3) finished to match downspout.

D. End Caps: Provide factory end caps at all gutter ends and wall abutments.

E. Liner Expansion Joint: Provide manufacturer's elastomeric expansion joints with cover plates at 40' intervals or as shown on shop drawings.

F. Fasteners: Aluminum finish exposed fasteners same as flashing metal.

G. Splash Blocks: Provide precast concrete splash blocks at the termination of each downspout at grade.

H. Sealant: Shall be polyurethane or silicon based waterproofing type, compatible with aluminum gutter, downspout, and abutting dissimilar materials for intended application.

I. Primer: Zinc chromate type.

J. Protective Backing Paint: Bituminous.

2.05 FABRICATION

A. Form gutters and downspouts of profiles and sizes indicated in accordance with approved shop drawings.

B. Fabricate with required connection pieces.

C. Form sections square, true and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.

F. Fabricate gutter and downspout accessories; seal watertight.

2.06 DRAINWARE

A. Downspout & Elbows: Provide downspout in sizes and locations as indicated on plans. Downspouts shall be manufactured from 0.040/0.032 aluminum, finished to match gutter. Downspout elbows shall have heliar welded joints.

B. Outlets: At all downspout locations proivde aluminum outlets to connect liner to downspout.

C. Wall Brackets: Provide Style 1 Wall brackets at 60" maximum spacing (minimum 3 brackets). Brackets shall be manufactured from 0.125" x 1.00" aluminum, finished to match downspout.

2.07 FINISHES

A. Coating Type: High Performance Coating, two-coat, shop applied, 70% Polyvinylidene Fluoride (PVDF) coating based on Elf Arkema Chemicals, Inc. Kynar 500 or Ausimont USA, Inc. Hylar 5000 resin, meeting AAMA 2605 specification.

B. Color: Select from manufacturer's full range of 56 EZ Mix Colors.

C. Apply bituminous protective backing on surfaces in contact with dissimilar materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. The installer must examine substrates and conditions under which commercial gutter system will be installed. All wood plates and/or fascia boards shall be installed true, straight, and free of

splits, cracks, or other irregularities. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Prior to the installation of the commercial gutter system, soffits, extenders, and associated cornice profiles shall be installed.

B. Installer shall thoroughly read and follow manufacterer's installation instructions before proceeding with installation.

3.03 INSTALLATION

A. General: The commercial gutter system shall be installed in strict accordance with manufacturer's printed instructions and approved shop drawings. Deviations from the instructions are not allowed.

B. Gutter: Install gutter onto support brackets and fasten to substrates with aluminum or stainless-steel nails maximum 30 inches o.c. Rivet and seal liner joints with high grade exterior sealant as recommended by gutter manufacturer.

C. Slope gutters 1/8 inch per foot minimum to leader locations.

D. Expansion Joints: Install elastomeric expansion joints as shown on plans and/or shop drawings. Maximum expansion joint spacing shall be 40' centers.

E. Install interior straps by fully engaging them into gutter's hemmed edge, complete by securely riveting.

END OF SECTION 077123

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide through penetration firestopping in accordance with the Contract Documents as follows:
   1. Penetrations for the passage of all structural, plumbing, HVAC and electrical penetrations including but not be limited to ducts, piping, conduit, wiring and all other equipment through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions to prevent the passage of fire, smoke or toxic gases and to maintain required fire ratings.

1.02 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.03 REFERENCES

A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"

B. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”

C. UL Fire Resistance Directory:
   1. Firestop Devices (XHJI)
   2. Fire Resistance Ratings (BXRH)
   3. Through-Penetration Firestop Systems (XHEZ)
   4. Fill, Voids, or Cavity Material (XHHW)
   5. Forming Materials (XHKU)

D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.

E. Inspection Requirements: ASTM E 2174, “Standard Practice for On-site Inspection of Installed Fire Stops.”

F. ASTM E 84, “Standard Test Method for Surface Burning Characteristics of Building Materials.”

G. ASTM E119, Method for Fire Tests of Building Construction and Materials.

H. FM 4991, Fire stopping Specialist Contractor.

I. Building Code of New York State (Latest Edition)

J. Fire Code of New York State (Latest Edition)

K. NFPA 101 - Life Safety Code

1.04 QUALITY ASSURANCE

A. Provide on-site inspection by a manufacturer's direct technical representative (not distributor or agent) prior to submittal of firestop systems to assist in providing a schedule of approved firestopping systems required to be part of the contractor’s submission and ensure proper selection and installation procedures in accordance with the manufacturer's written recommendations published in their literature and details.

B. Qualifications: The work of this section shall be performed by a qualified and experienced installer. The term "installer", as used herein shall mean a firm of established reputation; which has been trained by the manufacturer in the proper installation of firesafing material and which is regularly engaged in, and maintains a regular force of workers skilled in the installation of firesafing material of the type specified. Installer shall be an FM 4991 Firestopping Specialist Contractor.

C. Install Firestop System to meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

D. Provide firestop materials and methods to conform to applicable governing codes and local authorities having jurisdiction.

E. Consult the Architect/Engineer prior to penetrating any load bearing assembly.

F. For those firestop applications that exist for which no UL tested system is available through a manufacturer, submit a manufacturer's engineering judgment derived from similar UL system designs or other tests to local authorities having jurisdiction for their review and approval prior to installation. Follow the requirements set forth by the International Firestop Council when preparing the engineering judgment drawings.

1.05 FIELD QUALITY CONTROL

A. Section 014500 - Quality Control: Field inspection and testing.

B. Independent Testing Agency shall:
1. Inspect the installed firestopping after application and curing for integrity, prior to its concealment.
2. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings.
3. Re-inspect the installed firestopping for integrity of fire protection, after installation of subsequent work.
4. Provide written inspection report and certification to the Architect, indicating installation meets or exceeds requirements of contract documents.
5. The costs associated with the independent testing agency shall be paid out of the Allowance.

1.06 SUBMITTALS

A. Schedule: Schedule shall indicate the locations and types of the various firesafing material to be used throughout the building, and material and methods of installation of damming for the various floor, wall and ceiling construction. Provide details of damming which shall be large scale and indicate material and methods of installation.

B. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions to comply with Division 1 requirements.

C. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Include both project name and contractor’s name who will install firestop system as described in engineering judgment drawing.

D. Test Reports: Submit copies of test reports, by an independent testing laboratory, indicating that the firesafing material complies with the specified contract requirements.

E. Submit material safety data sheets provided with materials delivered to job-site.

1.07 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is FM 4991 certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A manufacturer’s willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer. The “installer” shall engage the inspection services of the manufacturer during the course of Work and upon completion.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.09 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Scheduling: Schedule installation of firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

1.10 WARRANTY

A. Provide standard manufacturer's warranty on material composition and resistance to breakdown.

PART 2 - PRODUCTS

2.01 FIRESTOPPING, GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions

of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:
   1. Hilti, Inc., Tulsa, OK (800) 879-8000
   2. The Rectorseal Corporation, Houston, TX (800) 231-3345
   3. Specified Technologies, Incorporated (STI), Somerville, NJ (800) 992-1180
   4. 3M Fire Protection Products, St. Paul, MN (800) 328-1687
   5. Tremor Firestop System, Beechwood, OH (800) 321-7906
   6. Other products such as USG Firestop System by U.S. Gypsum Co. are acceptable if complying with requirements.

2.03 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E 814 or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Install cast-in place firestop devices prior to concrete placement for use with noncombustible and combustible pipes (closed and open systems), and conduit penetrating concrete floors, the following products are acceptable:
   1. Hilti Cast-In Place Firestop Device (CP 680-P)
   2. Add Aerator Adaptor when used in conjunction with aerator system
   3. Hilti Tub Box Kit (CP 681) for use with tub installations
   4. Hilti Cast-In Place Firestop Device (CP 680-M) for use with noncombustible penetrants
   5. Hilti Speed Sleeve (CP 653) for use with cable penetrations
   6. Hilti Firestop Drop-In Device (CFS-DID) for use with noncombustible and combustible penetrants
   7. Hilti Firestop Block (CFS-BL)

C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
   1. Hilti Intumescent Firestop Sealant (FS-ONE)
   2. Hilti Self-leveling Firestop Sealant (CP 604)
   3. Hilti Fire Foam (CP 620)
   4. Hilti Flexible Firestop Sealant (CP 606)
   5. Hilti Elastomeric Firestop Sealant (CP 601S)

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
   1. Hilti Elastomeric Firestop Sealant (CP 601S)
   2. Hilti Flexible Firestop Sealant (CP 606)
   3. Hilti Intumescent Firestop Sealant (FS-ONE)

E. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:
   1. Hilti Firestop Joint Spray (CFS-SP WB)
   2. Hilti Elastomeric Firestop Sealant (CP 601S)
   3. Hilti Flexible Firestop Sealant (CP 606)
   4. Hilti Self-leveling Firestop Sealant (CP 604)

F. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant

G. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal profile deck; as a backer for spray material.
   1. Hilti Speed Plugs (CP 777)
   2. Hilti Speed Strips (CP 767)

H. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti Intumescent Firestop Sealant (FS-ONE)
   2. Hilti Fire Foam (CP 620)
   3. Hilti Elastomeric Firestop Sealant (CP 601S)
   4. Hilti Flexible Firestop Sealant (CP 606)

I. Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti Firestop Putty Stick (CP 618)
   2. Hilti Firestop Plug (CFS-PL)

J. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
   1. Hilti Firestop Putty Pad (CP 617)
   2. Hilti Firestop Box Insert

K. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:
   1. Hilti Firestop Collar (CP 643N)
   2. Hilti Firestop Collar (CP 644)
   3. Hilti Wrap Strips (CP 648E/648S)

L. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
   1. Hilti Firestop Mortar (CP 637)
   2. Hilti Firestop Block (CFS-BL)
   3. Hilti Fire Foam (CP 620)
   4. Hilti Firestop Board (CP 675T)

M. Non-curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
   1. Hilti Firestop Block (CFS-BL)
   2. Hilti Firestop Board (CP 675T)

N. Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating gypsum or masonry walls, the following products are acceptable:
   1. Hilti Speed Sleeve (CP 653) with integrated smoke seal fabric membrane.
   2. Hilti Firestop Sleeve (CFS-SL SK)
   3. Hilti Retrofit Sleeve (CFS-SL RK) for use with existing cable bundles.
   4. Hilti Gangplate (CFS-SL GP) for use with multiple cable management devices.
   5. Hilti Gangplate Cap (CFS-SL GP CAP) for use at blank openings in gangplate for future penetrations.

O. Sealants or caulking materials used for openings between structurally separate sections of wall and floors, the following products are acceptable:
   1. Hilti Firestop Joint Spray (CFS-SP WB)
   2. Hilti Elastomeric Firestop Sealant (CP 601S)
   3. Hilti Flexible Firestop Sealant (CP 606)
   4. Hilti Self-leveling Firestop Sealant (CP 604)

P. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:
   1. Hilti CFS-BL Firestop Block
   2. Hilti CFS-PL Firestop Plug

Q. Mineral Fiber Fire Safing insulation:
   1. Provide insulation as manufactured by USG INTERIORS, INC. Product "Thermafiber Safing", CAFCO INDUSTRIES LTD., FIBREX INC. or approved equal. Density shall be 4 pcf with thickness to suit condition.
   2. Provide 20 gauge minimum metal plate where required for firesafing support to comply with fire ratings.
   3. Do not use fibrous safing insulation unless it is in conjunction with a compatible smoke seal as specified herein.

R. Firestopping Mortar:
   1. Provide Portland cement/fly ash mortar with an air-dried density of 50 to 55 pounds per cu.ft. Mortar shall be classified for both flame and temperature ratings under ASTM E814.
   2. Acceptable materials are BIO FIRESHIELD "Novasit K-10".

S. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E 814 which is equal to the time rating of construction being penetrated.

T. Provide a firestop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction joint assembly.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
   1. Verify penetrations are properly sized and in suitable condition for application of materials.
   2. Make surfaces to which firestop materials will be applied free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
   3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
   4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

5. Do not proceed until unsatisfactory conditions have been corrected.
6. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 COORDINATION

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Assure that the responsible trade has provided adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

C. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed per specified requirements.

D. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

E. Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.

F. Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector.

3.03 INSTALLATION

A. Material and equipment shall be as approved by the manufacturer. Application procedures shall be in strict accordance with the manufacturer's directions and specifications. Only experienced, skilled mechanics approved by the material manufacturer shall be allowed to place the material.

B. Provide firestopping material at thicknesses as required to provide indicated ratings. Where not otherwise indicated, comply with U.L. standard designs. In multiple layer work, offset joints by at least 6 inches.

C. Anchor firestopping using manufacturer's recommended system and in compliance with U.L. standard designs.

D. Install firestopping without gaps and voids of any kind. Do not use damaged materials. Remove and replace non-fitting or disturbed work.

E. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

F. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.
   1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
   2. Do not install firestop systems in a manner that hampers the performance of fire dampers, coordinate with the requirements for ductwork and fire damper installation.
   3. Protect materials from damage on surfaces subjected to traffic.

3.04 PREFORMED PIPE SEALS

A. Use preformed pipe seals for firestopping nonmetallic pipes or conduit penetrating rated assemblies. Preformed collars may be surface mounted or embedded in firestop mortar as

space permits to seal PVC or ABS pipe penetrations. Size selection and installation shall be in strict accordance with manufacturer's written instructions.

3.05 FOAM-IN-PLACE FIRESTOPPING

A. Apply foam-in-place firestopping material in depths required to meet the fire ratings indicated or required by U.L. standards. Provide clips or other approved means to contain the foam-in-place material which will enable the foam to solidly fill the areas intended. Mixing and application shall be in strict accordance with the manufacturer's written instructions.

B. Foam firestopping may be used in lieu of sealant or mortar material at the Contractor's option, provided details conform to manufacturer's recommendations for maintaining the integrity of the assembly in question.

3.06 FIRESTOPPING SEALANT

A. Use firestopping sealant at narrow joints at fire-rated floor and wall penetrations, and at penetrations subject to vibration or movement. Typical penetrations requiring sealant are plumbing and HVAC piping, electric conduit and ductwork.

B. Where openings are large enough, use mineral safing insulation in thicknesses required to dam the joint, and apply 1/2-inch minimum depth of sealant, or as required to achieve the rated assembly.

3.07 MINERAL SAFING INSULATION

A. Use mineral saving insulation at top of fire-rated partitions at underside of metal deck to provide complete fire-rated seal.

B. Mineral safing insulation must be used in conjunction with a sealant or foam firestop to ensure a continuous smoke seal.

3.08 FIRESTOPPING MORTAR

A. Mortar may be used to firestop all large, nonmoving openings in fire-rated assemblies, including multiple openings in floor slabs.

B. Mix mortar with clean water in accordance with the manufacturer's printed instructions. Wet all surfaces with water prior to application of mortar. Apply by hand or pump and vibrate in penetrations to prevent voids from forming.

C. Do not apply mortar if ambient or substrate temperature is below 35°F during the 24-hour period before application.

3.09 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection. Contractor shall be responsible for third party inspections performed in accordance with ASTM E2174 to verify compliance with requirements. Contractor shall submit third party and manufacturer’s inspection reports under Section 017800 Closeout Submittals.

C. Inspect through-penetration firestopping in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard.

D. Perform under this Section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

E. The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration and joint location on the entire project.

F. The Documentation Form for through penetrations is to include:
   1. A Sequential Location Number
   2. The Project Name
   3. Date of Installation
   4. Detailed description of the penetrations location
   5. Tested System or Engineered Judgment Number
   6. Type of assembly penetrated
   7. A detailed description of the size and type of penetrating item
   8. Size of opening
   9. Number of sides of assemblies addressed
   10. Hourly rating to be achieved
   11. Installers Name

G. The Documentation Form for Construction Joints is to include:
   1. A Sequential Location Number
   2. The Project Name
   3. Date of Installation
   4. Detailed description of the Construction Joints location
   5. Tested System or Engineered Judgment Number
   6. Type of Construction Joint
   7. The Width of the Joint
   8. The Lineal Footage of the Joint
   9. Number of sides addressed
   10. Hourly rating to be achieved
   11. Installers Name

H. Copies of these documents are to be provided to the general contractor at the completion of the project.

I. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
   1. The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's Name, address, and phone number.
   3. Through-Penetration firestop system designation of applicable testing and inspecting agency.
   4. Date of Installation.
   5. Through-Penetration firestop system manufacturer's name.
   6. Installer's Name.

3.10 CLEANING AND PROTECTION

A. Remove equipment, materials and debris, leaving areas in undamaged, clean condition.

B. Upon completion of the work, remove all unused materials from the site. Clean floors, walls and other adjacent surfaces that are stained, marred or otherwise damaged by this work. Leave all work and the adjacent areas in a clean condition.

C. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations.

D. Protect all completed work from damage, by methods recommended by the manufacturer of installed material.

E. If damage occurs, cut out and remove damaged or deteriorated firestopping and install new materials.

END OF SECTION 078400

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preparation of sealant substrate surfaces.

B. Sealants and joint backing.

C. Joint sealants to be provided at:
   1. Joints of all material requiring caulking or sealants and to prevent water, moisture, and air infiltration.
   2. Perimeter of wall openings, joints, and ends.
   3. Perimeter of piping wall and/or floor penetrations.
   4. Intersections of different materials requiring caulking and sealants.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM C717 - Standard Terminology of Building Seals and Sealants.
   2. ASTM C834 - Specification for Latex Sealants.
   3. ASTM C920 - Specification for Elastomeric Joint Sealants.
   4. ASTM D1056 - Flexible Cellular Material- Sponge or Expanded Rubber.
   5. ASTM C1193 – Standard Guide for Use of Joint Compounds.

B. Federal Specifications (FS):
   1. FS SS-S-200 - Sealing Compounds, Two Component, Elastomeric, Polymer Type, Jet-Fuel Resistant, Cold Applied.
   2. FS TT-S-1657 - Sealing Compound, Single Component Butyl Rubber Based Solvent Release Type (for Buildings and other Types of Construction).
   3. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specifications.

1.03 SUBMITTALS

A. Submit under provision of Section 013300.

B. Manufacturer's complete descriptive product data including chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

C. Manufacturer’s installation instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

D. Submit schedule of all conditions and joints requiring caulking and sealant proposed for each condition.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with sealant manufacturer’s requirements for preparation of surfaces and material installation instructions.

B. All work shall be performed by a qualified caulking and sealant contractor, who has specialized in this type of work for a minimum of five (5) years. Provide a minimum of five (5) references to the engineer for review and approval.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Section 016500 - Product Requirements: Transport, handle, store, and protect products.

B. Deliver Products in manufacturer's original unopened containers or packages with labels intact, identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions, where applicable.

C. Store and handle materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.06 PERFORMANCE REQUIREMENTS

A. Install sealants to prevent air and moisture from infiltrating or migrating from the building exterior to the interior.

1.07 PROTECTION

A. Mask surrounding surfaces.

B. Protect sealants until cured.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Install sealant during manufacturer's recommended temperature and humidity ranges and weather conditions for application and cure. Consult manufacturer when sealant cannot be applied during recommended conditions.

1.09 COORDINATION

A. Coordinate the work with all sections referencing this section.

1.10 WARRANTY

A. The products covered under this Section shall be covered by the manufacturer’s standard 5-year warranty and include coverage for installed sealants and accessories which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.01 SEALANT MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering specified items which may be incorporated into the work include the following:
   1. Bostik, Inc, Huntingdon Valley, PA, (800) 523-2678, (125) 674-5600.
   2. Dow Corning, Midland, MI (517) 496-4000.
   3. GE Silicones, Waterford, NY (518) 233-3330.
   4. Mameco International, Cleveland, OH, (800) 321-6412, (216) 752-4400.
   5. W.R. Meadows, Inc, Elgin, IL (800) 342-5976, (847) 683-4500.
   6. Nomaco, Inc., Zebulon, NC, (919) 269-6500.
   7. Pecora Corporation, Harleysville, PA, (800) 523-6688, (215) 723-6051.
   8. Sika Corporation, Lyndhurst, NJ, (800) 933-7452, (201) 933-8800.
   9. Sonneborn Building Products Div. ChemRex, Inc., Shakopee, MN (800) 243-6739, (612) 496-6000.
   10. Tremco, Beachwood, OH, (800) 852-3821, (216) 292-5000.

11. USG Corp., Chicago, IL (800) 874-4968, (312) 606-4000.
12. Sherwin-Williams Co. (The), Cleveland, OH (800) 321-8194

2.02 BUILDING SEALANTS (SEE SEALANT SCHEDULE AT THE END OF THIS SECTION FOR SPECIFIC USE OF SEALANTS.)

A. Urethanes:
   1. Type 1: Two-Part Urethane: Self-Leveling, ASTM C920, Type M, Grade P, Class 25.
      a. Chem-Calk CC-550, by Bostik.
      b. Vulkem 245, by Mameco.
      c. Vulkem 255, Wide-Joint, by Mameco.
      d. NR-200 Urexpan, by Pecora Corporation.
      e. Loxon 2K SL Multi-Component Polyurethane Sealant, by Sherwin-Williams.
   2. Type 2: Two-Part Urethane: Non-Sag, ASTM C920, Type M, Grade NS, Class 25.
      a. Chem-Calk 500, by Bostik.
      b. Vulkem 227, by Mameco.
      c. Sonolastic NP 2, by Sonneborn Building Products, ChemRex Inc.
      d. Loxon 2K NS Multi-Component Polyurethane Sealant, by Sherwin-Williams.
   3. Type 3: One-Part Urethane: Self-Leveling, ASTM C920, Type S, Grade P, Class 25.
      a. Vulkem 45, by Mameco.
      b. Urexpan NR-201, by Pecora Corporation.
      c. Sonolastic SL1, by Sonneborn Building Products, ChemRex Inc.
      d. Sikaflex 1C-SL by Sika.
      e. Loxon 1K SL Polyurethane Sealant, by Sherwin-Williams.
   4. Type 4: One-Part Urethane: Non-Sag, ASTM C920, Type S, Grade NS, Class 25.
      a. Chem-Calk 900, by Bostik.
      b. Vulkem 116, by Mameco.
      c. Sonolastic NP I, by Sonneborn Building Products, ChemRex Inc.
      d. Loxon 1K Smooth Polyurethane Sealant, by Sherwin-Williams.

B. Bond Breaker Tape: Polyethylene tape of plastic as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate of joint filler must be avoided for proper performance of sealant.

2.03 COLORS

A. Generally, use sealant colors matching color of material joint is located in.

B. Where a joint occurs between two materials of differing colors and Contractor cannot determine which material to match, contact Architect/Engineer for selection.

2.04 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint cleaner: Non-corrosive and non-staining type, as recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint backing: Round, closed cell polyethylene foam rod, oversized 50% larger than joint width; as recommended by sealant manufacturer; and compatible with sealant.

D. Bond breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates, and conditions are as required, and ready to receive Work.
   1. Verify that joint widths are in conformance with sealant manufacturer allowable limits.
   2. Verify that contaminants capable of interfering with adhesion have been cleaned form joint and joint properly prepared.
   3. Verify that joint backing and release tapes are compatible with sealant.

B. Report in writing to Architect/Engineer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 PREPARATION

A. Prepare and size joints in accordance with manufacturer's instructions. Clean substrates of dirt, laitance, dust, or mortar using solvent, abrasion, or sandblasting as recommended by manufacturer. Remove loose materials and foreign matter which might impair adhesion of sealant.

B. Verify that joint backing and release tapes are compatible with sealant. Verify sealant is suitable for substrate. Verify that sealant is paintable if painted finish is indicated.

C. Protect materials surrounding work of this Section from damage or disfiguration.

D. Perform preparation in accordance with manufacturer’s instructions and ASTM C1193.

E. Apply masking tape. Do not allow tape to touch surface to which caulking, or sealant is to be applied.

3.03 INSTALLATION

A. Perform installation in accordance with sealant manufacturer’s requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Install sealant to achieve performance requirements, in accordance with manufacturer’s instructions.

D. Prime or seal joint surfaces where recommended by sealant manufacturer. Do not allow primer or sealer to spill or migrate onto adjoining surfaces.

E. Measure joint dimensions and size material to achieve required 2:1 width/depth ratios.

F. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.

G. Remove masking tape immediately after tooling of sealant is accomplished and before surface skin has started to form.

H. Install bond breaker where joint backing is not used.

I. Install sealants to depths recommended by sealant manufacturer in uniform, continuous ribbons free of air pockets, foreign embedded matter, ridges, and sags, "wetting" joint bond surfaces equally on both sides.

J. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

K. Tool joints concave unless shown otherwise. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form slight cove so that joint will not trap moisture and foreign matter. Dry tool joints. Do not use soap, water, or solvent to tool joints.

3.04 CURING

A. Cure sealants in compliance with manufacturer's published instructions.

3.05 CLEANING AND PROTECTION

A. Comply with the requirements of Section 017423.

B. Remove excess and spillage of sealants promptly as the work progresses, using materials and methods as recommended by sealant and substrate manufacturers. Clean adjoining surfaces to eliminate evidence of spillage without damage to adjoining surfaces or finishes.

C. Protect sealants until cured and until project completion.

3.06 SEALANT SCHEDULE

A. Exterior Joints:
   1. Perimeters of exterior openings where frames and other penetrations meet exterior facade of building: precast concrete, brick, CMU, polymer reinforced concrete.
      a. Sealant Urethane Type 2
      b. Sealant Silicone Type 1 (for prefinished materials only)
   2. Expansion and control joints in exterior surfaces of unit masonry walls and polymer reinforced concrete, including at metal panels.
      a. Sealant Urethane Type 2
   3. Exterior joints in horizontal wearing and non-wearing surfaces.
      a. Sealant No. Urethane Type 1
      b. Sealant No. Urethane Type 3
      c. Preformed Compressible & Non-Compressible Filler Type 1
   4. Setting bed for threshold and saddles.
      a. Sealant Acoustical Type 1
   5. Painted metal lap or flashing joints.
      a. Sealant Silicone Type 1

B. Interior Joints:
   1. Seal interior perimeters of exterior openings.
   2. Expansion and control joints on interior of exterior masonry walls.
   3. Perimeters of interior hollow metal and aluminum frames.
   4. Interior masonry vertical control joints and intersecting masonry walls; CMU-to-CMU, CMU-to-concrete.
   5. For all the above interior joints:
      a. Sealant Urethane Type 2
      b. Sealant Urethane Type 4

c. Sealant Silicone Type 1 (for prefinished materials only)

6. Interior expansion and control joints in floor surfaces exposed to foot traffic.
   a. Sealant Urethane Type 2
   b. Sealant Urethane Type 4
   c. Preformed Compressible & Non-Compressible Filler Type 1
7. Painted metal lap joints.
   a. Sealant Silicone Type 1

END OF SECTION 079200

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Interior expansion control systems.
   2. Exterior wall expansion control systems.

1.03 ACTION SUBMITTALS

A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

B. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches (152 mm) long in size.

C. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
   1. Manufacturer and model number for each expansion control system.
   2. Expansion control system location cross-referenced to Drawings.
   3. Nominal joint width.
   4. Movement capability.
   5. Classification as thermal or seismic.
   6. Materials, colors, and finishes.
   7. Product options.

1.04 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Minimum 10 years documented experience in production of specified materials.
   2. Certified to ISO 9001 and 14001.

B. Installer Qualifications: Minimum 2 years documented experience in work of this Section.

C. Pre-installation Meetings
   1. Convene at Project site 2 weeks prior to beginning work of this Section.
   2. Attendance: Architect, Engineer, Contractor, Construction Manager, Joint Seal Installer, and Other Related Trades.
   3. Review and discuss:
      a. Joint seal manufacturer’s requirements, project conditions, allowable structural movement at joints, and protection of completed work.

b. Transitions in plane and direction, and requirement for continuity of seal through watertight transitions from wall expansion joint to other interfacing expansion joint systems at adjacent construction.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered and stored in accordance with the manufacturer's instructions so as to avoid breakage, moisture, staining or damage of any kind.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
   1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
   2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

B. Coordination: Coordinate installation of exterior wall expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

2.02 MATERIALS

A. Aluminum: ASTM B221, Alloy 6005A-T61, 6063-T5, 6061-T5, 6105-T5 for extrusions; ASTM B209, Alloy 6061-T6, 3003-H14, 5005-H34 for sheet and plate.
   1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
   2. Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker) complying with AAMA 611. Color: As selected by the Architect form the manufacturer's full color offering.
   3. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions. AAMA 2604 and with coating and resin manufacturers' written instructions. Color: As selected by the Architect form the manufacturer's full color offering.

B. Compression Seals: ASTM D2000; preformed rectangular elastomeric extrusions having internal baffle system and designed to function under compression.

C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required rating period.

D. Moisture Barrier: 7-ply laminate reinforced Polyethylene.

E. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.03 WALL EXPANSION CONTROL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Construction Specialties, Inc. (Basis of Design)
   2. EMSEAL Corporation.
   3. Or Approved Equal.

B. Wall-to-Wall:
   1. Basis-of-Design Product: 3HFR-200 (2" Joint).
   2. Design Criteria:
      a. Nominal Joint Width: As indicated on Drawings.
   3. Type: Cover plate.
      a. Locations as indicated on Drawings.
      b. Metal: Aluminum.
         1) Finish: Color Anodic, Class II.
         2) Color: As selected by Architect from manufacturer's full range.
   4. Type: Preformed cellular foam.
      a. Foam Material: Manufacturer's standard.
         1) Color: As selected by Architect from manufacturer's full range.

2.04 MATERIALS

A. Aluminum: ASTM B221, Alloy 6063-T5 for extrusions; ASTM B209, Alloy 6061-T6 for sheet and plate.
   1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.

C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.

D. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

E. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.05 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.06 ALUMINUM FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to expansion control system manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.

3.03 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.

B. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
   1. Provide in continuous lengths for straight sections.
   2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
   3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

C. Foam Seals: Install with adhesive recommended by manufacturer.

D. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

3.04 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 079500

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Non-fire rated Fiberglass Reinforced Plastic (FRP) flush doors and frames.

B. Reinforcement, anchorage, accessories and attachment items, trim, shims and closures.

C. Factory preparation for hardware.

1.02 REFERENCES

A. 2020 Building Code of New York State.

B. Accessible and Usable Buildings and Facilities ICC A117.1-2009.

C. ASTM D523 - Standard Test Method for Specular Gloss.

D. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.

E. ASTM E84- Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E 152 - Standard Methods of Fire Tests of Door Assemblies.

G. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

H. SDI 100 - Recommended Specifications for Steel Doors and Frames.

I. UL 305 - Standard for Panic Hardware.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300 - SUBMITTALS.

B. Shop Drawings: Drawings shall fully describe and locate all items being furnished and shall include large scale details of principal construction features and internal reinforcement. Indicate frame elevations, hardware, reinforcement, anchor types and spacing, location of factory cut-outs for hardware, and finishes.

C. Product Data: Indicate frame and door configuration and finishes.

D. Submit color and texture chips of FRP door and frame colors and textures for selection by Owner. The selected color shall pigment both the gel-coat and exterior laminate.

E. Submit samples of finished materials, door section and exposed fastening devices for approval upon the Owner or Architect’s request.

F. Calculations: Submit calculations for fiberglass composite door, verifying theoretical limits of thermal warpage based upon the exposure temperature differential.

G. Closeout: Submit warranty documents specified herein.

1.04 PROJECT CONDITIONS

A. Examine contract documents with respect to work indicated or required under this Section to ensure its completeness. Notify Architect of deficiencies in construction where attachment of

the work of this Section is concerned. Contractor is responsible to coordinate hardware function and operation with all required system components.

B. Coordinate the work with frame opening construction, door and hardware installation.

1.05 QUALIFICATIONS

A. The manufacturer of the items herein shall have been regularly engaged in the manufacture and installation of the complete assembly specified herein for a period of no less than five (5) years. Upon request of the Owner or Architect, working samples and list of similar installations shall be submitted before approval.

B. Except when so described, the manufacture and fabrication must originate in that manufacturer's plant or plants.

C. The use of different finished components from more than one source of manufacture will not be acceptable.

D. Contractor with five (5) years documented experience installing FRP doors and frames. Contractor shall submit five (5) references for projects completed within the last two (2) years.

1.06 SITE STORAGE AND PROTECTION OF MATERIALS

A. Comply with the requirements contained in Section 016500 - PRODUCT DELIVERY, STORAGE, AND HANDLING.

B. Any scratches or disfigurement caused in shipping or handling are to be promptly cleaned and touched up per manufacturers recommendations, and materials are to be properly stored on planks or dunnage, out of water, and covered to be protected from damage due to any cause.

C. Doors shall have their wrappings or coverings removed upon arrival at the building site and shall be stored in a vertical position, spaced by blocking to permit air circulation between them.

D. Provide packaging, separators, banding, spreaders and paper wrappings as required to completely protect all frames during transport and storage.

E. Remove defective or damaged material from project site within 24 hours.

F. Acclimate doors and frames to site conditions for a minimum of 24 hours before installation.

1.07 PERFORMANCE REQUIREMENTS

A. ASTM E84/NFPA 255: Door faces shall have a Class A rating with a flame spread of 25, or less, and a smoke developed rating of 450, or less.

B. Wind Loading: Design and reinforce doors and frames to withstand wind loading pressures indicated on the structural drawings.

1.08 WARRANTY

A. Furnish a written warranty covering repair of defects in materials, installation, and workmanship developing during the specified period at no extra cost to the Owner for the following:
   1. Doors and frames shall have a lifetime guarantee against failure due to corrosion from the specific environment named at the time of purchase.
   2. Doors and frames shall be guaranteed for ten years against failure due to materials and workmanship, including warp, separation or delamination, and expansion of the core.

3. Hardware shall be warranted to be free of defects in both workmanship and materials for a period of one year.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Chem-Pruf Door Co., Ltd.; P.O. Box 4560, Brownsville, Texas 78523, Toll Free (800) 444-6924, Fax: 956-544-7943, Website: www.chem-pruf.com.

B. Fib-R-Dor, a Div. of Chase Doors, Inc.; 1721 East 5th Street, North Little Rock, AR 72114. Toll Free: (800) 342-7367, Fax: 501-758-9496. Website: www.fibrdor.com.

C. Special-Lite; PO Box 6, Decatur, Michigan 49045, Toll Free: (800) 821-6531, Fax (800) 423-7610, website: www.special-lite.com. Model AF-100.

D. Or pre-approved equal.

2.02 MATERIALS

A. Fiberglass Reinforced Plastic (FRP) DOORS:
   1. Thickness: 1-3/4 inches.
   2. Thermal Insulating Value: 'R' factor 7.42 minimum.
   3. Construction:
      a. Core: Polyurethane foam core.
      b. Door Plates: Molded in one continuous piece, resin reinforced with hand-laid glass fiber mat, nominal 1/8-inch-thick, minimum 15-mil gel-coated surface.
      c. Door Edges: Minimum 3 layers resin-reinforced glass fiber mat, nominal 3/8 inch thick, machine tooled.
   4. Sizes: Indicated on drawings.
   5. Door Plates: 1/8-inch-thick, molded in one continuous piece, starting with a 25-mil gelcoat of the color specified, integrally molded with at least two layers of 1.5 ounce per square foot fiberglass mat and one layer of 18 ounces per square yard woven roving. This will yield a plate weight of 0.97 lbs. per square foot at a ratio of 30/70 glass to resin.
   6. Finish: Flush, smooth gloss surface, minimum value of 88 in accordance with ASTM D523.
   7. Color and texture: To be selected by Owner from manufacturer’s full line.

B. Fiberglass Frames:
   1. Construction: One-piece pultruded fiberglass reinforced plastic, minimum 1/4-inch wall thickness, jamb-to-head joints mitered and reinforced with FRP clips and stainless steel fasteners; conforming to SDI requirements for performance equivalent to 16 gage steel frames.
   2. Frame profile: as Indicated on drawings.
   3. Sizes: as Indicated on drawings.
   4. Finish: Satin Co-Extruded finish, with true and consistent color throughout frame thickness.
   5. Color: To be selected by Owner from manufacturer’s full line.
   6. Provide conduit in frame for access control system.

C. Frame Anchors: Manufacturer's standard stainless steel expansion anchors for existing openings, and stainless steel masonry tee anchors for new construction. Provide jamb anchors within 18 inches of top and bottom each frame and at 24 inches on center in between.

D. Door Hardware: Specified in Section 087100 - DOOR HARDWARE.

E. Accessories:
   1. Rubber silencers at interior doors.
   2. Vision Lite – Type 9 or 10 beveled pultruded fiberglass reinforced plastic frame with stainless steel fasteners on interior or less public side of door. See Section 088100 - GLAZING for glazing information.
   3. Sizes: Indicated on drawings.

2.03 FABRICATION

A. Hardware Preparation: Doors and frames shall be factory mortised, reinforced, drilled and tapped at the factory for fully templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware contractor. Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only.
   1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
   2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
   3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of FRP work for hardware.

B. Fiberglass Reinforced Plastic (FRP) Doors:
   1. Minimum glass fiber to resin ratio: 30 percent.
   2. Mortise for lockset, and recess for strike plate in lock stile.
   3. Embed steel reinforcement for hinges in fiberglass matrix; provide for hinge leaf recesses in hinge stile.
   4. Astragals shall be full height, fully fastened to face of active leaf.

C. Fiberglass Frames:
   1. Mortise for lock strike, and recess for strike plate in lock jamb.
   2. Reinforce for hinges and other required hardware.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Field verify that opening sizes and tolerances are acceptable. Beginning of installation means installer accepts existing conditions and substrate.

3.02 INSTALLATION

A. Install doors and frames in accordance with ANSI/SDI 100 and manufacturer’s instructions plum, level, and square.

B. Coordinate installation of doors with installation of frames and hardware specified in Section 087100. Interface with other work. Field cutting of doors or frames is not permitted. Any field cut doors or frames shall be replaced by the contractor at no cost to the Owner.

C. Install frames plumb, level, square, and rigidly secured in the opening.

D. Adjust doors to fit snugly and close without sticking or binding.

E. Coordinate with masonry construction for anchor placement.

F. Protect materials to prevent scratching, twisting, and denting or otherwise damaging.

G. Caulk interior and exterior perimeter of frames.

H. Shim frames every 12 to 16 inches.

I. Secure frame with appropriate anchors and hardware.

J. Set all entrance saddles in mastic.

K. Install and adjust all hardware and adjust to achieve quiet and smooth operation.

L. Install all weather-stripping.

3.03 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

B. Maximum Clearances: 1/8 inch at jambs and heads, 1/4 inch at meeting stiles of pairs of doors, 1/4 inch between door bottom and finished floor or threshold.

3.04 ADJUSTING

A. Adjust work under provisions of Section 017500 - STARTING AND ADJUSTING.

B. Adjust door and hardware for quiet, smooth and balanced door movement.

3.05 PROTECTION AND CLEANING

A. Upon completion of the work, all protection (including coatings) shall be removed and the exposed surfaces of the work cleaned and left in perfect condition free of smears, scratches and abrasions. Repair or replace damaged materials as directed by Architect / Engineer.

END OF SECTION 081500

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Hardware for all new doors.

B. Accessories and miscellaneous trim.

1.02 REFERENCES

A. American National Standards Institute (ANSI);
   1. ANSI A156.3 - National Standard for Exit devices.
   2. ANSI A156.4 - National Standard for Door Controls - Closers.
   3. ANSI A156.6 - National Standard for Architectural Door Trim.
   4. ANSI A156.13 - National Standard for Mortise Locks & Latches.

B. National Fire Protection Association (NFPA):
   1. NFPA 80 - Fire Doors and Windows.
   2. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
   3. NFPA 252 - Fire Tests of Door Assemblies.

C. Underwriters Laboratories (UL):
   1. UL 10B - Fire Tests of Door Assemblies.
   2. UL 305 - Panic Hardware.

1.03 GENERAL REQUIREMENTS

A. Keying:
   1. General - Locks must incorporate a security system to ensure that keys used during construction will not open doors after District occupancy. Coordinate permanent locks with District's standard keying.
   2. Construction Keys and Inserts - Permanent cylinders with construction inserts are to be assembled into and shipped with all exterior-door locksets. Construction keys are to be shipped with the door locks. Construction insert-extractor keys are to be shipped to the Owner via Registered Mail. Prior to substantial completion, the Contractor shall collect all construction keys and, in the presence of the Owner or Engineer, remove the construction inserts from the lock cylinders and give all construction keys and inserts to the Owner or Architect/Engineer.

B. Provide all hardware templates for mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping requirements to the door manufacturer. Field cutting of doors or frames for hardware installation is not permitted. Any field cut doors or frames shall be replaced by the contractor at no cost to the Owner.

1.04 SUBMITTALS

A. Comply with the requirements contained in Section 013300 - SUBMITTALS.

B. Copy of supplier's Architectural Hardware Consultant (AHC) certificate who will be preparing the hardware schedule submittal.

C. Product Data: Submit manufacturers' technical product data for each item of hardware. Include whatever information may be necessary to show compliance with requirements and include instructions for installation and for maintenance of operating parts and finishes. Hardware sets will not be considered for approval without technical product data.

D. Hardware Schedule: Submit final hardware schedule in manner indicated below. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.
   1. Final Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
      a. Type, style, function, size and finish of each hardware item.
      b. Name and manufacturer of each item.
      c. Fastenings and other pertinent information.
      d. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
      e. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
      f. Mounting locations for hardware.
      g. Door and frame sizes and materials.
      h. Keying information.
   2. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.

E. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Deliver, store and handle materials in accordance with the requirements of Section 016500 - DELIVERY, STORAGE, AND PROTECTION.

B. Packing and marking: Package each item of hardware and each lock set separately in individual containers, complete with necessary screws, keys, instructions, and installation template for spotting mortising tools. Mark each container, identifying installation location of each item. Keep knobs suitably covered during construction period.

1.06 QUALITY ASSURANCE

A. Coordinate the work with other directly affected Sections involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.

B. Coordinate Owner’s keying requirements during the course of the Work. Furnish the Owner with ten (10) keys. Key all door cylinders to match Owner's master cylinder.

C. Perform work in accordance with the following requirements:
   1. ANSI A117.1
   2. NFPA 80.
   3. NFPA 101.
   4. NFPA 252.
   5. UL 10B.
   6. UL 305.

D. Regulatory Requirements:
   1. Conform to applicable code for requirements applicable to doors and frames.

2. Conform to ANSI A117.1-2009 "Accessible and Useable Buildings and Facilities" for mounting heights and locations of accessories.

E. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

F. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware to similar projects for a period of not less than 10 years, and who employs an experienced Architectural Hardware Consultant (AHC) to prepare the hardware schedule submittal and who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements.

1.07 WARRANTY

A. Provide manufacturer’s standard minimum one-year warranty for all hardware.

1.08 MAINTENANCE PRODUCTS

A. Provide special wrenches and tools applicable to each different or special hardware component.

B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS (GENERAL)

A. Bolts, screws and other fastenings required for the application of the finish hardware shall be of size and type to fit requirements and shall be of same material and finish as the exposed parts of the hardware that they fasten.

B. Door hardware: Hand of lock shall be as required. If door hand is changed by proper bulletin or change order before hardware is delivered, furnish such hardware items at no additional expense to Owner.

C. Strikes: Furnish curved lip strikes with dust box of sufficient length to protect trim on all locks or latches.

D. Hinges: Furnish three hinges for doors up to 90” in height and four hinges for doors up to 120” in height.

E. Silencers: Use three at single doors, four at pairs of doors on interior frames.

F. All locks, locksets, latch sets, and bolts shall conform to Federal Specification FF-H-106a/ANSI. All locks shall accept interchangeable, removable cores.

G. Finishes: Refer to the individual hardware headings for finish designations.

2.02 DOOR HARDWARE

A. Lockset: Corbin Russwin ML2000 Series mortise lock or approved equal with Lustra lever handle, LWA trim and Best removable core cylinders keyed to District’s system. US32D finish, function as noted.

B. Exit Device: Sargent 8913ETJ for single door and Sargent 8904ETJ for active leaf of pair of doors, or approved equal, US32D finish.

C. Hinges - Exterior: Stainless steel 4-1/2" x 4-1/2" heavy weight ball bearing, non-rising stainless-steel pin, Model T4A3386 4.5 x 4.5 NRP, manufactured by McKinney or approved equal, stainless steel machine screws furnished by hinge manufacturer.

D. Hinges - Interior: Stainless steel 4-1/2" x 4-1/2" standard weight ball bearing, non-rising stainless-steel pin, Model TA2714 4.5 x 4.5, manufactured by McKinney or approved equal, stainless steel machine screws furnished by hinge manufacturer.

E. Closer - Exterior: Parallel arm application, 7500 Series x arm as required, extra duty hold open on non-fire rated doors only, 689 finish with SRI pretreatment coating, manufactured by Norton or approved equal.

F. Closer – Interior Doors: Parallel arm application, 7500 Series x arm as required, extra duty hold open on non-fire rated doors only, 689 finish with SRI pretreatment coating, manufactured by Norton or approved equal, mount closer on less public side of door.

G. Overhead Stop: Model 6-series-652 as manufactured by Rixson or approved equal.

H. Flush Bolts: Inactive leaf of double doors, Model 555 x US26D UL Listed for Metal Doors, metal door extension, flush bolts as manufactured by Rockwood or approved equal. Shim and wear plate shall be furnished by hardware manufacturer, top and bottom of door. Provide 24" long rod for doors over 7'-0" tall at top.

I. Dustproof Strike: Model 570 x US26D as manufactured by Rockwood or approved equal.

J. Astragal: Astragal shall be of same material, gauge, and finish as metal door, FRP doors use FRP, 2 inches wide, edges rounded, factory finish, supplied by door manufacturer. Astagals shall be full height and fully welded to face of active leaf.

K. Exterior Saddle: Aluminum, thermally broken, Model S281AV x opening width as manufactured by Reese or approved equal.

L. Interior Saddle: Aluminum Model S405A x opening width as manufactured by Reese or approved equal.

M. Weatherstripping: Model 373SS as manufactured by Reese or approved equal, mounted with stainless steel self-tapping screws, min. 8” on center.

N. Door Sweep: Model 18062CNB as manufactured by Rockwood or approved equal, mounted with stainless steel self-tapping screws, min. 8” on center.

O. Door Silencers: Model 608-RKW gray rubber, as manufactured by Rockwood or approved equal.

P. Provide matching strikes, screws and brackets for all hardware.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated.

3.02 INSTALLATION

A. Where not specified under other sections to be performed by manufacturer or suppliers, machine, fit and drill metal doors.

B. Prepare doors of various types to receive hardware, using templates and instructions provided with the hardware items for jobsite work. Field cut or modifed hardware shall be replaced at no cost to Owner.

C. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by the Architect/Engineer.
   1. Conform to requirements of ANSI A117.1-2009 "Accessible and Useable Buildings and Facilities"

D. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface mounted items until finishes have been completed on the substrate.

E. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

G. Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant.

3.03 ADJUSTING

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct Owner’s Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.04 PROTECTION OF FINISHED WORK

A. Do not permit adjacent work to damage hardware or finish.

3.05 HARDWARE SETS

A. Coordinate the Hardware Schedule with the Door Schedule on the Contract Drawings, each set to have:

   <u>HS-1 (Exterior Single Door)</u>

   3 ea. Exterior Hinges

1 ea. Lockset (Storeroom)

1 ea. Exterior Closer

1 ea. Exterior Saddle

1 set Weatherstripping

1 ea. Door Sweep

HS-2 (Exterior Double Doors)

6 ea. Exterior Hinges

1 ea. Lockset (Storeroom)

1 ea. Exterior Closer

1 ea. Overhead Stop

2 ea. Flush Bolts

1 ea. Dustproof Strike

1 ea. Astragal

1 ea. Exterior Saddle

1 set Weatherstripping

2 ea. Door Sweeps

HS-3 (Interior Single Door)

3 ea. Interior Hinges

1 ea. Exit Device (Passage)

1 ea. Interior Closer

1 ea. Interior Saddle

3 ea. Silencers

END OF SECTION 087100

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Glass and glazing for door and window glazing.
   1. Clear tempered glass.

B. All related items to complete the glazing installation.

1.02 REFERENCES

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C162 – Standard Terminology of Glass and Glass Products.

D. ASTM C1036 - Standard Specification for Flat Glass; 2021.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

H. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

I. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications; 2018.

J. ASTM E773 – Standard Test Method for Seal Durability of Sealed Insulated Glass Units.

K. ASTM E774 – Standard Specification for Sealed Insulated Glass Units.

L. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

M. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

N. ASTM F1233 - Standard Test Method for Security Glazing Materials And Systems; 2021.

O. Flat Glass Marketing Association (FGMA) – Glazing Manual and Glazing Sealing Systems Manual.

1.03 SUBMITTALS

A. Submit for approval double samples of 10” x 10” size of glass required. Samples shall have included all proposed coatings and be assembled with appropriate spacers. Each sample shall bear a label indicating the kind and quality of the glass, type and manufacturer of coatings, if any, and the name of the glass manufacturer.

B. Submit product data: identify glazing system, glazing accessories and material, glass composition and emissivity rating, include installation and maintenance instructions.

C. Provide certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.

D. Provide Product Test Listings: From a qualified testing agency indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

E. Design Data: Provide glass size calculations, prepared in accordance with specified method.

1.04 QUALITY ASSURANCE

A. Manufacturer, Flat Glass Materials: Minimum ten years documented experience producing glass products specified in this section.

B. Fabricator, Sealed Insulating Glass Units: Minimum ten years experience producing sealed insulating glass units qualifying to IGCC CBA level.

C. Installer: Minimum five years documented experience installing products specified by this section, and approved by fabricator.

D. Identification: Each unit of tempered glass and burglar resistant glazing shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and be visible when the unit is glazed.

E. Provide Energy Star Label on glazing indicating compliance with DOE Energy Star requirements.

F. Glass shall be as defined in, and in accordance with, Federal Specifications DD-G-451-a and Flat Glass Jobbers Association.

G. Perform Work in accordance with FGMA Glazing Manual.

H. All glazing specified in this section shall conform to the local, state and federal codes and requirements. Glass type and thickness as indicated shall be adjusted as required to meet structural performance.

1.05 DELIVERY, STORAGE AND HANDLING

A. Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING: Transport, handle, store and protect product.

1.06 PROJECT OR SITE CONDITIONS

A. Verify glass sizes specified can withstand dead loads and positive and negative live loads acting normal to plane of glass in accordance with ASTM E1300.

B. Verify glass deflection limit is within ¾ inch or within flexure limit of glass with full recovery of glazing materials, whichever is less.

C. Glaze only when temperature is 40° or higher. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. It is the obligation of the supplier and/or subcontractor to replace all glass that cracks, breaks and that develops any other undesirable characteristics that cannot be contributed to the Owner's activities or vandalism, within one year following the letter of Substantial Completion.

B. Provide ten year warranty for coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

C. Provide five year warranty for delamination of laminated glass and replacement of same.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. PPG Industries, Pittsburgh, PA (412) 434-2858 (800) 377-5267.

B. Pilkington Libbey-Owens-Ford, Toledo, OH (800)221-0444.

C. Viracon, Owatonna, MN (800) 533-2080

D. Or approved equal.

E. Manufacturers offering polycarbonate products include Sheffield Plastics, Incorporated Sheffield, MA (800) 628-5084, GE Plastics, Pittsfield, MA (800) 451-3147, or approved equal.

F. Manufacturers offering security film products include 3M, St. Paul, MN (800) 480-1704, or approved equal.

2.02 GLASS MATERIALS

A. Shop fabricate all components.

B. Glass Type 3 - Clear Tempered Glass: ASTM C 1048, Kind FT (Fully Tempered), Condition A (Uncoated), Type I (Transparent Glass, Flat), Class 1 (Clear), Quality q3 (Glazing Select). Conform to ANSI Z97.1 and CPSC 16CFR Part 1201.
   1. Thickness: 1/4 inch (6 mm), unless indicated otherwise.

C. All glazing in doors, transoms, sidelights, all glazing within 18" of finished floor, all glazing within 8' of grade, and glazing greater than 50 S.F. shall be tempered glass.

2.03 GLAZING ACCESSORIES

A. Setting Blocks: Resilient blocks of 70 to 90 Shore A durometer hardness; compatible with glazing sealant.

B. Spacers: Resilient blocks of 40 to 50 Shore A durometer hardness; self-adhesive on one side; compatible with glazing sealant.

C. Filler Rods: Closed cell or jacketed foam rods of polyethylene, butyl, neoprene, polyurethane, or vinyl; compatible with glazing sealant.

D. Joint Cleaners: Primers, and Sealers: As recommended by glazing sealant manufacturer.

E. Gaskets: ASTM D2000, SBC 415 to 3BC 620; extruded or molded neoprene or EPDM, black.

F. Mastic: Non-solvent type adhesive as recommended by mirrored glass manufacturer.

G. Tapes: Tremco's 440 Tape, Polybutylene 3MN-EC1201, or equal.

H. Sealants and tapes shall conform to N.A.A.M.M. Specification for classes of work involved.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Before starting installation verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

B. Verify that openings for glazing are correctly sized and within tolerance. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement; weeps are clear, and ready to receive glazing.

C. Report in writing to the Architect/Engineer any conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant

3.03 GLAZING

A. Install glazing as per manufacturer's written instructions.

B. Conform to the more stringent requirements as set forth in the following publications:
   1. Latest Edition - "Glazing Manual" issued by Flat Glass Jobbers' Association and manufacturer's instructions.
   2. Latest Edition - "Glass for Construction" as published by Libbey-Owens-Ford Company.

C. Install tempered glass with tong marks at the bottom of openings.

D. Glass shall be set without springing and with an equal bearing on the entire width and length of each piece.

E. The actual sizes required shall be determined by measuring the frames to receive the glass. All glass shall be factory labeled.

F. Glass shall be properly cut and set in accordance with the best practice of the trade.

G. Center glass in glazing rabbet to maintain recommended clearances at perimeter for expansion and contraction of each face of glass.

H. Whenever flat glass is over 50 united inches, maintain the centered position and the sealer thickness from glass to frame through the use of setting blocks at the sill and centering shims.

I. Locate setting blocks at quarter points of sill; set in sealant if heel or toe bead is required.

J. Install spacers inside and out except where pre-shimmed tape or glazing gaskets are to be used.

K. Set each piece in a series to other pieces in pattern draw, bow, or other visually perceptible characteristics.

L. Provide glazing sealants and gaskets as required for particular glazing application. Coordinate with other Sections for material compatibility.

M. Gaskets:
1. Provide adequate anchorage, particularly for driven-in wedge gaskets.
2. Miter and weld ends of channel gaskets at corners to provide continuous gaskets.
3. Seal face gaskets at corners with sealant to close opening and prevent withdrawal of gaskets from corners.

N. Do not leave voids in glazing channels except as specifically indicated or recommended by glass manufacturer. Force sealant into channel to eliminate voids. Tool exposed surfaces to slight wash away from joint. Trim and clean promptly.

O. Do not allow sealant to close weeps of aluminum framing.

P. Provide filler rod where sealants are used in the following locations:
1. Head and jamb channels.
2. Colored glass over 75 united inches in size.
3. Clear glass over 125 united inches in size.

3.04 FIELD QUALITY CONTROL

A. Special Inspections required, refer to Section 014500 - QUALITY CONTROL.

B. Inspect preparation and installation of glass.

3.05 PROTECTION AND CLEANING

A. After installation, protect exposed portions of aluminum surfaces from damage by grinding and polishing compounds, plaster, lime, acid, cement, or other contaminants.

B. Remove glazing materials from finish surfaces. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces in accordance with manufacturer recommendations.

D. After installation, mark pane with an 'X' by using removable plastic tape or paste. Do not mark reflective glass units.

END OF SECTION 088100

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide Louvers and all associated louver accessories and components in accordance with the Contract Documents and as required to provide a complete and first class installation. The work of this section shall include, but not be limited to the following:
   1. Fixed metal louvers and frames.
   2. Bird and insect screening.

1.02 RELATED SECTIONS

A. Caulking and Sealants: Section 079200.

B. Mechanical: Division 23.

1.03 REFERENCES

A. AMCA 500 (Air Movement Control Association) - Test Method for Louvers.

B. ASTM B221 – Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.

C. SMACNA – Architectural Sheet Metal Manual.

1.04 PERFORMANCE REQUIREMENTS

A. Design and fabricate units to withstand wind lateral loads and snow loads.

1.05 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens and frames.

C. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

D. Samples: Submit two (2) samples, 2" x 2" in size illustrating finish and color of exterior and interior surfaces.

E. Submit two samples of manufacturer’s full line of powder coating color chips. Color to be selected by Owner.

F. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

G. Equals will only be accepted if they meet or exceed the performance of specified louvers.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with AMCA Certification for louvers and dampers.

1.07 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings and instructed by the manufacturer.

1.08 COORDINATION

A. Coordinate the Work with installation of flashings.

B. Coordinate the Work with installation of mechanical ductwork.

1.09 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authroized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

PART 2 - PRODUCTS

2.01 ACCESSORIES

A. Fasteners and Anchors: Stainless steel type.

B. Head and Sill Flashings: Roll formed to required shape, single length in one piece per location. Flashings: Of same material as louver frame.

C. Screens: Install screen mesh in shaped frame, reinforce corner construction, shop install to louver with fasteners. Screen shall be easily removed from the building interior.

D. Sealants: Type specified in Section 079200.

2.02 INTAKE LOUVERS

A. Louvers shall be fabricated to provide a minimum of (50%), 8.00 square feet of free area for a 48” x 48” size louver and bear the AMCA certified ratings program seal for air performance and water penetration. The rating shall show a beginning point of water penetration at .01 ounces per square foot of free area at a free area velocity of 1,007 feet per minute, with .125 inches of water gauge pressure drop for air intake. Louvers shall have a full width sill with head and blades contained within jambs. Louver shall be approximately 4” deep.

B. Louvers shall be provided with an aluminum insect screen.

C. Material: Extruded Aluminum 6063 – T5 Alloy.

D. Louver finish shall be Kynar, color as selected by Owner.

E. Louvers shall be Type ESD-403 by Greenheck or approved equal.

2.03 DAMPERS

A. Dampers shall have a minimum leakage of Class 1 at 4 in. wg or Class 1A at 1 in. wg as defined by AMCA (Leakage class 1 is defined as 8 cfm/sq. ft. at 4 in. wg and class 1A is defined as 3 cfm/sq. ft at 1 in wg. at -40F). Tested in accordance with AMCA standard 500-D.

B. Dampers shall meet or exceed the IECC requirements for damper leakage ratings of 3 cfm/sq. ft. at 1 in. wg or 8 cfm/sq. ft. at 4 in. wg or less when integral to the building envelope.

C. Dampers shall be rated up to a maximum differential pressure of 5 in. wg and maximum velocity of 3,000 fpm.

D. The damper manufacturer's submittal data shall certify that all pressure drop data is licensed in accordance with the AMCA Certified Ratings Program for Test Figures 5.2, 5.3, and 5.5. Damper air performance data shall be developed in accordance with the latest edition of AMCA Standard 500-D. Dampers shall be labeled with the AMCA Air Performance Seal. AMCA certified pressure drop for a 24 in. wide x 24 in. high damper shall not exceed 0.04 in. wg when subjected to an airflow velocity of 1500 fpm according to AMCA Test Figure 5.3.

E. Damper frame shall be 16 ga. galvanized steel formed into a 5 in. x 1 in. structural hat channel. Top and bottom frame members on dampers less than 17 in. high shall be low profile design to maximize the free area of these smaller dampers. Frame shall be 4-piece construction with 1 1/2 in. (minimum) integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking.

F. Damper blades shall be 16 ga. galvanized steel strengthened by three longitudinal 1 in. deep V-grooves running the entire length of each blade. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening. Blade orientation is horizontal.

G. Blade edge shall be TPE, mechanically fastened to each blade Jamb shall be flexible stainless steel compression type.

H. Dampers of whole inch height increments shall not require blade stops. When required, individual blades stops shall occupy no more than 1/2 in. of the damper opening to provide maximum free area and minimal pressure loss.

I. Linkage shall be plated steel.

J. Axles shall be minimum 1/2 in. dia. and be plated steel. Axle bearings shall be synthetic (acetal) sleeve rotating in polished extruded holes in the damper frame.

K. A complete damper assembly shall have blades no wider than 48 inches and no higher than 74 inches. Where required damper width or height exceeds manufacturer’s maximum recommended single panel size, the assembly shall be made of a combination of sections. Dampers shall be sized for the scheduled air velocity and pressure classification.

L. Louvers shall be Low Leakage Control Damper Model VCD-23 as Manufactured by Greenheck or approved equal.

2.04 MOTORIZED DAMPER ACTUATORS

A. Fast-acting, two-position actuators shall be of the power open, spring return direct coupled type for on/off damper control.

B. Actuator shall fail normally closed.

C. Galvanized steel and plastic housing

D. Timing at rated torque and voltage:
   1. Drive Open: less than 75 seconds
   2. Spring Close: less than 20 seconds

E. Motorized actuators shall be as called for on equipment schedule.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings and instructed by the manufacturer.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louvers in opening framing with concealed fasteners.

E. Install screens and frame to interior of louver where indicated.

F. Install perimeter sealant and backing rod in accordance with Section 079200.

G. Install motorized damper in accordance with manufacturer's instructions.

3.03 ADJUSTING AND CLEANING

A. Adjust work under provisions of Section 017500.

B. Clean work under provisions of 017423.

C. Test operable louvers and adjust as needed to produce fully functioning units that comply with the requirements.

D. Clean exposed louver surfaces that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

E. Before final inspection, clean exposed surfaces in accordance with manufacturer’s directions.

F. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Engineer, remove damaged units and replace with new units.

G. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. 2'-0" x 2'-0" acoustical ceilings complete with suspension systems and related accessories. Acoustical units, suspension system, grid system and wall moldings shall be furnished by a single manufacturer, for a complete ceiling system.

B. It shall be the contractor's responsibility to coordinate with all other trades and other contractors hired by the Owner including the electrical contractor. Contractor shall remove and replace ceiling panels as required. It shall be the ceiling contractor’s responsibility to furnish a finished ceiling with no broken, scarred, marked, or soiled ceiling panels following the total completion of the project. Contractor shall assume removal replacement of up to 20% of ceilings installed.

1.02 REFERENCES

A. Job conditions, preparatory work, and installation techniques shall be in accordance with Acoustical Materials Association Installation Recommendations.

B. Acoustical units shall be as described in the current edition of the Acoustical Materials Association Performance Data Bulletin.

C. American Society for Testing and Materials (ASTM):
1. ASTM C 635 - Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Panel and Lay-in Panel Ceilings.
2. ASTM C 636 - Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Panel and Lay-in Panels.
3. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials.
4. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.
5. ASTM E 580 - Specification for Application of Ceiling Suspension Systems for Acoustical Panel and Lay-In Panels in Areas Requiring Seismic Restraint.
6. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
8. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
9. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
10. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
11. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
12. ASTM E 1264 Classification for Acoustical Ceiling Products.
13. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
14. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

D. ASCE 7 Standard - American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

E. CISCA 0-2 - Ceilings and Interior Systems Construction Association Recommendations for Direct-Hung Acoustical Panel and Lay-In Panel Ceilings, Seismic Zones 0-2.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300 - SUBMITTALS.

B. Product Data: Provide data on metal grid system, components, acoustic panel units and accessories.

C. Samples: Submit two 6" x 6" samples of each ceiling type, illustrating material and finish of acoustic units.

D. Submit to the Architect/Engineer for approval scaled shop drawings showing layout of suspension system and panel, incorporating light fixtures, grilles and other items mounted through or on acoustical ceiling.

E. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

B. Installer Qualifications: Company specializing in performing work of this Section with minimum 5 years documented experience.

C. Install components to withstand seismic loads in accordance with the 2020 Building Code of New York State, Section 1613 for Category C.

D. Regulatory Requirements: Surface Burning Characteristics in Accordance with ASTM E1264 for Class A finish:
   1. Flame Spread: Less than 25.
   2. Smoke Developed: Less than 50.

1.05 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered and stored under the provisions of Section 016500 - PRODUCT DELIVERY, STORAGE, AND HANDLING.

B. Deliver acoustical ceiling units to project site in original, unopened packages, labeled so as to allow easy identification.

C. Follow manufacturer’s instructions on storage of materials; store materials in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

D. Prior to installation, store acoustical units for 24 hours minimum at same temperature and relative humidity as space where Work will be installed.

E. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.06 ENVIRONMENTAL CONDITIONS

A. Section 016500 - PRODUCT DELIVERY, STORAGE, AND HANDLING: Environmental conditions affecting products on site.

B. Maintain uniform temperature of minimum 60 degrees F and maximum 80 degrees F and maximum humidity of 75 percent prior to, during, and after acoustic unit installation.

C. Do not subject ceiling system to chemical fumes, vibrations, moisture or condensation, excessive humidity, or excessive dirt or dust buildup.

D. The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supported insulation materials.

1.07 PROJECT CONDITIONS

A. Section 013100 - PROJECT MANAGEMENT AND COORDINATION.

B. Sequence work to ensure acoustic ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

C. Install acoustic units after all interior wet work is complete and dry.

D. Rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/36”.

1.08 WARRANTY

A. Provide manufacturer’s 30 year system warranty to withstand relative humidity without sagging, warping, mold/mildew, bacteria or rust.

1.09 EXTRA MATERIALS

A. Section 017800 - CLOSEOUT SUBMITTALS.

B. Provide minimum 10 percent of total acoustic unit area of each type of Panel to Owner in unopened packages.

PART 2 - PRODUCTS

2.01 STANDARD OF QUALITY

A. The following acoustic Panel specification is based upon products as manufactured by Armstrong World Industries, Incorporated, Lancaster, PA (800) 448-1405. Substitutions shall be considered during bidding as stipulated in section 012500 - PRODUCT SUBSTITUTION PROCEDURES.

B. Provide acoustical ceiling system including Panel, grid suspension system and all accessories manufactured by a single manufacturer.

2.02 ACOUSTIC PANELS

A. Type “ACP” 24" x 24" x 5/8" Armstrong Ceramaguard Fine Fissured perforated square lay-in #607, white, mineral fiber composition, Humiguard Plus and Antimicrobial BioBlock Plus.

B. Ceiling Attenuation Class (CAC) of 38, Light Reflectance (LR) of 0.82 and Noise Reduction Class (NRC) of 0.55.

C. Recycled Content: Manufactured from minimum 65 percent recovered slag.

2.03 SUSPENSION SYSTEM

A. Type Armstrong 15/16” Prelude Plus XL fireguard exposed Tee grid, Color: White

B. Suspension system shall not be less in size and strength than required to support itself and shall be increased in size and strength as necessary to support the light fixtures, acoustical units and related items without deflecting more than 1/36" of the span when tested as a simple beam, ends free.
   1. Grid: ASTM C 635, intermediate duty, steel exposed T; nominal 1 inch width; stab-in connections. ASTM E580, galvanized steel with baked polyester paint finish. Main beams and cross tees in accordance with the Building Code of New York State, Section 1621 for Category C as described in ESR-1308.
   2. Accessories: Stabilizer bars, beam end retaining clips, hold down clips, and splices.
   3. Support System: Main runners, cross tees, spacer bars, variable placement tees, grid adapters, and components shall be of cold rolled steel with a protective coating.
   4. Edge Moldings: Moldings and channel moldings nominal 15/16 inch x 15/16 inch hemmed (#7809), shall be of cold rolled steel with a protective coating of standard (white) factory applied and in accordance with the Building Code of New York State, Section 1621 for Category C as described in ESR-1308.
   5. Recycled Content: Manufactured from minimum 20 percent recycled steel.
   6. Attachment devices, wire hanger and ties in accordance with the 2020 Building Code of New York State, Section 1613 for Category C.

2.04 HANGERS

A. Suspension wire attached to power actuated fasteners shall be 12 gauge galvanized pre-straightened wire to support a maximum of 16 sq. ft. of ceiling and 8 gauge galvanized pre-straightened wire to support a ceiling area exceeding 16 sq. ft. No hanger shall support more than 24 sq. ft. of ceiling.

B. Types of power actuated fasteners shall be subject to the approval of the manufacturer for the type of ceiling installed.

2.05 ACCESSORIES

A. Provide all accessories, as required or recommended by manufacturer for use/condition including, spacers, hold downs, and wall moldings.

B. Touch up Paint: Type and color to match acoustic and grid units.

C. Sealant for Perimeter Moldings: Specified in Section 079200 - JOINT SEALANTS.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 013100 - PROJECT MANAGEMENT AND COORDINATION: Verification of existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 INSTALLATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Install ceiling system per manufacturer's instructions and in accordance with the Building Code of New York State, Section 1613 to support ceiling and applied fixture loads. Provide hanger wire at all four corners of each light fixture. If acceptable to authority having jurisdiction, fixed attachment may be accomplished by pop-riveting the runner to the wall molding.

C. Install ceiling Panel in accordance with Panel layouts shown on Reflected Ceiling Plans and approved shop drawings.

D. Contractor to coordinate work closely with electrical and mechanical trades in order to establish and maintain clearances with a minimum of conflict.

E. Refer to Acoustical Materials Bulletin LXXII (1962) for installation and materials standards.

F. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

G. Hanger spacing to fall not more than 4'-0" o.c., not more than 2' 0" from ends, and not more than 4'-0” o.c. between ends of main runners and as required to support other work resting in or on ceiling. All four corners of all light fixtures must be supported with hanger wire.

H. The presence of a hanger wire within 3 inches of an expansion relief joint as called for in ASTM C636/C636M shall be required in addition to the requirements of the Building Code of New York State, Section 1613.

I. Where conditions prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

J. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

K. Do not eccentrically load system, or produce rotation of runners.

L. Perimeter Molding:
   1. Install edge molding at intersection of ceiling and vertical surfaces into bed of acoustic sealant at walls.
   2. Use longest practical lengths.
   3. Overlap and rivet corners.

4. Provide at junction with other interruptions.
5. To be same material and style as grid system.
6. To be manufactured by the same manufacturer as grid system.

M. Wall moldings shall be provided at the perimeter of all rooms and shall be securely fastened to walls or as indicated. Finish channel corner plates shall be used at all exterior corners. Channel flanges shall be cut, the web bent, and flanges overlapped to form interior corners.

3.03 INSTALLATION – ACOUSTIC UNITS

A. Install acoustic units in accordance with manufacturer's instructions.

B. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

C. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.

D. Lay directional patterned units one way. Fit border trim neatly against abutting surfaces.

E. Install units after above ceiling work is complete.

F. Install acoustic units level, in uniform plane, and free from twist, warp, and dents.

G. Cutting Acoustic Units:
1. Cut and field paint exposed edges to fit irregular grid and perimeter edge trim.
2. Cut and field paint exposed edges of field cut units.
3. Double cut and field paint exposed edges of tegular or recessed units.

3.04 CLEANING

A. Panel and trim shall be clean and without blemish at time of acceptance.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members.

C. Replace damaged and broken panels.

D. At the completion of the finished acoustical ceiling work, remove all rubbish from the building, leaving floors broom clean. Excess material, scaffolding, tools and other equipment shall be removed from the building and job site.

3.05 CONSTRUCTION TOLERANCES

A. Section 014500 - QUALITY CONTROL: Tolerances.

B. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

C. Local kinks or bends shall not be made in hanger wires as a means of leveling main runners. Wire hanger loops shall be tightly wrapped and sharply bent to prevent any vertical movement or rotation of the member within the loops.

D. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 095123

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Painting, sealing, and filling.

C. The work described in this section includes, but is not limited to the following:
   1. Concrete Block Walls.
   2. Miscellaneous walls and surfaces, as indicated on painting schedule, plans and details.
   3. Rough, finish, and PVC carpentry.
   4. Steel lintels and miscellaneous steel fabrications.
   5. Exposed pipes and conduits.
   6. All items provided by other specification sections and/or indicated on contract drawings that are not pre-finished or that are furnished in prime coats.

D. All sections or work referencing this section.

E. Items not included:
   1. Anodized aluminum or stainless-steel surfaces.
   2. Prefinished surfaces.
   3. Exposed pipes and booster pumps, see Section 099744.

1.02 REFERENCES

A. 6 NYCRR Part 205 “Architectural & Industrial Maintenance (AIM) Coatings of NYSDEC for VOC content.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2019.

C. ASTM D3359 - Standard Test Method for Rating Adhesion by Tape Test; 2017.

D. ASTM D7091 – Standard Practice for Nondestructive Measurement of Dry Film Thickness.

E. NACE (National Association of Corrosion Engineers) – Industrial Maintenance Painting.

F. NPCA (National Paint and Coatings Association) – Guide to U.S. Government Paint Specifications.

G. PDCA (Painting and Decorating Contractors of America) – Painting – Architectural Specifications Manual.

H. SSPC V1 (PM1) - Good Painting Practice: Painting Manual Volume 1; 2016.

I. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual Volume 2; 2021.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300 - SUBMITTALS.

B. Product Data: Provide data on all finishing products to be used.

C. Provide confirmation of compliance with 6 NYCRR Part 205 “Architectural & Industrial Maintenance (AIM) Coatings of NYSDEC for VOC content including removal of the quart exemption for some coatings.

D. Provide schedule indicating all surfaces to be painted, type of primer and finish paint, surface preparation and color to Architect prior to application. Provide manufacturers product number and description.

E. Samples:
   1. Submit two sets of paper chip samples, illustrating range of colors available for each surface finishing product scheduled.

F. Manufacturer’s Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

G. Submit material safety data sheets (MSDS).

H. Submit detailed daily reports upon Architect/Engineer’s request at any time during the project which are to include the following:
   1. The start date and time and the completion date and time of surface preparation to any item or zone. The item or zone (location) must be cleaned in this report.
   2. The start date and time and the completion date and time of each coat applied to any item or zone. The item or zone (location) must be clearly defined in the report.
   3. The ambient conditions recorded daily on site, every day of surface preparation, coating application, and curing applied coatings. Ambient conditions records shall include wet bulb temperature, dry bulb temperature, surface temperature, relative humidity, dew point, the time conditions were recorded, and the location where the conditions were taken. Also include the weather reported for the previous day and the weather forecasted for the following date of the dated report.

1.04 QUALITY ASSURANCE

A. The Contractor shall either verify in writing that he intends to apply the products listed or shall submit for approval a list of comparable materials of another listed approved manufacturer. This submittal shall include full identifying product names, descriptive literature, catalog numbers, and color samples.

B. Consideration will only be given to Suppliers who can demonstrate that their paint system complies with these specifications having had successful and documented experience of the size, quality, performance and reliability to that specified, and who can successfully demonstrate this criteria to the Architect/Engineer.

C. Manufacturer: Company specializing in manufacturing the products specified in this section with a minimum 5 years documented experience.

D. Applicator: Company specializing in performing the work of this section with minimum 5 years documented experience and approved by the manufacturer.

E. No claim by the Contractor as to the unsuitability or unavailability of any material specified, or his unwillingness to use same, or his/her inability to produce first class work with same, will be entertained.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Conform to the applicable code(s) for flame and smoke ratings requirements for finishes.

B. Conform and confirm compliance with 6 NYCRR Part 205 “Architectural & Industrial Maintenance (AIM) Coatings of NYSDEC for VOC content including removal of the quart exemption for some coatings.

C. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

D. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer. Do not apply exterior coatings when unfavorable weather conditions are forecast within 24 hours of application.

E. Apply exterior paint only when temperature exceeds 50 degrees F or as otherwise required by manufacturer and drying conditions are good and predicted to remain so for at least 24 hours.

F. Apply interior paint only when inside space and surface temperatures exceed 60 degrees F or as required by manufacturer and will be maintained above that point until paint has dried. Provide and maintain application temperatures for all finishes.

G. A 24-hour ambient monitor shall be required for all coating phases from surface preparation through complete cure for final coat for both interior and exterior work. The cost of the ambient monitor shall be borne by the Contractor. The ambient monitor or approved equal must be capable of recording dry bulb, relative humidity, dew point, and surface temperature at 15-minute intervals for the duration stipulated above.

H. Provide minimum lighting levels of 80-foot candles (860 1x) measured mid-height at substrata surface.

1.06 DELIVERY, STORAGE AND PROTECTION

A. Deliver, store and handle products under the provisions of Section 016500 - PRODUCT DELIVERY, STORAGE, AND HANDLING.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

C. Container label to include manufacturer’s name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

D. Store paint at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer’s instructions.

E. Do not allow product to freeze.

1.07 PROJECT CONDITIONS

A. Section 013100 - PROJECT MANAGEMENT AND COORDINATION.

B. Sequence application to the following:
   1. Do not apply finish coats until paintable sealant is applied.
   2. Do not apply sealant or primer until surfaces are properly prepared.

1.08 EXTRA MATERIALS

A. Furnish under provisions of Section 017800 - CLOSEOUT SUBMITTALS. Supply minimum 1 gallon of each color, type, and surface texture used; store where directed.

B. Label each container with color, type, texture, room locations, in addition to the manufacturer's label.

1.09 PROTECTION OF OTHER WORK

A. The Contractor shall furnish and lay drop cloths in all areas where painting is being done to protect floors and other work from damage. Contractor shall be responsible for any damage to other work and shall replace any materials which have been damaged to such an extent that they cannot be restored to their original condition.

B. Protect all finished surfaces by covering or by removing and replacing, in case of small items such as hardware.

1.10 JOB CONDITIONS

A. Before painting is started in any area, the area shall be cleaned, and excessive dust shall be removed from all areas to be painted. After painting operations begin in a given area, clean only with commercial vacuum cleaning equipment.

B. Adequate illumination and ventilation shall be provided in all areas where painting operations are in progress.

1.11 INSPECTION OF SURFACES

A. Before starting any work, surfaces to receive paint finish shall be examined carefully for defects which cannot be corrected by the procedures specified herein and which might prevent satisfactory painting results. Work shall not proceed until such damages are corrected.

B. The commencing of work shall be construed as acceptance of the surfaces, and thereafter this Contractor shall be fully responsible for satisfactory work as required herein.

1.12 COOPERATION WITH OTHER TRADES

A. This work shall be scheduled and coordinated with other trades and shall not proceed until other work and/or job conditions are as required to achieve satisfactory results.

B. The Contractor shall examine the specifications for the various other trades and shall thoroughly familiarize himself with all their provisions regarding painting. All surfaces that are left unfinished by the requirements of other sections except "Items not Included" in this Section, shall be painted or finished as part of the work covered by this Section.

PART 2 - PRODUCTS

2.01 MANUFACTURERS - PAINT

A. The following requirements listed in this specification are based upon products as manufactured by Tnemec and Sherwin-Williams and are provided as the standard of quality for the basis of the bid. Substitutions shall be considered during bidding as stipulated in Section 002113. Coating substitutions shall be permitted only after receiving written approval from the Architect/Engineer prior to bid.

2.02 PAINT MATERIAL

A. Refer to the attached schedule for a listing of the appropriate surfaces for each paint material. The following are the types of materials that shall be used:

1. Modified Aromatic Polyurethane Primer:
   a. Tnemec Series 1 Omnithane or Sherwin-Williams B65G11 Corothane I Galvapak 1K Zinc Rich Primer.
2. Polyamidoamine Epoxy:
   a. Tnemec Series V69 Hi-Build Epoxoline II or Sherwin-Williams Macropoxy 5500LT Potable Water Epoxy (limited colors only) or Macropoxy 646-100 Fast Cure Epoxy.
3. Aliphatic Acrylic Polyurethane:
   a. Tnemec Series 73 or 1095 Endura-Shield or Sherwin-Williams B65J-300 Series Hi-Solids Polyurethane 250 (OTC 2 VOC Compliant).
4. 100% High Solids, Hi-Build Amine Epoxy:
   a. Tnemec 280 Tneme-Glaze or Sherwin-Williams B62-210 Dura-Plate UHS
5. Waterborne Cementitious Acrylic Filler:
   a. Tnemec Series 130 Envirofill or Sherwin-Williams B42W200 Cement-Plex 875 Cementitious WB Block Filler.
6. Self-Crosslinking Hydrophobic Acrylic:
   a. Tnemec Series 115 Uni-Bond DF or Sherwin-Williams B66W1 DTM Primer/Finisher.
7. HDP Acrylic Polymer:
   a. Tnemec Series 1028 Enduratone or Sherwin-Williams B66-350 Sher-Cryl HPA High Performance Acrylic Gloss.

B. Colors shall be as selected by the Owner and Architect/Engineer.

C. Gloss levels for paints required are as follows (ref. National Paint & Coatings Association - NPCA):

Sheen Level	Test Method	Gloss Range
Flat	85-degree meter	Below 15
Eggshell	60-degree meter	5 to 20
Satin	60-degree meter	15 to 35
Semi-gloss	60-degree meter	30 to 65
Gloss	60-degree meter	Over 65

D. Coatings shall be ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogenous coating, good flow, and brushing properties, capable of drying or curing free of streaks or sags.

2.03 MIXING

A. Mixing or tinting shall be done at factory.

B. Site mixing will be prohibited.

2.04 APPLICATION EQUIPMENT

A. Application equipment items are not required to be new, but they shall be adequate and commensurate for the work and workmanship required herein.

2.05 ACCESSORIES MATERIALS

A. Provide all required ladders, scaffolding, drop cloths, makings, scrapers, tools, sandpaper, dusters, cleaning solvents, and remove waste as required to perform the work and achieve the results specified herein. Materials not specifically indicated but required to achieve the finishes specified shall be of commercial quality and as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify the surfaces and substrate conditions are ready to receive Work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop applied primer for compatibility with subsequent cover materials. Test area must be approved by the Architect/Engineer or Architect/Engineer's representative.

E. Do not begin work until surfaces to receive paint are dry, firm, sound, clean and free of defects or blemishes which would adversely affect the quality or appearance of the finished work.

F. Verify items are ready to receive finishes. Beginning of work means Contractor accepts existing substrata and surface conditions.

G. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Masonry and Stucco: 8 percent.
   2. Wood: 19 percent, measured in accordance with ASTM D2016.

3.02 PREPARATION - GENERAL

A. Protect finished surfaces and equipment.

B. Correct defects and clean surfaces which affect work of this section. Remove any coatings that exhibit loose surface defects.

C. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

D. Galvanized Surfaces: Remove surface contamination and oils as per SSPC SP-1 solvent cleaning. Apply coat of etching primer.

E. Uncoated Ferrous Surfaces: Remove scale as per SSPC SP11 power tool clean to bare metal. Apply treatment of phosphoric acid solution. Prime paint after repairs.

F. Shop Primed and Existing Previously Painted Steel Surfaces: Sand and scrape to remove loose paint and rust, power tool clean, feather edges; clean surfaces with solvent. Prime bare steel surfaces.

G. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, fittings, and all other surfaces to be protected from paint prior to preparing surfaces or finishing.

H. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.

I. Follow specifications or manufacturer's recommendations for preparing surfaces to be primed and painted, the more stringent shall apply.

J. Mask, cover or remove surfaces to be protected from paint. Protect electrical, plumbing, and mechanical equipment and systems not to be painted.

K. Provide adequate lighting.

L. Clean and sand surfaces to be painted.

M. Clean and remove scale, oil, or grease from ferrous metal surfaces.

3.03 EXAMINATION – ADDITIONAL REQUIREMENTS

A. Before painting is started in any area, the area shall be cleaned, and excessive dust shall be removed from all areas to be painted. After painting operations begin in a given area, clean only with commercial heavy-duty vacuum cleaning equipment.

B. Adequate illumination and ventilation shall be provided in all areas where painting operations are to take place.

C. Before starting any work, surfaces to receive paint finish shall be examined carefully for defects which cannot be corrected by the procedures specified herein and which might prevent acceptable painting results. Work shall not proceed until such damages are corrected.

D. The commencing of work in a specific area only shall be construed as acceptance of the surfaces, and thereafter the Contractor' applicator shall be fully responsible for satisfactory work as required herein.

3.04 PREPARATION – ADDITIONAL REQUIREMENTS

A. All surfaces shall be prepared as specified in the attached schedule. Surface preparation of steel shall be in accordance with SSPC Standards - Surface Preparation Specifications.

B. Masonry: All joints shall be tooled slightly concave. After erection, all mortar splatter shall be removed, and all voids and holes shall be patched and leveled flush with the surrounding surfaces and be bagged to simulate surrounding texture. All masonry shall be installed with the intent that it will be painted.

C. Surface appurtenances: If allowed by the Architect/Engineer, remove or mask electrical plates, hardware, light fixture trim, escutcheons, fittings, and all other surfaces to be protected from paint prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces, which affect work of this Section. Remove or repair existing coatings that exhibit surface defects.

E. Do not paint over UL Labels, manufacturer installed equipment nameplates, factory installed nameplates and equipment identification plates.

3.05 APPLICATION

A. Application of paint shall be in accordance with SSPC - Good Painting Practices.

B. It is the intent that the above brand names and types of material will give complete coverage with uniform appearance. If any additional coat is necessary for complete coverage and appearance, it shall be done at no additional cost.

C. All paints to be new stock, delivered to job unopened. Prepare surfaces properly for receiving paint; protect adjacent surfaces not to be painted.

D. All work shall be carefully done by skilled mechanics. Finished surfaces to be uniform in thickness, coverage, gloss, finish, and color, and free from brush marks. All coats shall be thoroughly dry before applying succeeding coats.

E. Apply products in accordance with manufacturer's instructions. Do not apply finishes to surfaces that are not dry.

F. Do not apply finish coats until paintable sealant is applied.

G. Do not apply sealant or primer until surfaces are properly prepared.

H. All coatings in multiple coats shall be in contrasting color to each coat with final finish coat chosen by Owner.

I. Spray, roller and/or brush may be used as appropriate for the various conditions, but the specified dry film thicknesses must be provided.

J. Thicknesses listed in the Schedule for High Build Coatings can be obtained in one coat by spray, but not necessarily by brush or roller.

K. The specified DFT shall hold precedence over whatever recommendations are made for other supplier's products.

L. Minimum air and surface temperature for application of epoxy coatings shall be maintained at 60 degrees F unless otherwise approved by the Architect/Engineer.

M. Minimum air and surface temperature for 100% solids by volume epoxy coatings shall be 70 degrees F. Optimum temperature of unopened 100% solids epoxy shall be 75 degrees F. Minimum temperature of unopened 100 solids epoxy shall be 60 degrees F.

N. Heat and dehumidification shall be supplied by equipment that delivers clean, warm, dry air into the space to be coated. Heat shall not be supplied by devices that give off exhaust fumes such as carbon dioxide or carbon monoxide into the area to be coated.

O. Sand surfaces lightly between coats to achieve required finish.

P. Vacuum clean surfaces to remove all particles. Use tack cloth to remove dust and particles just prior to applying next coat.

Q. Prime concealed surfaces and cut ends of interior and exterior woodwork with primer paint.

R. Apply materials to obtain:
   1. Owners and Architect/Engineer's satisfaction and approval.
   2. Smooth uniform appearance.
   3. Complete coverage.
   4. Match with approved color sample.
   5. Work free of runs, sags, and skips.
   6. Sharp, clean edges where finishes or colors change.
   7. Surfaces free of defects and damage at time of acceptance.

S. Fill nail holes and cracks after prime coat. Fill minor imperfections prior to final coats.

T. Sand metal, wood, and drywall between coats.

U. Paint PVC pipe in accordance with recommendations of the paint manufacturer and apply primer.

3.06 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint shop primed equipment.

B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are shop finished.

D. Paint exposed conduit and electrical equipment occurring in finished areas.

E. Paint both sides and edges of plywood backboards of electrical and telephone equipment before installing equipment.

F. Color code equipment, piping, conduit, and exposed duct work in accordance with other Sections.

3.07 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under the provisions of Section 014500.

B. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
   1. If test results show that dry film thickness of applied coating does not comply with specifications or coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with specifications and coating manufacturer's written recommendations.

C. The Architect/Engineer will inspect the painting/coatings as it is being performed.

D. The Architect/Engineer reserves the right to accept each phase of the work before further work may be conducted, to halt all work deemed to be improper or not in compliance with project specifications, and to require the Contractor to promptly correct all improper practices or deficient work. Contractor shall notify the Architect/Engineer’s representative 24 hours minimum prior to the following inspection hold points:
   1. Prior to and upon completion of any work the Architect/Engineer reserves the right to accept or reject each phase of the work before further work may be conducted.
   2. Prior to the delivery and upon receiving of materials, equipment, supplies, or personnel.
   3. Prior to and upon completion of any installation of permanent and nonpermanent items on the project.
   4. Prior to the start of work (of any item).
   5. Upon completion of work (of any item).
   6. Prior to the installation of containment or masking.
   7. Upon completion of the removal of containment or masking.
   8. Prior to the start of surface preparation (of any section, zone, or area).
   9. Upon completion of surface preparation (of any section, zone, or area).
   10. Prior to the application of any coating or lining (of any section, zone, or area).
   11. Upon completion of application of any coating or lining (of any section, zone, or area).
   12. Following the curing of any coating or lining (of any section, zone, or area).
   13. Prior to the dismantling or removal of the containment.
   14. Upon the completion of the dismantling or removal of the containment.

15. Prior to the dismantling or removal of any ladders, scaffolding, or fabricated access work platforms.
16. Prior to and upon completion of disinfection.
17. Prior to and upon completion of any sampling or testing.

E. The Architect/Engineer reserves the right to conduct both destructive and nondestructive testing at any time for inspection or evaluation purposes. The Contractor shall repair any areas damaged by testing at no additional cost. For purposes of bidding, the Contractor shall expect to repair six (6) tested areas.

3.08 PROTECTION

A. Protect adjacent areas from splattering of paint.

B. Protect painted coating from damage or discoloration until project is accepted by Owner.

3.09 CLEAN UP

A. Clean work under the provisions of 017423 - CLEANING.

B. Collect waste materials, which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

C. Install finished items removed by this Section. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

D. Remove masking and protective covering.

E. Leave factory finish surfaces clean and free of paint.

F. Clean adjacent area of any paint not scheduled to receive painted coating.

G. Remove tools, rubbish, equipment, and unused material.

3.10 SCHEDULE

A. Ferrous Metals, Interior (including, but not limited to, structural AND miscellaneous steel)
   1. Shop Surface Preparation - SSPC-SP6/NACE No.3, Commercial Blast Cleaning.
   2. Field Surface Preparation - SSPC-SP1 “Solvent Cleaning” and “Low Pressure Water Clean” (as necessary) in accordance with SSPC-SP WJ-4 / NACE WJ-4 to remove all forms of surface contamination and any formations of zinc oxide. Power tool clean all damages to shop applied primer in accordance with SSPC-SP3 “Power Tool Cleaning” and apply spot coat of designated field primer.
   3. Shop Primer – Series 1 Omnithane at 2-3 mils or S-W Corothane I Galvapak 1K Zinc Primer at 3-4 mils.
   4. Field Primer – Series V69 Epoxoline II at 3-5 mils or S-W Macropoxy 5500LT Potable Water Epoxy at 3-5 mils in finish color.
   5. Finish (2 coats) – Series V69 Epoxoline II at 3-4 mils each or S-W Macropoxy 5500LT Potable Water Epoxy at 3-5 mils in finish color.

B. Ferrous Metals, Exterior (including, but not limited to, structural AND miscellaneous steel)
   1. Shop Surface Preparation - SSPC-SP6/NACE No.3, Commercial Blast Cleaning.
   2. Field Surface Preparation - SSPC-SP1 “Solvent Cleaning” and “Low Pressure Water Clean” (as necessary) in accordance with SSPC-SP WJ-4 / NACE WJ-4 to remove all forms of surface contamination and any formations of zinc oxide. Power tool clean all

damages to shop applied primer in accordance with SSPC-SP15 “Commercial Grade Power Tool Cleaning” and apply spot coat of designated field primer.

3. Shop Primer – Series 1 Omnithane at 2-3 mils or S-W Corothane I Galvapak 1K Zinc Primer at 3-4 mils.
4. Field Primer – Series 1 Omnithane at 2-3 mils or S-W Corothane I Galvapak 1K Zinc Primer at 3-4 mils.
5. Field Intermediate – Series V69 Epoxoline II at 3-5 mils or S-W Macropoxy 5500LT Potable Water Epoxy at 3-5 mils in finish color.
6. Finish (2 coats) – Series 73 Endura-Shield III at 2-3 mils or S-W B65J-300 Series Hi-Solids Polyurethane 250 Aliphatic Polyurethane at 3-5 mils each.

C. Galvanized Metals
1. Surface Preparation – Per manufacturer’s recommendations
2. Prime Coat – Series 115 Uni-Bond DF at 2-4 mils or S-W B66W1 DTM Primer/Finisher at 2-4 mils.
3. Finish (2 Coat) - Series 1028 Enduratone at 2-3.5 mils or S-W Sher-Cryl HPA at 2-3.5 mils each.

D. Masonry Block Walls, Interior
1. Surface Preparation - Remove all loose mortar, mortar splatter and mortar protrusions. Ensure all surfaces are dry and free of dust and other construction residues. Allow curing for 28 days.
2. Block Filler – Series 130 Envirofill, 60-80 sf/gal or S-W Cement-Plex 875 Cementitious Acrylic WB Block Filler, 50-100 sf/gal.
3. Finish (2 coats) – Series 280 Tneme-Glaze at 7.0-10.0 mils or Dura-Plate UHS at 7.0-10.0 mils each. Finish surface shall be uniformly smooth to the touch, free of voids, holidays, and cleanable.

E. PVC Millwork and Trim
1. Surface Preparation – SSPC-SP1 “Solvent Cleaning” followed by abrasive sanding.
2. Field Primer – Series 115 Uni-Bond DF at 2.0-4.0 mils DFT or S-W B66W1 DTM Primer/Finisher at 2.5-5.0 mils.
3. Finish (2 coats) – Series 1028 Enduratone at 2.0-3.0 mils DFT or S-W B66 Series DTM High Performance Acrylic Semi-Gloss at 2.5-4.0 mils DFT each.

F. Exposed Pipes and Conduits, Metal Doors and Frames, Mechanical Grilles, Convectors, etc.
1. Surface Preparation – SSPC-SP1 “Solvent Cleaning” followed by abrasive sanding.
2. Field Primer – Series 115 Uni-Bond DF at 2.0-4.0 mils DFT or S-W B66W1 DTM Primer/Finisher at 2.5-5.0 mils.
3. Finish (2 coats) – Series 1028 Enduratone at 2.0-3.0 mils DFT or S-W B66 Series DTM High Performance Acrylic Semi-Gloss at 2.5-4.0 mils DFT each.

END OF SECTION 099100

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Exterior coating.

C. Piping, Valves and Fittings.

1.02 RELATED SECTIONS

A. Section 013300 - Submittals

B. Section 016100 - Basic Product Requirements

C. Section 016500 - Product Delivery, Storage and Handling

D. Section 221113 - Facility Piping

E. Section 402323 - Large Piping and Fittings

F. Section 402324 - Valves and Valve Accessories

1.03 REFERENCES

A. ANSI/NSF 61 - Drinking Water System Components - Health Effects

B. AWWA - C115 - Standard for Flanged Pipe

C. NACE No. 2/SSPC SP10 - Near-white Blast Cleaning.

D. NACE No. 3/SSPC SP6 - Commercial Blast Cleaning.

E. SSPC PA - 1 - Shop, Field, and Maintenance Painting of Steel

F. SSPC PA 2 - Method for Measuring of Dry Paint Thickness with Magnetic Gages

G. SSPC VOL 1 - Good Painting Practices - 2002 4th Edition latest edition

H. SSPC VOL 2 - Systems and Specifications - 2005 Edition latest edition

I. SSPC SP 3 - Power Tool Cleaning

J. SSPC SP 2 - Hand Tool Cleaning

K. SSPC VIS 1-89 - Visual Standard for Abrasive Blast Cleaned Steel.

L. ASTM D4417–03 – Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel

M. ASTM E1216-99(2005) - Standard Practice for Sampling for Particulate Contamination by Tape Lift

N. AMPP SP0188-99 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

O. 6 NYCRR Part 205 "Architectural & Industrial Maintenance (AIM) Coatings of NYSDEC for VOC content.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide material data sheets (MDS) and material safety data sheets (MSDS), issued by the manufactures, for all materials and accessories that are to be used.

C. Samples: Provide a color chart for paint color selection by the Owner and Engineer for approval prior to all aspects of painting.

D. Manufacturer's instructions: Indicate surface preparation and paint application.

E. Submit a detailed plan on the method(s) to be employed to protect adjacent equipment and surfaces including, but not limited to, the following:
   1. Method of surface preparation.
   2. Method of paint application.
   3. Quality Control Plan for all phases of construction operations.

F. Submit detailed daily reports weekly, to include the following:
   1. The daily work location, date, start time and finish time, ambient conditions including wet bulb temperature, dry bulb temperature, and steel surface temperature, including hold point inspection observations.
   2. All surface preparation operations including location, date, start time and finish time.
   3. The date, start time and finish time for all painting operations, including location, wet bulb temperature, dry bulb temperature, and steel surface temperature, of the each coat applied.
   4. The name, type, batch numbers, manufacturer's name and amount of coatings used for each application.

G. The Contractor shall submit to the Engineer letters from manufacturers certifying that the paint being supplied for this project conforms completely to specifications.

1.05 REGULATORY REQUIREMENTS

A. All coatings shall comply with VOC regulations as promulgated by the Ozone Transport Commission, effective January 2005.

B. Industrial and Architectural coatings are subject to Article 19 of the New York State Environmental Conservation Laws (ECL) and the provisions of the regulation promulgated thereunder, 6NYCRR Part 205, Industrial and Architectural Coatings.

C. All coatings shall comply with 6 NYCRR Part 205 "Architectural & Industrial Maintenance (AIM) Coatings of NYSDEC for VOC content.

1.06 CERTIFICATES

A. The Contractor shall submit to the Engineer, immediately upon completion of the job, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces.

B. Industrial and Architectural coatings are subject to Article 19 of the New York State Environmental Conservation Laws (ECL) and the provisions of the regulation promulgated thereunder, 6NYCRR Part 205, Industrial and Architectural Coatings.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to the site under provisions of Sections 016100 and 016500.

B. All materials furnished by the Contractor shall be brought to the job site in the original sealed and labeled containers of the paint manufacturer and shall be subject to inspection by the Engineer.

C. Every container of coatings materials shall have the batch number imprinted on the can, as well as the Federal Specification Number. Colors, where not specified, shall be as selected by the Engineer or Owner.

D. Store all materials as recommended by the manufacturer. Any materials stored improperly shall be removed from the site immediately. Maintain storage location and temperature log at storage site available for inspection.

E. The Contractor shall supply the Owner with two (2) one gallon paint kits of each of the exterior, intermediate and finished coats in each color.

1.08 WARRANTY

A. Provide a 1-year labor and manufacturer's materials warranty for the coating systems.

B. Warranties are to be submitted in writing to the Engineer prior to product delivery.

C. Any defects, failures, breakdowns, or discrepancies of the paint or coatings, that reveal themselves within the 1-year warranty period after acceptance of work shall be promptly repaired at no additional cost to the Owner.

D. Touch up procedures shall be issued by the engineer for areas of coating defects, breakdowns, or discrepancies to be repaired, only if the accumulative areas are less than five square feet, or if the engineer permits.

E. Remove the entire coating in the area where failure occurs. Touch-up work will not be permitted. The surface is to be prepared as originally scheduled.

PART 2 - PRODUCTS

2.01 COATING REQUIREMENTS

A. All coating systems submitted for use shall be new for the project described. Two component coating materials shall be mixed in accordance with the manufacturer's data sheet. No partial kits shall be permitted to be used.

B. All coating systems submitted for use shall conform and meet the minimum requirements specified by the Engineer for:
   1. Adhesion - ASTM-D-3359 and 4541
      a. Minimum 900 psi as measured with a Type 2 tester
   2. Hardness - ASTM-D-3363, 2583, and 2240
      a. Exterior Finish Coating - No gouging or scratching with an 8H or less pencil

3. Flexibility - ASTM-D-522 and FED-STD-6221
   a. Exterior Finish Coating - No less than 34% elongation, average of three tests
   b. Impact Resistance - ASTM-D-2754
   c. Exterior Coating - No visible cracking or delamination of film after 34 inch pounds or less direct impact.
4. Abrasion Resistance - ASTM-D 968 and 4060
   a. No More than 100 mg loss after 1000 cycles

2.02 MANUFACTURERS

A. TNEMEC COMPANY, INC

B. SHERWIN WILLIAMS

C. Coating substitutions shall be permitted only after receiving written approval from the Engineer prior to bid.

2.03 MATERIALS - CARBON STEEL AND BLACK IRON PIPING

A. TNEMEC Paint System - Three full coats, one stripe coat.
   1. Tnemec Series 94H2O, Hydro-Zinc, 2.5 - 3.5 mils DFT
   2. Tnemec Series 138 Protuff, Stripe Coat (Contrasting Color)
   3. Tnemec Series 138 Protuff, 3.0 - 5.0 mils DFT
   4. Tnemec Series 1094 Endura Shield, 2.5 - 5.0 mils DFT

B. SHERWIN WILLIAMS Paint System - Three full coats, one stripe coat.
   1. Sherwin Williams Corothane 1 Galvapac 1K Zinc Primer, 2.5 - 3.5 mils DFT
   2. Sherwin Williams Macropoxy 646 Fast Cure Epoxy Stripe Coat (Contrasting Color)
   3. Sherwin Williams Macropoxy 646 Fast Cure Epoxy, 3.0 - 5.0 mils DFT
   4. Sherwin Williams Hi-Solids Polyurethane 250, 2.5 - 5.0 mils DFT

2.04 MATERIALS - DUCTILE IRON PIPING

A. TNEMEC Paint System - Two full coats, one stripe coat.
   1. Tnemec Series 138 Protuff, Stripe Coat (Contrasting Color)
   2. Tnemec Series 138 Protuff, 4.0 - 6.0 mils DFT
   3. Tnemec Series 1094 Endura Shield, 3.0 - 5.0 mils DFT

B. SHERWIN WILLIAMS Paint System - Two full coats, one stripe coat
   1. Sherwin Williams Macropoxy 646 Fast Cure Epoxy Stripe Coat (Contrasting Color)
   2. Sherwin Williams Macropoxy 646 Fast Cure Epoxy, 4.0 - 6.0 mils DFT
   3. Sherwin Williams Hi-Solids Polyurethane 250, 3.0 - 5.0 mils DFT

2.05 MATERIALS - PVC & COPPER PIPING (CHEMICAL PROCESS)

A. TNEMEC Paint System - Two full coats
   1. Tnemec Series 115 Uni-bond, 2.0 - 4.0 mils DFT
   2. Tnemec Series 1029 Enduratone, 2.0 - 3.0 DFT

B. Sherwin Williams Paint System - Two full coats
   1. Sherwin Williams DTM Primer/Finish, 2.5 - 5.0 mils DFT
   2. Sherwin Williams DTM Acrylic Semi-Gloss, 1.5 - 2.5 mils DFT

2.06 ACCESSORIES

A. Seam Sealer/Caulk: Shall be as recommended by the coating manufacturer.

2.07 TESTING

A. The Engineer shall have the right to take random samples of paint from the painter's bucket as it is being applied to the steel structure, tank or mechanical piping. These samples will be sent to the paint manufacturer for analysis to determine constituents and type of coating.

B. No material of any kind shall be used until it has been inspected and accepted by the Engineer. All materials rejected shall be immediately removed from the work and not again offered for inspection.

2.08 ACCESSORY MATERIALS

A. Provide all required ladders, scaffolding, drop cloths, maskings, scrapers, tools, sandpaper, cleaning solvents, and remove waste as required to perform the work to achieve the results specified herein. Materials not specifically indicated but required to achieve the finishes specified shall be of commercial quality and as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor shall verify existing ambient condition and substrate conditions prior to proceeding with any work and submit to Engineer/representative prior to requesting Engineer's/representative's verification.

B. Contractor shall verify substrate is properly prepared, properly cleaned, and or properly coated in accordance with project specifications prior to proceeding with any additional work and prior to requesting Engineer's/representative's verification.

C. Should the contractor request verification from Engineer/representative and work is not in conformance with requirements contractor shall pay $500 per occurrence to cover the costs to the owner.

3.02 PREPARATION - GENERAL

A. Surface Preparation Schedule:
   1. Carbon Steel: Shall be abrasive blast cleaned to SSPC SP-6 (commercial blast cleaning) to achieve an angular surface profile between 1.5 - 3 mils.
   2. Ductile Iron (red factory primer): All damaged primer and or connections shall be cleaned to SSPC SP-3 (Power Tool Cleaning) Power Tool Cleaning shall be via MBX Bristle Blaster, or approved equal.
   3. Galvanized Steel: Shall be cleaned in accordance with SSPC SP-1 (Solvent Cleaning) and may also require SSPC SP-7 (Brush off Blasting) as deemed necessary by the engineer or owner.
   4. Copper & PVC: Shall be cleaned in accordance with SSPC SP-1 (Solvent Cleaning) and SSPC SP-2 (Hand Tool Cleaning) to achieve a uniformly scarified surface.

B. Cleaned surfaces, when viewed without magnification, shall be free of all visible paint oil, grease, dirt, mill scale, rust, oxides, corrosion products and other foreign matter as noted in Chapter 2, SSPC Painting Manual Volume 2.

C. Pit filler shall be applied to all voids that are greater than ¼ of the original steel surface thickness.

D. The pit filler shall be applied prior to the application of the first coat and in accordance with manufacturer's instructions. If the manufacturer's instructions differ from the project specifications, the more stringent will apply.

E. All areas shall be cleaned prior to any coating application. All surfaces to be painted shall be dry.

F. Weld projections or irregular portions of welds, or any steel defects that would interfere with the proper coating shall be ground smooth, as directed.

3.03 APPLICATION

A. Apply coating in strict conformance with the manufacturer's instructions and requirements. If the manufacturer's instructions differ from the project specifications, the more stringent will apply.

B. Before coating is applied to surfaces, steps shall be taken, either by circulation of dry air or by the application of heat, to dry the metal surfaces completely.

C. No coatings shall be applied when the surface temperature is less than 5 degrees Fahrenheit (3 degrees Celsius) above the dew point.

D. No coatings shall be applied when the relative humidity is above 80% or as recommended by manufacturer. If the specifications differ from the manufacturer's recommendations, the more stringent shall apply.

E. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer. Do not apply exterior coatings when unfavorable weather conditions are forecast within 24 hours of application.

F. No surfaces shall be coated that are not in compliance with SSPC surface preparation standards or any other part of the project specifications.

G. All coatings shall be applied at the rate specified. Deficiencies in film thickness shall be corrected with the proper surface preparation and application of an additional coating or as directed by the Engineer. Coatings in excess of the specified range shall be corrected at the direction of the Engineer.

H. All coating applications shall be inspected and approved by the Engineer prior to the application of any succeeding coats. All coats shall be applied to the dry film thickness specified.

I. The minimum and maximum total dry film thickness shall be as indicated in this section. The Mil Gauge shall be calibrated in accordance with the National Institute of Standard and Technology. The Contractor shall have available on the job site a satisfactory magnetic type Mil Gauge for measuring film thickness.

J. A brush applied stripe coat, of different color, shall be applied to all weld seams, edges, seams, nuts, bolts, flanges, or any non conforming surfaces deemed necessary by the Engineer. The stripe coat shall be applied after the first coat but prior to the second coat.

K. The coating shall be applied as a continuous film of uniform thickness. Any holidays or areas missed in the application shall be recoated within the maximum re-coat time or be corrected

with the proper surface preparation and cleaning prior to the application of the subsequent coating.

L. All coatings that are specified shall only be acceptable in the number of coats specified in the contract documents.

M. Color Coding of Process Piping shall be in accordance with Ten States Standards as follows:

Service	**Color**
Raw Water	Olive Green
Potable Water	Dark Blue
Blowoff	Light Brown
Chlorine	Yellow
Drainage and Waste	Dark Gray

N. All applied coatings shall not exceed a 10-day re-coat window regardless of the number of coats, or the type of coating. If the re-coat window of any applied system is more than 10-days, the Contractor must take necessary steps to meet that re-coat window.

3.04 CLEANING

A. All surfaces shall be free of all dirt, oil, debris, or any other foreign matter prior to the application of any coating.

B. The Contractor shall maintain his work area in a neat, orderly fashion. Accumulation of debris, muck, rust, scale, etc., shall be frequently (not to exceed 1 week) cleaned up and removed from the site. Thinners used to clean equipment shall be held in sealed containers and removed from the site to an approved disposal area by the Contractor. Provide certificates from the disposal site indicating that the material has been properly disposed of.

C. Upon completion of the work, all excess material, rigging, empty containers, cables, tarps, etc., shall be removed from the site. Buildings and grounds shall be left in as good condition as when work was started.

3.05 FIELD QUALITY CONTROL

A. The Engineer will inspect the painting as it is being performed.

B. The Engineer reserves the right to accept each phase of the work before further work may be conducted, to halt all Work deemed to be improper or not in compliance with project specifications, and to require the contractor to promptly correct all improper practices or deficient work. Contractor shall notify the Engineer's/representative's 24 hours minimum prior to the following:
   1. Prior to the start of work
   2. Immediately following surface preparation
   3. Immediately prior to each coating or lining application
   4. Following the application of each coat
   5. Following the curing of the coating or lining

C. The Engineer reserves the right to conduct any testing, both destructive and nondestructive, at any time for inspection or evaluation purposes.

D. Any expenses incurred for corrective measures required as the result of improper practices and/or defective or deficient work shall be borne by the contractor and the extent of these corrective measures shall be at the discretion of the engineer.

E. The contractor shall provide safe access to all areas, including but not limited to, equipment, containers and spaces for inspection at any time as deemed necessary by the engineer or his representative

F. Sufficient lighting shall be provided to ensure proper safety conditions and permit inspection.

G. All manholes and other tank openings shall remain open as necessary during cleaning, painting and curing operations.

END OF SECTION 099744

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Building plaque.

B. Roof truss identification signage.

1.02 QUALITY ASSURANCE

A. Acceptable Manufacturers: Regularly engaged in production of signs, which meet project requirements for a minimum of five (5) years.

B. Provide manufacturer five (5) year warranty for building signage.

1.03 SUBMITTALS

A. Manufacturer's Instructions: Manufacturer's recommended installation instructions and procedures for care of finished surfaces for each product specified.

B. Shop Drawings/Manufacturer's Data:
1. Shop drawings showing sign locations on plans and corresponding sign schedule.
2. Details of fabrication and erection showing each product's materials and finishes.
3. Indicating color, type, spacing, text and style of letters; background and frame.

C. Samples: Submit a sample of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in manufacturer's original unopened protective packaging in accordance with Section 016500 - PRODUCT DELIVERY, STORAGE, AND HANDLING.

B. Identify contents, manufacturer, brand name and applicable standards.

C. Store in original packaging, off the ground and under protective covers.

D. Handle to prevent damage.

PART 2 - PRODUCTS

2.01 MANUFACTURER - BUILDING PLAQUE

A. U.S. Bronze, New Hyde Park, New York.

B. Or approved equal.

2.02 MATERIALS - BUILDING PLAQUE

A. Plaque: Cast Bronze, with spray lacquer finish, size as indicated on the drawings.

B. Font: Font and font size as indicated on the drawings.

C. Borders: Flat band bevel.

D. Background: Stipple.

E. Mounting: Concealed threaded rod; Grouted in place.

2.03 MATERIALS – ROOF TRUSS IDENTIFICATION SIGNAGE

A. Roof Truss Identification signage
   1. Reflective image
   2. UV, chemical, abrasion and moisture resistant
   3. Compliant with New York 19NYCRR Part 1264 requirements.
   4. Substrate: 0.040” aluminum with 1/8” mounting holes or flexible vinyl label stock with permanent adhesive.
   5. Signs shall be located at each exterior building entrance. Sign placement shall be compliant with New York 19NYCRR Part 1264 requirements requirements.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas scheduled to receive signs for conditions that would affect quality and execution of work.

B. Do not proceed with installation until defects are corrected.

3.02 INSTALLATION

A. Install sign and components at the locations indicated; securely mount with concealed theft-resistant fasteners. Attach signs to substrates in accordance with the manufacturer's instructions.

B. Install level, plumb, and at the proper height. Cooperate with other trades for installation of sign units to finish surfaces.

END OF SECTION 101416

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Right-to-know tank and chemical system signs.

B. Equipment Identification.

C. NYS CBS & SCDHS tank ID signage

1.02 REFERENCES

A. NFPA 704.

1.03 RELATION SECTIONS

A. Section 101416 - Building Signage

B. Section 220553 - Identification for Mechanical Piping & Equipment

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Seton Name Plate Co., New Haven, CT.

B. Approved Equal.

2.02 MANUFACTURED UNITS

A. Right to Know Signage:
   1. Interior signage shall be fiberglass.
   2. Exterior signage shall be suitable for outdoor installation and UV protected.
   3. Size 15 by 15 inches for exterior signage; 10 by 7 inches for interior signage.
   4. Mounting holes through sign or self adhesive for direct mounting on tank.
   5. List chemical identity, NFPA hazard warning and personal protective items that shall be used.
   6. Provide right to know signs for each of the following:

Chemical/Material	NFPA Rating	Quantity
Calcium Hypochlorite	2H, 0F, 0R, 0X	As indicated on plans
Diesel Fuel	1H, 2F, 0R	As indicated on plans

   7. Provide 14-inch by 10-inch fiberglass sign at each storage tank; Quantity - 2:
      a. Chemical being stored
      b. Facility name
      c. NYSDEC Chemical bulk storage number
   8. Provide NYS CBS & SCDHS tank ID signs for all chemical bulk storage tanks. Signs shall contain information including Facility name, NYSDEC CBS #, NYSDEC & SCDHS Tank ID#, Design Capacity and Working Capacity required by local and state regulations. Signs shall be installed directly on tanks indicating capacity of tank. Install at remote fill location (exterior) and on tank (interior).
   9. Provide No Smoking sign at entrance to the building and chemical room (exterior).
   10. Provide signs for tank indicating capacities and use. Install on tanks (interior).
   11. Provide interior identification signs for the following equipment:

a. Design capacity
b. Working capacity

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install identification signs on or immediately adjacent to tanks with stainless steel hardware and as directed by engineer/owner.

B. Install exterior warning signs at each entrance.

C. Use stainless steel hardware to mount signs on exterior walls. Engineer shall determine location of each sign adjacent to building entrance.

END OF SECTION 104300

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers and mounting clips.

B. Fire extinguisher identification decal.

1.02 REFERENCES

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

B. UL 299 - Dry Chemical Fire Extinguishers.

1.03 SUBMITTALS

A. Submit in accordance with Section 013300 - SUBMITTALS.
   1. Product Data:
   2. Extinguisher type, operational features, color.
   3. Materials, construction, features, dimensions and installation requirements.
   4. Building floor plans indicating the locations of the different types of extinguishers.

1.04 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017800 - CLOSEOUT SUBMITTALS.

B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 QUALITY CONTROL

A. Regulatory Requirements: Conform to NFPA 10 and local jurisdiction for requirements for extinguisher location and mounting.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients, unless protected with an anti-freeze charge.

1.07 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering Products that may be incorporated in the work include the following:
   1. J.L. Industries, Bloomington, MN (800) 554-6077.
   2. Larsen's Manufacturing Company, Minneapolis, MN (800) 527-7367.
   3. Potter-Roemer, Incorporated, Cerritos, CA (800) 366-3473.

4. Or approved equal.

2.02 MATERIALS

A. Dry Extinguisher: Provide multipurpose dry chemical type, UL 299; UL-rated 4-A: 60-B: C. 10-pound nominal capacity in enameled steel container at locations noted on plans.

B. Mounting Bracket: Provide surface mounted wall bracket mounting clips and all required accessories. Metal designed to prevent accidentally dislodging extinguisher, of size required for type and capacity of extinguisher specified. Bright chrome finish.

C. Identification: Decal complying with authorities having jurisdiction for style, size, spacing, and location.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify wall is finished and acceptable to receive bracket.

B. Verify location with Architect / Engineer in field before installation.

3.02 INSTALLATION

A. Install extinguisher and bracket in accordance with manufacturer's published instructions in locations required by authority having jurisdiction and where indicated by Architect / Engineer.

B. Mount brackets so top of extinguisher is maximum 54” above finished floor and bottom is a minimum of 12” above finished floor.

C. Install extinguisher clips plumb and level, secure rigidly in place.

D. Place extinguisher on clips.

E. Apply identification decal above fire extinguisher, size and location per local authority having jurisdiction.

END OF SECTION 104416

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe hangers for various installed pipe systems.

1.02 SUBMITTALS

A. Submit under provisions of Section 013300

1.03 REFERENCES

A. Underwriters Laboratories - UL Listing.

B. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel

C. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

D. ASTM A653 - Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process

E. ASTM A1011 - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability (Formerly ASTM A570)

F. MSS SP58 - Manufacturers Standardization Society: Pipe Hangers and Supports- Materials, Design, and Manufacture

G. MSS SP69 - Manufacturers Standardization Society: Pipe Hangers and Supports- Selection and Application

H. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices

1.04 QUALITY ASSURANCE

A. Steel pipe hangers and supports shall have the manufacturers name, part number, and applicable size stamped in the part itself for identification.

B. Hangers and supports shall be designed and manufactured in conformance with MSS SP 58.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Anvil International (Grinnell)

B. Cooper B-Line, Inc.

C. Carpenter and Patterson

D. Fee and Mason

E. Hilti

F. Elcen

G. Piping Technology and Products, Inc.

H. Or Approved Equal

2.02 MATERIALS

A. Pipe Hangers & Supports:
   1. All pipe hangers and supports for stainless steel piping systems shall be of stainless steel construction.
   2. All pipe hangers and supports for copper tubing piping systems shall be of stainless steel construction. Provide dielectric/isolation wrapping or pipe insulation where dissimilar metals meet.
   3. All pipe hangers and supports for black iron piping systems shall be of stainless steel construction. Provide dielectric/isolation wrapping where dissimilar metals meet.
   4. All pipe hangers and supports for PVC piping systems shall be of galvanized steel construction, except where piping is used for chemical treatment.
   5. All pipe hangers and supports for chemical lines including calcium hypochlorite shall be of stainless steel construction.
   6. All pipe hangers and supports for Rigid galvanized piping systems shall be of galvanized steel construction.
   7. All pipe hangers and supports for fiberglass piping systems shall be of galvanized steel construction.

B. Trapeze Hangers: Where three or more non-chemical lines of pipe run parallel, support them with galvanized trapeze hangers, Grinnell Figure 46. Trapeze to be supported by a minimum of two galvanized rods with Figure 60 washer plates. For top loading only.

C. Concrete Inserts: Anvil International Figure 282, MSS SP-58 (Type 18), galvanized, universal concrete inserts, adequately sized and correctly positioned to support full load operating systems.

D. C-Clamps: Anvil International Figure 86, MSS SP-58 (Type 23) galvanized with set screw and lock nut. Use these for attaching hangers to steel beams. Welding hanger rods to steel members is not permitted. Provide retaining clip for C-Clamps.

E. Malleable Beam Clamps: Anvil International Figure 218, MSS SP-58 (Type 30), galvanized. Use these for attaching hangers to bar joists. Provide retaining clip for all beam clamps.

F. Clevis Hangar (4" diameter Piping or Less): Anvil International Figure 67, MSS SP-58 (Type 5), galvanized. Use these for attaching hangers to bar joists, column or wall.

G. Clevis Hanger (4" diameter or Greater D.I. Piping): Anvil International Figure 590, MSS SP-58 (Type 1), galvanized.

H. Pipe saddle support: Pipe saddle with U-bolt and threaded pipe adjuster. Cooper B-Line Figure 318A, MSS SP-69 (Type 37), stainless steel. Pipe stand: Cooper B-Line Figure 316T, stainless steel.

I. All hangers and supports shall be UL Listed. Cooper B-Line Figure 318A & 316T,

J. Provide threaded rod in accordance with manufacturer instruction.

2.03 FINISHES

A. Indoor Finishes

1. Hangers and clamps for support of bare copper piping shall be coated with copper colored epoxy paint, B-Line Dura-Copper®. Additional PVC coating of the epoxy painted hanger shall be used where necessary.
2. Hangers for other than bare copper pipe shall be zinc plated in accordance with ASTM B633 OR shall have an electro-deposited epoxy finish.
3. Strut channels shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 OR have an electro-deposited green epoxy finish.

B. Outdoor and Corrosive Area Finishes (Chemical Room)
1. Hangers and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123. All hanger hardware shall be hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor or corrosive use.
2. Hangers, strut, and clamps located in corrosive areas shall be type 316 stainless steel with stainless steel hardware.
3. Provide dielectric/isolation wrapping in systems of dissimilar metals.

PART 3 - EXECUTION

3.01 SCHEDULES - HANGER SPACING

A. Copper Pipe
1. Not more than 10'-0" o.c.

B. S.S. Tubing
1. Not more than 10'-0" o.c.

C. Black Iron and Galvanized
1. 1/4 to 1-1/4 inches - 5'-0" o.c.
2. 2 to 2-1/2 inches - 8'-0" o.c.
3. 3-inches and above - 10'-0" o.c.

D. Ductile Iron Piping
1. As shown on contract drawings and not more than 10'-0" o.c.

E. PVC Pipe
1. 1/2 to 1-inch - 4'-0" o.c.
2. 11/4 to 8-inches - 5'-0" o.c.

F. Fiberglass Pipe
1. 1/2 to 1-inch - 4'-0" o.c.
2. 11/4 to 8-inches - 5'-0" o.c.

3.02 INSTALLATION

A. Support pipes on specified hangers so that equipment, pumps, and fittings do not bear weight of pipe.

B. Do not use perforated metal, strap iron, or band iron.

C. Do not make offsets in hangers.

D. Maximum allowable spacing of pipe hangers for horizontal piping is listed above. Space hangers and brackets at close intervals where necessary to maintain levels, slopes, and drainage, or to prevent sagging.

E. Place hangers within 12 inches of each horizontal elbow.

F. Use hangers with 1-1/2 inch minimum vertical adjustment.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Allow for forces imposed by expansion joints, satisfy structural requirements and maintain proper clearances with respect to adjacent piping, equipment and structures. Hangers for insulated pipes shall be sized to accommodate insulation thickness.

I. Keep the different types of hangers to a minimum and provide hangers that are neat, without complicated bolting and with the number of parts of each hanger and its anchor kept to a minimum.

J. Make accurate weight balance calculations to determine the required supporting forces at each hanger or support location and the pipe weight load at each equipment connection.

K. Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.

L. All hangers and supports that are not galvanized shall be painted or shop primed.

M. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation tape- B-Line Iso-pipe. Galvanized felt isolators sized for copper tubing may also be used, B-Line B3195CT.

N. Support horizontal cast iron pipe adjacent to each hub.

O. Install hangers to provide a minimum of 1/2 inch space between finished covering and adjacent work.

P. Provide neoprene protection where dissimilar metals come into contact.

Q. Maximum allowable spacing of pipe supports for vertical piping independently of connected horizontal piping. Support vertical pipes at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.

R. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified. Trapeze hangers shall be spaced according to the smallest pipe size, or install intermediate supports according to schedule.

S. Do not support piping from other pipes, ductwork or other equipment that is not building structure.
   1. Where horizontal piping movements are greater than 1/2 inch, or where the hanger rod angularity from the vertical is greater than four degrees from the cold to hot position of the pipe, the hanger pie and structural attachments shall be offset in such a manner that the rod is vertical in the hot position.

T. In the part of the building which is steel-framed, attach hangers to the building structural steel beams. Where hangers do not correspond with the building structural steel beams, provide supplemental steel members continuously welded or bolted to the building structural steel beams.

U. In the parts of the building which is a concrete structure, attach hangers to the concrete structure by installing anchors into the concrete.

END OF SECTION 220529

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This section describes the complete UL Listed, CSA Certified, or FM Approved system of heating cables, components, and controls to prevent pipes from freezing.

1.02 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide data on heating cable and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.03 QUALITY ASSURANCE

A. Perform work in accordance with all applicable UL, CSA and FM requirements.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Sections 016100 and 016500.

B. Do not store materials directly on the ground.

C. Protect all materials from natural elements and animals.

PART 2 PRODUCTS

2.01 HEAT TRACING

A. The self-regulating heating cable shall consist of two (2) 16 AWG nickel-copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature all along its length, allowing the heating cable to be cut to length in the field. The heating cable shall be covered by a radiation-crosslinked, modified polyolefin dielectric jacket. To provide a ground path and to enhance the heating cable’s ruggedness, the heating cable shall have a braid of tinned copper and an outer jacket of modified polyolefin, as required per section 427-23 of the NEC-1996. For installation on plastic piping, the heating cable shall be applied using aluminum tape (AT-180).

B. In order to conserve energy and to prevent overheating, the heating cable shall have a self regulating factor of at least 90 percent. The self-regulation factor is defined as the percentage reduction, without thermostatic control, of the heating cable output going from 40° F pipe temperature operation to 150° F pipe temperature operation.

C. The heating cable shall operate on line voltages of 120 volts single phase without the use of transformers.

D. The heating cable for metal-pipe freeze protection shall be sized according to the table below. The required heating cable output rating is in watts per foot at 50° F. (Heating cable selection based on 1 inch fiberglass insulation on metal piping.)

Pipe Size (inches)	**Minimum Ambient Temperature 0 degrees F**
<4	1 strip - 5 watts

12	2 strips - 5 watts

E. The heating cable shall be XL-Trace cable as manufactured by Raychem Corporation.

F. Power connection, end seal, splice, and tee kit components shall be applied in the field.

G. Heating cable circuit shall be protected by a ground-fault device for equipment protection. This requirement is in accordance with section 427-22 of the NEC-1996.

2.02 COMPONENTS

A. All heating-cable components shall be UL Listed, CSA Certified, or FM Approved for use as part of the system to provide pipe freeze protection. Component enclosures shall be rated NEMA 4X to prevent water ingress and corrosion. Installation shall not require the installing contractor to cut into the heating-cable core to expose the bus wires. Connection systems that require the installing contractor to strip the bus wires or that us crimps or terminal blocks, shall not be acceptable. All components that make an electrical connection shall be re-enterable for servicing. No component shall use silicone to seal the electrical connections. An exception will be made in areas where a conduit transition is required.

2.03 SYSTEM CONTROL

A. Thermostatic Control-Ambient Sensing: The system shall be controlled by an ambient sensing thermostat set at 40 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

A. System must be installed per manufacturer’s recommendations.

B. Position the heating-cable on the lower section of the piping to protect it from damage.

C. Provide the following minimum amount of additional footage of heating cable for the following heat sinks. Wrap heat sinks with heating cable as per the manufacturer’s recommendations.

Item	Feet per Item
Gate Valve	4.3
Butterfly Valve	2.0
Ball Valve	2.6
Globe Valve	3.9
Flanges	2.0 x pipe diameter (in feet)
Pipe Supports	3.0 x pipe diameter (in feet)

D. Apply the heating cable linearly on the pipe after piping has been successfully pressure-tested. Secure the heating cable to piping with cable ties or fiberglass tape.

E. Apply “Electric Traced” labels to the outside of the thermal insulation.

F. Do not mount ambient thermostats where they will be exposed to direct sunlight. If it is unavoidable, provide sunshields.

G. Apply heat tracing where shown on drawings and all places where pipe freezing may occur.

3.02 TESTS

A. After installation and before and after installing the thermal insulation, subject heating cable to testing using a 2500-Vdc Megger, Minimum insulation resistance shall be 20 mega-ohms or greater.

END OF SECTION 220533

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Stencils

B. Pipe markers

C. Tags

1.02 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Submit list of wording, symbols, letter size and color coding for mechanical identification.

C. Submit valve chart and schedule, including valve tag number, location, function and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures and installation.

PART 2 - PRODUCTS

2.01 STENCILS

A. Manufacturers:
   1. SETON NAMEPLATE CO., New Haven, CT, Model SPS.

B. Stencils: With clean cut symbols and letters of following size:
   1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
   2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
   3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.
   4. 8 to 16 inch (200-250 mm) Outside Diameter of Insulation or Pipe: 24 inch (600 mm) long color field, 2-1/2 inch (65 mm) high letters.
   5. Equipment: 2-1/2 inch (65 mm) high letters.

C. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

2.02 PIPE MARKERS

A. Manufacturers:
   1. SETON NAMEPLATE CO., New Haven, CT., Set Mark Pipe Markers.
   2. BUNTING, Pittsburgh, PA, Wrap-Mark.

B. Color: Conform to ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed. For the following piping systems:
   1. Water Service
   2. Drain
   3. Air Relief
   4. Blowoff water.
   5. Domestic water.
   6. Fuel Supply
   7. Fuel Return
   8. Sample Lines
   9. Pressure Sensing/Static Water Lines
   10. Calcium Hypochlorite injection lines

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mils (0.10 mm) thick, manufactured for direct burial service.

2.03 TAGS

A. Manufacturers
   1. SETON NAMEPLATE CO., New Haven, CT.
   2. Metal Tags: Brass with stamped letters.
   3. Tag Size Minimum: 1-1/2 inch diameter.
   4. Chart: Typewritten letter size.

B. Signage: Factory fabricated, flexible, semi-rigid plastic; minimum information indicating PID identification, contents, volume, installation date and right to know information, for the following piping systems:
   1. Tablet Chlorinator
   2. Fuel Tank

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with paint manufacturers recommendations.

3.02 INSTALLATION

A. Apply stencil painting in accordance with paint manufacturer’s application instructions.

B. Install plastic pipe markers in accordance with manufacturer's instructions at intervals of 8’-0” on center, or after any change in direction. Minimum of one marker per pipe section.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

E. Identify piping, concealed or exposed, with plastic pipe markers or stenciled painting. Use tags on piping 3/4 inch (20 mm) diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

F. Install tags with stainless steel/brass S hooks on corrosion resistant chain.

G. Identify valves in main and branch piping with tags.

END OF SECTION 220553

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe insulation.

B. Insulate piping as indicated on contract drawings.

1.02 REFERENCES

A. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

B. ASTM C533 - Specification for Calcium Silicate Block and Pipe Thermal Insulation.

C. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

D. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

E. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

G. ASTM E96 - Test Method for Water Vapor Transmission of Materials.

1.03 SUBMITTALS

A. Submit the following in accordance with the requirements contained in Section 013300:
   1. Product Data: Provide product description, list of materials and thickness for each
   2. Manufacturer's Installation Instructions: Indicate procedures that ensure acceptable workmanship and installation standards will be achieved.

1.04 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements contained in Section 016500.

B. Deliver, store and protect products in accordance with manufacturer's instructions.

C. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

D. Store insulation in original wrapping and protect from weather and construction activities.

E. Protect insulation against dirt, water, chemical, and mechanical damage.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

1.06 QUALITY ASSURANCE

A. Work of this Section shall be performed by persons experienced in the installation of the specified system.

B. If requested by the Engineer, submit documentation relative to the installer's qualifications. The Owner and Engineer may elect to visit the installer's previous work.

C. Submit at least three references who may be contacted regarding the installer's qualifications.

PART 2 PRODUCTS

2.01 ELASTOMERIC INSULATION - PIPING 4-INCHES AND GREATER

A. Manufacturers: Armacell Engineered Foams, ArmaTuff White or equal.

B. Insulation:
1. Flexible elastomeric, closed cell insulation with laminated painted composite exterior.
2. Sheet Thickness: 1-1/2” (non self-adhering).
3. Minimum Service Temperature: -297° F.
4. Maximum Service Temperature: 180° F.
5. Maximum Moisture Absorption: 0.2% by volume.

C. Insulation Adehsive:
1. Armaflex 520 or equal (adhere butt joints and seams only).

D. Insulation Tape:
1. ArmaTuff Seal Tape or equal.

E. Fire and Smoke Hazard Ratings: Class 1 and 2 jacketing materials, mastics, sealants and adhesives shall have a maximum flamespread rating of 25 and a maximum fuel contributed and smoke developed rating of 50 or less, when tested in accordance with ASTM E84 and UL723.

2.02 ELASTOMERIC INSULATION - PIPING LESS THAN 4-INCHES

A. Manufacturers: Armacell Engineered Foams, AP/Armaflex Black LapSeal or equal.

B. Insulation:
1. Flexible elastomeric, closed cell insulation with a self-seal system reinforced with lap seal tape.
2. Sheet Thickness: 1” (non self-adhering).
3. Minimum Service Temperature: -297° F.
4. Maximum Service Temperature: 220° F.
5. Maximum Moisture Absorption: 0.2% by volume.

C. Fire and Smoke Hazard Ratings: Insulation system shall have a maximum flamespread rating of 25 and a maximum fuel contributed and smoke developed rating of 50 or less, when tested in accordance with ASTM E84 and UL723.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed and dry.

C. Paint piping before insulation is installed. Painting shall be work of Section 099744.

3.02 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Minimum pipe insulation thickness shall be in accordance with New York State Energy Code requirements

C. Inserts and Shields:
   1. Application: All piping regardless of size.
   2. Shields: 304L Stainless steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping, and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Cork or other heavy density insulating material suitable for the planned temperature range.
   6. Neatly finish insulation at supports, protrusions, and interruptions.

END OF SECTION 220719

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Black iron piping, valves and accessories

B. Copper piping, valves and accessories

C. Galvanized piping and accessories

D. PVC piping, valves and accessories

E. Reinforced flexible tubing and accessories

F. Stainless steel piping, valves and accessories

G. Caps

H. Escutcheons

I. Pressure gauges

J. Pressure regulating valves

K. Relief valves

L. Solenoid valves

M. Vacuum breakers

1.02 RELATION SECTIONS

A. Section 220529 - Hangers and Supports for Piping

B. Section 220553 - Identification for Mechanical Piping and Equipment

C. Section 221119 - Plumbing Specialties

D. Section 331110 - Disinfection of Water Facilities

1.03 REFERENCES

A. ASME B16.3 - Malleable Iron Threaded Fittings

B. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings

C. ASME B16.23 - Cast Copper Alloy Solder - Joint Drainage Fittings -DWV

D. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV

E. ASME B31.3 - Process Piping

F. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

G. ASTM A120 - Pipe, steel, black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses

H. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service

I. ASTM A403 - Wrought Austenitic Stainless Steel Fittings

J. ASTM B42 - Seamless Copper Pipe

K. ASTM B88 - Seamless Copper Tube

L. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications

M. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

N. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120

O. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

P. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

Q. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)

R. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings

S. ASTM D2737 - Standard Specification for Polyethylene (PE) Plastic Tubing

T. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings

U. AWWA C800 - Underground Service Line Valves and Fittings

V. AWWA C901 - Polyethylene Pressure Pipe and Tubing, 1/3" to 3", for Water Service

1.04 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, hydrants and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with the local water utility company requirements.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016500.

B. Deliver and store items in shipping containers with labeling in place.

1.07 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017839.

B. Accurately record actual locations of piping mains, valves, connections and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

D. Provide manufacturer's standard warranty for all applicable items under provisions of Section 017800.

PART 2 - PRODUCTS

2.01 BLACK IRON PIPING, VALVES AND ACCESSORIES

A. Standard weight, Schedule 40, threaded ends, conforming to ASTM A53. Fittings shall be malleable iron, screwed type conforming to ASME B16.3.

B. Transitions from black iron to poly-tubing shall be made with barbed fittings and stainless clamps, or approved equal.

C. Ball Valves: All 316 stainless steel body, ball and retainer, reinforced RPTFE stem, seat and retainer seal, 304 stainless steel lever with vinyl grip, rated for 125 psi minimum working pressure, threaded connections, Series 76F-100-A Apollo Valve as manufactured by CONBRACO INDUSTRIES, INC.

D. Check Valves: All 316 stainless steel construction, including body, tail piece, guide and spring, glass filled RPTFE ball check, rated for 125 psi minimum working pressure, threaded connections, Series 62-100 Apollo Valve as manufactured by CONBRACO INDUSTRIES, INC.

2.02 COPPER PIPING, VALVES AND ACCESSORIES

A. All exposed small copper piping shall be Type "K" hard drawn copper tubing. All underground piping shall be soft annealed Type "K" copper tubing with compression fittings.

B. All brass valves and fittings installed on potable water supply piping shall be made of "low-lead" materials (UNS Copper Alloy C89833 or C89520) and have a maximum lead content of 0.25 percent by weight. All low lead brass fittings shall be stamped or embossed with a mark indicating that the product is manufactured from low-lead alloys.

C. Check valves shall be swing check renewable BUNA-N disc, all bronze, STOCKHAM Figure B-319Y (threaded end) or Figure B-309Y (solder end) - 250 to 300 psi non-shock water.

D. Ball valves for copper piping/tubing and galvanized piping shall be renewable reinforced Teflon seats, adjustable packing gland, non-blowout stem with run port opening. Ball valves shall be STOCKHAM Figure T or S-285 (threaded or soldered ends).

2.03 GALVANIZED PIPING AND ACCESSORIES

A. Galvanized piping shall be standard weight, Schedule 40, seamless, with threaded ends, conforming to ASTM A120. Fittings shall be galvanized cast iron, threaded, conforming to ASME B16.12.

2.04 PVC PIPING, VALVES AND ACCESSORIES

A. PVC piping for all interior and exterior applications shall be polyvinyl chloride, Class 1245-B, Schedule 80, and shall conform to ASTM Specifications D2267, D2241, D1784 and D1785. All PVC piping shall conform to NSF-61 and be approved for potable water applications. Pipe shall be as manufactured by A.M. BEYERS or CHARLOTTE PIPE COMPANY or approved equal. Fittings for PVC piping shall conform to ASTM D2467 and be slip type and shall be of the same schedule approved for use by the pipe manufacturer. Pipe shall bear the trademark of the manufacturer.

B. Transitions from PVC to poly-tubing shall be made with barbed fittings and stainless clamps, or approved equal.

C. Ball valves shall be double union/double block with PVC body, ball, insert and stainless steel rod and stem with Teflon seats, Tru-Bloc by NIBCO CHEMTROL, SPEARS or approved equal.

D. Check valves shall be of the true union ball check type with a PVC body construction. The valves shall be rated at 150 psi. The valves shall be manufactured by HAYWARD CO., SPEARS or approved equal.

E. Strainers shall be Y type, of size indicated, PVC body with 40 mesh cylindrical stainless steel screen and shall be as manufactured by HAYWARD CO. or approved equal.

F. Pressure relief/backpressure valves shall be molded in-line valves with PVC body construction. Valves shall have a setting range from 5 to 100 psi and be compatible with chemicals in application. Valves shall be as manufactured by PLAST-O-MATIC VALVES, INC., WALLACE & TIERNAN, WALCHEM, or approved equal.

G. Globe valves shall be of thermoplastic construction rated to 150 psi with EPDM seals and flanged connections. Valves shall be as manufactured by ASAHI-AMERICA, NIBCO or approved equal.

H. Unions shall be UL listed, Oring unions with Teflon gaskets by HAYWARD CO. or approved equal.

I. Threads and dimensions: ANSI B1.1 and B18.2.

J. All wetted parts of PVC piping, valves and accessories shall be compatible with treatment chemicals.

K. Thread lubricant: Crane "Formula 425", or equal. (NOTE: Approved Teflon tape may be used).

L. Gaskets: Full face, 1/8-inch thick neoprene rubber.

M. Solvent welded joints for chemical piping shall be made using solvent cement that meets or exceeds ASTM F493, compatible with PVC pipe and fittings. Solvent cement shall be Low V.O.C., Heavy Duty Gray Industrial solvent cement by Oatey; Model EP42 or specifically approved equal.

N. Pressure connections to pressure switches, recorders, and indicating gauges shall be equipped with a snubber.

2.05 REINFORCED FLEXIBLE TUBING

A. PVC tubing with nylon inner braided reinforcing made from FDA approved materials, 65 Durometer, 175 psi working pressure for 1/2 to 1-1/2 inches ID. Install high pressure fittings with double stainless steel clamps for all connections to tubing.

B. HDPE translucent tubing, compatible with chemical transported, minimum 190 psi working pressure at 70F for 1/2" to 3/4" O.D. Install high pressure PVC compression fittings all connections to tubing.

2.06 STAINLESS STEEL PIPING AND ACCESSORIES

A. Standard weight, Schedule 40, two-ferrule type tube fitting connections, conforming to ASTM A269. All tubing, fittings, and valves shall be 316 stainless steel.

2.07 CAPS

A. Vent caps
   1. Mushroom style, pipe size, galvanized cast iron construction with stainless steel no. 24 mesh screen as manufactured by PREFERRED UTILITIES MANUFACTURING CORP. or approved equal.

2.08 ESCUTCHEONS

A. Provide chrome plated escutcheons where uninsulated pipes penetrate walls of finished spaces.

2.09 PRESSURE GAUGES

A. Pressure gauges shall be manufactured by ASHCROFT, all stainless steel construction, with pressure range from 0 to 250 psi, stem mounted 4" diameter, liquid filled, provided with snubber and shut-off petcock valve.

2.10 PRESSURE REGULATING VALVES

A. Manufacturer:
   1. WATTS, Series 263A (3-way).
   2. Approved equal.

B. Valves shall be of brass construction with Buna-N disc/diaphragm, inlets/outlet size to match piping, maximum working pressure 300 psi, adjustable range 3 psi to 50 psi.

C. Provide with pressure gauge and slotted adjusting screw.

2.11 RELIEF VALVES

A. Air Release/Vacuum Valves
   1. Manufacturer:
      a. CRISPIN, "AL" series
      b. Approved equal
   2. Valve shall comply with ANSI/AWWA C512 Standards.
   3. The body and valve shall be constructed of cast iron conforming to ASTM A126, Class B.
   4. Spherical stainless steel float shall seal against a renewable Buna-N resilient seat.

B. Pressure relief & Backpressure / Anti-siphon valves

1. Manufacturer:
   a. PLAST-O-MATIC VALVES, INC.
   b. GRIFFCO, PRG2050P & BPV05OP
   c. Approved equal
2. Valves shall be molded in-line type with PVC body construction.
3. Valves shall have a setting range from 5 to 120 psi and be compatible with chemicals in application. Size in accordance with the Plans.

2.12 SOLENOID VALVES

A. Manufacturer:
   1. Red Hat II, Series 8210.
   2. Approved equal.

B. Provide normally closed valves, 120 volt AC, 304 stainless steel body. The construction material of all wetted parts shall be compatible with the product contained.

2.13 VACUUM BREAKERS

A. Vacuum breaker check valves shall be constructed of PVDF (Kynar), normally-closed, with self-sealing diaphragm. Connectors to match pipe and fittings. As manufactured by PLAST-O-MATIC VALVES, INC., Series VBM, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Clean inside of piping and tubing before installation. Keep installed piping clean and protect ends from foreign matter by capping or plugging.

B. Install piping and tubing so that it does not interfere with opening of doors or apparatus, access to equipment or any portion of electrical equipment.

C. Run piping and tubing in straight lines and square with building. Install rise plumb. Make offsets only where indicated and where necessary.

D. Install pipes so that expansion and contraction will not cause undue stress or strain to pipes or equipment. Provide offsets and expansion joints as shown on drawings.

E. Provide flanges and unions throughout the piping systems to make installation and removal of piping and equipment convenient. Make provisions for servicing and removal of equipment without dismantling piping.

F. Support pipe in accordance with provisions of Section 220529.

G. Install non-conducting dielectric connections wherever joining dissimilar metals.

H. Install valves with stems upright or horizontal.

I. Install water service lines in accordance with water utility standards.

J. All copper piping shall be cut square, burrs removed and reamed after cutting. Fitting sockets and tube ends shall be thoroughly cleaned to a bright finish. All solder joints shall be fluxed and soldered using 95-5 tin and antimony solder and water soluble flux.

K. All copper tubing connections shall be compression type.

L. Joints between PVC and Black Iron/Galvanized Pipe (wherever necessary), shall be made with screwed fittings or screwed companion flanges.

M. PVC piping and fittings connections to treatment equipment and at ends of runs shall have screw type joints. In all other locations, solvent welded slip type joints shall be used.

N. Solvent welded joints shall be made using solvent cement that meets or exceeds ASTM F493, compatible with PVC pipe and fittings. Solvent cement shall be Heavy Duty Industrial orange solvent cement by Oatey, or specifically approved equal.

O. Install PVC pipe in such a manner that it is not forced out of line by pipe supports, hangers or other supporting members. Pipe hangers shall be clevis or strap type.

P. Threaded joints where specified shall be made using standard hand or machine pipe threading tools. Dies must be sharp and in good condition to assure a clean and smooth threading operation from start to finish. Threads shall be full cut and perfect. Protective pads of leather, rubber or felt shall be employed to prevent damage to pipe walls by chuck and/or vise jaws. A slightly tapered wood plug shall be tapped snugly into the pipe for the length of thread to prevent distortion of the pipe wall by the die.

Q. Threaded pipe joints shall be made up using Teflon base compounds placed on the pipe threads. Do not place compound on threads of fittings. NO WICKING WILL BE PERMITTED.

R. All fittings, except couplings, shall be supported and valves shall be braced to resist torque during valve manipulation.

S. All piping shall be free of traps and graded to permit complete drainage.

T. Connect reinforced flexible tubing to transition couplings with stainless steel clamps and/or compression fittings in accordance with tubing manufacturer's installation instructions.

3.02 FIELD QUALITY CONTROL

A. Flush piping prior to conducting pressure testing.

B. Piping shall be pressure tested with air before piping is concealed. All joints shall be checked for leakage while under air pressure by swabbing, utilizing a soap and water solution, and leaks found shall be repaired and rechecked. Pressure of air during testing shall be at least 50 percent higher than normal working pressure. Piping shall be tested for pressure and leakage in accordance with Section 017550.

C. Before piping and valves are concealed, recheck it for leaks.

D. Rework or replace defective and leaking joints, and joints which are otherwise unsatisfactory. Peening, caulking and doping are not permitted.

E. The Contractor shall furnish all labor, materials and equipment necessary to accomplish all testing and repairs.

3.03 VALVE ACCESS

A. Locate shutoff and control valves for easy access and operation. Where valves are located in enclosed spaces provide and install access doors.

3.04 TESTING

A. All small piping shall be tested for pressure and leakage, in accordance with AWWA Specification C600.

3.05 EXTRAS

A. Provide District with one (1) 100-foot sections of poly-tubing (one for each chemical treatment system). Size appropriately, as indicated on the drawings.

END OF SECTION 221113

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Insulation Kits

B. Interior Hose Bibs

C. Non-Freeze Wall Hydrant

D. Backwater Valve

1.02 REFERENCES

A. ASME A112.21.1 - Floor Drains

B. ASEE 1019 - Wall hydrants, Frost Proof Automatic Draining Anti-Backflow Types

C. ASSE 1011 - Hose Connection Vacuum Breakers

D. PDI WH-201 - Water Hammer Arrestors

E. NSF 61 - Drinking Water System Components

1.03 SUBMITTALS FOR REVIEW

A. Submit in accordance with Section 013300.

B. Product Data: Provide component dimensions, weights, sizes, rough-in requirements, service sizes, and finishes.

C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions including assembly and support requirements.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products in accordance with Section 016500.

B. Accept specialties on site in original factory packaging. Inspect for damage.

1.05 WARRANTY

A. Provide manufacturer’s standard warranty for all applicable items under provisions of Section 017800.

PART 2 - PRODUCTS

2.01 INSULATION KITS

A. Manufacturer: TRUEBRO, INC.

B. Other acceptable manufacturers offering equivalent products.
1. BROCAR PRODUCTS, INC., Trap Wrap 500R.

C. Product shall cover exposed supply and drain in accordance with ADA requirements.

2.02 INTERIOR HOSE BIBS

A. Manufacturers: NIBCO or approved equal

B. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, with handwheel, vacuum breaker in conformance with ANSI/ASSE 1011.

2.03 NON-FREEZE WALL HYDRANT

A. Wall Hydrant:
   1. Manufacturers:
      a. ZURN Model Z-1310
      b. ZURN Model Z-1321 Ecolotrol ceramic disc wall hydrant
      c. Approved equal
   2. ANSI/ASSE 1019; non-freeze, anti-siphon, self-draining type with 3/4” hose connection, and integral backflow preventer.
   3. Exposed non-freeze, anti-siphon, automatic draining with copper casing, all bronze interior parts with 1/2 turn ceramic disc cartridge, 3/4” hose thread spout, stainless steel face, and operating key lock. Mounting height of 18 inches from center line of hydrant to finished grade or as indicated on Plans.
   4. Coordinate stem length in field.

2.04 BACKWATER VALVE

A. Manufacturers:
   1. Zurn Model Z-1090
   2. Approved equal

B. Assembly: ANSI A112.21.2.

C. Body: Dura-coated cast iron, gasketed bolted cover, flapper type backwater valve with O-ring

D. No hub connections

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install insulation kits on exposed lavatory and drain pipe.

END OF SECTION 221119

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Eyewash.

B. Test tags.

1.02 RELATED SECTIONS

A. Section 221113 - Facility Piping.

B. Section 224536 - Water Tempering Equipment.

1.03 REFERENCES

A. ANSI Z358.1. - Emergency Eyewash and Shower Equipment

1.04 SUBMITTALS

A. Submit product data under provisions of Section 013300.

1.05 WARRANTY

A. Provide manufacturer’s standard warranty under provisions of Section 017800.

B. Minimum 1 year.

C. Warranty to include coverage for materials.

PART 2 - PRODUCTS

2.01 WALL MOUNT EYE/FACE WASH (INDOOR)

A. Manufacturers:
   1. HAWS CORP. of Sparks, Nevada, Model 8905.
   2. Approved equal.

B. Barrier free eye wash unit.

C. Instant action continuous flow activated by chrome plated brass stay-open squeeze lever valve.

D. 12-foot recoil hose with chrome-plated swivel fitting at one end, pressure rated to 200 psi, capable of providing extended coverage.

E. Eyewash with integral flow control and dust cover for sprayhead.

F. Universal language emergency sign mounted on wall near unit.

G. Wall hook and 1/2″ NPT inlet.

H. Compliance with ANSI Z358.1.

I. Provide 1-year limited warranty.

2.02 ACCESSORIES

A. Test Tag: HAWS Model SP 170, card with space for date and initials of inspector and beaded ties. 25 per pack

B. Vacuum Breaker: Model SP212 chrome-plated brass vacuum breaker.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide stainless steel fasteners to attach device to wall.

B. Install water supply piping to emergency fixture unit.

3.02 DEMONSTRATION

A. Demonstrate operation of emergency fixture unit to Owner.

END OF SECTION 224533

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Instantaneous electric eyewash water heater.

1.02 RELATED SECTIONS

A. Section 221113 - Facility Piping.

B. Section 221119 - Plumbing Specialties.

C. Section 224533 - Combination Emergency Fixture Units.

1.03 REFERENCES

A. ANSI/ASHRAE 90A - Energy Conservation in New Building Design.

B. ANSI/NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data:
   1. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Provide electrical characteristics and connection requirements.
   3. Manufacturer's installation instructions.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017823.

B. Include operation, maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.06 QUALITY ASSURANCE

A. Ensure products and installation of specified products are in conformance with UL and National Sanitary Foundation (NSF) recommendations and requirements.

1.07 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016500.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.09 WARRANTY

A. Provide manufacturer’s warranty for water heaters under provisions of Section 017800 and as indicated below.

PART 2 - PRODUCTS

2.01 INSTANTANEOUS ELECTRIC EYEWASH WATER HEATER

A. Manufacturers:
   1. Eemax Inc., Oxford, CT, model EX4277T with EE Option - Emergency Eyewash “Tepid Water” ANSI Z358.1
   2. Approved equal.

B. Performance/Design Criteria:
   1. Performance: 14 degrees F rise at 2.0 GPM.
   2. Maximum working pressure: 150 psig.
   3. Unit shall include thermostatic control of outlet temperature factory set to 80 degrees F.
   4. Outlet temperature regulation shall be accurate to +/- 1 degrees F.
   5. Unit shall fail to the cold supply upon electrical failure.
   6. Unit shall meet ANSI Z358.1 tepid water requirements.

C. Operation:
   1. Electrical Rating: 277V, 60Hz, 14.8A, 4.1 kW.

D. Accessories:
   1. Wall mounting kit.
   2. Flow switch - Guardian Equipment Flow Switch for Emergency Eyewash and Showers or Dwyer Flotect V6 Flow Switch. Brass body with brass tee, size to match process connection.

E. Warranty: Manufacturer shall warranty heater body/element assembly for a period of five years against failure due to leaks.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install water heater in accordance with manufacturer's instructions.

B. Coordinate with plumbing piping and electrical work as required to achieve operating systems.

C. Provide stainless steel hardware and wall brackets to secure heater to wall.

END OF SECTION 224536

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section describes the general requirements for all mechanical items and systems required by the Contract Documents.

B. Comply with all Contract Requirements, General Conditions, Supplementary Conditions and Division 1 Sections applying to or affecting the Work of Division 23.

C. Unless specifically dimensioned, the Work shown on the Drawings is in diagrammatic form only to show general arrangement.

D. Include, in the Work, all accessories and appurtenances, necessary and integral, for the intended operation of any system, component or device, as such systems, components and devices are specified.

E. Do not install pipe or conduit through ductwork.

F. If the pipe or duct size shown on the Drawings does not match the connection size of the equipment that it is connected to, provide the necessary transition pieces at the piece of equipment.

G. Do not use or allow to be used asbestos or asbestos-containing materials on this project. Be rigorous in assuring that all materials, equipment, systems and components thereof do not contain asbestos. Any deviations from this requirement shall be remedied at the Contractor's expense without regard to prior submittal approvals.

1.02 RELATED DOCUMENTS

A. The General Conditions and General Requirements Division 1 apply to the Work of this Section.

1.03 REFERENCE STANDARDS

A. Compliance with the following codes and standards shall be required:

1.	Codes, Rules and Regulations of the State of New York	
2.	USAS	USA Standards Institute (Formerly ASA)
3.	AMCA	Air Moving and Conditioning Association
4.	ADC	Air Diffusion Council
5.	NEMA	National Electrical Manufacturers Association
6.	FM	Factory Mutual
7.	NFPA	National Fire Protection Association
8.	ASTM	American Society for Testing Materials
9.	UL	Underwriters Laboratories, Inc.
10.	NEC	National Electrical Code
11.	ASME	American Society of Mechanical Engineers
12.	ANSI	American National Standards Institute
13.	OSHA	Occupational Safety and Health Act
14.	BSA	Board of Standards and Appeals
15.	MEA	Materials and Equipment Acceptance
16.	DEC	New York State Department of Environmental Conservation
17.	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers.
18.	SMACNA	Sheet Metal and Air Conditioning Contractor's Nation-al Association
19.	F.S. or FED	Spec. Federal Specification
20.	ASA	Acoustical Society of America

21. NACE National Association or Corrosion Engineers
22. ASSE American Society of Sanitary Engineers
23. Building Code of New York State
24. Energy Conservation Code of New York State
25. Mechanical Code of New York State
26. New York State Industrial Code Rules
27. IRI Industrial Risk Insurers
28. AABC American Air Balance Council
29. NEBB National Environmental Balancing Bureau
30. AWS American Welding Society

1.04 DEFINITIONS

A. "Provide" means furnish and install, complete the specified material, equipment or other items and perform all required labor to make a finished installation.

B. "Furnish and install" has the same meaning as given above for "Provide."

C. Refer to General Conditions for other definitions.

1.05 ABBREVIATIONS

A. Reference by abbreviation may be made in the Specifications and the Drawings in accordance with the following list:
1. HVAC Heating, Ventilating and Air Conditioning
2. CM Construction Manager
3. AC Air Conditioning
4. USS United States Standard
5. PSIG Pounds per Square Inch Gauge
6. MBH Thousand BTU per hour
7. BTU British Thermal Units
8. WG Water Gage
9. LB Pound (Also shown as: #)
10. ASME American Society of Mechanical Engineers
11. ASTM American Society for Testing Materials
12. ASA American Standards Associates

See Drawings for additional abbreviations

1.06 REVIEW OF CONTRACT DOCUMENTS AND SITE

A. Give written notice with the submission of bid to the Architect/Engineer of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of Authorities having jurisdiction, and any necessary items of work omitted. In the absence of such written notice it is mutually agreed that the Contractor has included the cost of all required items in his proposal for a complete project.

B. Contractors shall acknowledge that they have examined the Plans, Specifications and Site, and that from his own investigations he has satisfied himself as to the nature and location of the Work; the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials; availability of labor, utilities, roads and uncertainties of weather; the character of equipment and facilities needed preliminary to and during the execution of the Work; all federal, state, county, township and municipal laws, ordinances and regulations particularly those relating to employment of labor, rates of wages, and construction methods; and all other matters which can in any way affect the Work or the cost thereof under this Contract. Any failure by the Contractor to acquaint himself with the available information

concerning these conditions will not relieve him from the responsibility for successfully performing the Work.

C. Owner assumes no responsibility for any understanding or representation made during or prior to the negotiation and execution of this Contract unless such understanding or representations are expressly stated in the Contract and the Contract expressly provides that the responsibility, therefore, is assumed by the Owner.

1.07 MEASUREMENTS

A. Base all measurements, both horizontal and vertical from established bench marks. Make all Work agree with these established lines and levels. Verify all measurements at site; and check the correctness of same as related to the Work.

1.08 LABOR AND MATERIALS

A. Provide all materials and apparatus required for the Work of new and first-class quality. Furnish, deliver, arrange, erect, connect and finish all materials and equipment in every detail, so selected and arranged as to fit properly into the building spaces.

B. Remove all materials delivered, or work erected, which does not comply with Drawings or Specifications, and replace with proper materials, or correct such work as directed, at no additional cost to the Owner.

1.09 COVERING OF WORK

A. Do not cover up or hide from view any duct, piping, fitting, or other work of any kind before it has been examined or approved by the Architect/Engineer and/or other authority having jurisdiction over the same. Remove and correct immediately any unacceptable or imperfect work or unauthorized or disapproved materials discovered immediately after being disapproved.

1.10 PROTECTION

A. Protect the Work and material of all trades from damage and replace all damaged material with new.

B. Protect work and equipment until the Work is finally inspected, tested, and accepted; protect the Work against theft, injury or damage; and carefully store material and equipment received on site which is not immediately installed; close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.

C. Preserve all public and private property, along and adjacent to the Work, and use every precaution necessary to prevent damage or injury thereto.

1.11 CUTTING AND PATCHING

A. Provide all cutting and patching required for the Work.

B. Provide all drilling required for the installation of hangers.

C. Punch or drill all holes cut through concrete slabs or arches from the underside. Do not cut structural members without the approval of the Architect/Engineer. Perform all cutting in a manner directed by the Architect/Engineer.

D. Do not do any cutting that may impair strength of building construction. Do not drill any holes, except for small screws, in beams or other structural members without obtaining prior approval. All Work shall be done in a neat manner by mechanics skilled in their trades and as approved.

1.12 SUBMITTALS

A. Submit for review, shop drawings for all materials and equipment furnished and installed under this Contract. Submissions shall include but not be limited to:
   1. Ductwork layout drawings, air devices and accessories
   2. Equipment layout drawings.
   3. Automatic temperature control equipment, diagrams and control sequences
   4. Equipment, fixtures, and appurtenances

B. Reports
   1. Compliance with listings and approvals for equipment and for fire ratings.
   2. Acceptance certificates from inspecting agencies.
   3. Complete printed and illustrated operating instructions in report format.
   4. Manufacturer's performance tests of equipment.
   5. Field operating test results for equipment.
   6. Performance report on the balancing of air systems.

C. Specific references to any article, device, product or material, fixture or item of equipment by name, make or catalog number shall be interpreted as establishing a basis of cost and a standard of quality. All devices shall be of the make and type listed by Special Agencies, such as the Underwriters' Laboratories, and where required, approved by the Owner.

1.13 SPACE ALLOTMENTS AND SUBSTITUTIONS

A. The space allotments and equipment layouts on the Drawings are based on the manufacturer’s model indicated or scheduled as the “Basis of Design”. Ensure that any equipment that is submitted other than the “Basis of Design” will fit in the space allotment and will provide the necessary maintenance clearances as recommended by the manufacturer. If maintenance clearances are not met, pay for any changes such that maintenance clearances will be met.

B. Bear all costs associated with re-layout of the equipment, changes to ductwork, and other changes as required if approved equipment other than the “Basis of Design” equipment is purchased. This shall also include any structural steel modifications and structural steel design changes. Submit, at no cost to the Owner, a steel design stamped by a structural engineer licensed in the state in which the Work is to be performed for structural modifications that must be made resulting from the use of equipment other than the “Basis of Design” or not specified.

1.14 PAINTING

A. Prime paint all bare supplemental steel, supports and hangers required for the installation of Division 23 Work in accordance with “Painting” Specification Section 099100. Touch up welds of galvanized surfaces with galvanizing primer.

1.15 MATERIAL SAFETY DATA SHEETS

A. Submit material safety data sheets (MSDS) for all chemicals, hydraulic fluids, seal oils, lubricating oils, glycols and any other hazardous materials used in the performance of the Work, in accordance with the US Department of Labor, Occupational Safety and Health Administration (OSHA) hazard communication and right-to-know requirements stipulated in 29 CFR 1910.1200 (g).

1.16 MOTORS AND STARTERS

A. Provide new NEMA Standard electric motors, sized and designed to operate at full load and full speed continuously without causing noise, vibration, and temperature rise in excess of their rating. Provide motors with a service factor of at least 1.15.

B. Install high efficiency electric motors for all HVAC fans.

C. Provide all motors for use with Variable Frequency Drives with “high efficiency inverter duty” insulation class “F” with class “B” temperature rise and that conform to or exceed the Energy Conservation Code of New York State requirements for efficiency.

D. Provide stainless steel nameplates, permanently attached to the motor, and having the following information as a minimum:
   1. Manufacturer
   2. Type
   3. Model
   4. Horsepower
   5. Service Factor
   6. RPM
   7. Voltage/Phase/Frequency
   8. Enclosure Type
   9. Frame Size
   10. Full-Load Current
   11. UL Label (where applicable)
   12. Lead Connection Diagram
   13. Bearing Data
   14. Efficiency at Full Load.

E. Provide motors whose sound power levels do not exceed that recommended in NEMA MG 1-12.49.

F. Motor Characteristics:
   1. As called for on schedules and equipment specifications sections.

1.17 ACOUSTICAL PERFORMANCE OF EQUIPMENT AND SYSTEMS

A. Install the Work in such a manner that noise levels from operation of motor driven equipment, whether airborne or structure-borne, and noise levels created by or within air handling equipment and air distribution and control media, do not to exceed sound pressure levels determined by the noise criteria curves published in the ASHRAE guide.

B. Acoustical Tests
   1. Owner may direct the Contractor to conduct sound tests for those areas he deems too noisy.
   2. If NC level exceeds the requirements of the Contract Documents due to improper installation or operation of mechanical systems, make changes or repairs to bring noise levels to within required levels.
   3. Retest until specified criteria have been met.

1.18 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Instructions and Demonstration for Owner's Personnel
   1. Provide operating and maintenance instruction to the Owner when project is completed and all HVAC equipment serving the building is ready to be turned over to the Owner.

2. Turn over the HVAC equipment to the Owner only after the final testing and proper balancing of HVAC systems.
3. Instruct the Owner's personnel in the use, operation and maintenance of all equipment of each system.
4. The above instruction requirements are in addition to that specified for specific equipment or systems. Conform to specified requirements if more stringent or longer instruction is specified for specific equipment or systems.

1.19 CODES, RULES, PERMITS & FEES

A. Give all necessary notices, obtain all permits and pay all government sales taxes, fees, and other costs, in connection with the Work. File all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for the Work and deliver same to the Owner's Representative before request for acceptance and final payment for the Work.

B. Conform to the requirements of the NFPA, NEC, FM, UL and any other local or State codes which may govern.

1.20 RECORD DRAWINGS

A. During the progress of the Work, make a record set of drawings of all changes by which the actual installation differs from the Drawings.

B. Create all record drawings in AutoCAD version 2002 or later in .dwg format. Upon completion of the Work, submit to the Architect/Engineer for approval three complete sets of hard copies of the record drawings, of the same size as the Drawings for approval. Upon approval by the Architect/Engineer furnish the Owner a CD copy of the record drawings along with one hard copy for his records.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 CLEANING AND ADJUSTING

A. Cleaning
1. Blow out, clean and flush each system of equipment, to thoroughly clean the systems.
2. Clean all materials and equipment; leave in condition ready to operate and ready to receive final finishes where required.
3. Clean the operating equipment and systems to be dust free inside and out.
4. Clean concealed and unoccupied areas such as plenums, duct spaces and equipment rooms to be free of rubbish and dust.

B. Lubrication
1. Lubricate equipment as recommended by the manufacturer, during temporary construction use.
2. Provide complete lubrication just prior to acceptance.

C. Permanent Equipment Operating During Construction
1. Use only in same service as the permanent applications.
2. Replace expendable media, including belts used for temporary operation and similar materials just prior to acceptance of the Work.

3. Repack packing in equipment operated during construction just prior to system acceptance, using materials and methods specified by the equipment manufacturer.

D. Retouch or repaint equipment furnished with factory finish as required to provide same appearance as new.

E. Tools
1. Provide one set of specialized or non-standard maintenance tools and devices required for servicing the installed equipment.

3.02 EQUIPMENT BASES, PLATFORMS AND SUPPORTS

A. Provide supporting platforms, steel supports, anchor bolts, inserts, etc., for all equipment and apparatus provided.

B. Obtain prior approval for installation method of structural steel required to frame into building structural members for the proper support of equipment, conduit, etc. Welding will be permitted only when approved by the Architect/Engineer.

C. Submit shop drawings of supports to the Architect/Engineer for approval before fabricating or constructing.

D. Where supports are on concrete construction, take care not to weaken concrete or penetrate waterproofing.

3.03 ACCESSIBILITY

A. Install items requiring access conveniently and accessibly located with reference to the finished building.

3.04 USE OF EQUIPMENT

A. The use of any equipment, or any part thereof, even with the Owner's consent, is not an indication of acceptance of the Work on the part of the Owner, nor shall it be construed to obligate the Owner in any way to accept improper work or defective materials.

3.05 MODIFICATIONS OF EXISTING WORK

A. Coordinate the Work with all other contractors and provide necessary dimensions for all openings.

B. Upon completion, remove all temporary equipment, shoring, scaffolds, etc., and leave all areas clean and free from material and debris resulting from the Work performed under this Section. Provide patching in areas required.

3.06 EQUIPMENT INSTALLATION

A. Locate and set equipment anchor bolts, dowels and aligning devices for equipment requiring them.

B. Level and shim the equipment; coordinate and oversee the grouting work.

C. Perform field assembly, installation and alignment of equipment under direct supervision provided by the manufacturer or with inspections, adjustments and approval by the manufacturer.

D. Alignment and Lubrication Certification for Motor Driven Apparatus
   1. After permanent installation has been made and connections have been completed, but before the equipment is continuously operated, have a qualified representative of the equipment manufacturer inspect the installation and report in writing on the manufacturer's letterhead on the following:
      a. Whether shaft, bearing, seal, coupling, and belt drive alignment and doweling is within the manufacturer’s required tolerances so that the equipment will remain aligned in the normal service intended by the Contract Documents and that no strain or distortion will occur in normal service.
      b. That all parts of the apparatus are properly lubricated for operation.
      c. That the installation is in accordance with manufacturer's instructions.
      d. That suitable maintenance and operating instructions have been provided for the Owner's use.
      e. Make any corrections to items that are required or recommended based on the manufacturer’s inspection and have the equipment re-inspected.

E. Machinery Guards
   1. Protect motor drives by guards furnished by the equipment manufacturer or in accordance with the Sheet Metal and Air Conditioning Contractors National Association's Low Pressure Duct Manual. Provide guards of all types approved as acceptable under OSHA Standards.

F. Equipment Start-up
   1. Require each equipment manufacturer to provide qualified personnel to inspect and approve equipment and installation and to supervise the start-up of the equipment and to supervise the operating tests of the equipment.
   2. If a minimum number of hours for start-up and instruction are not stated with the equipment specifications, these shall be 2 full 8-hour working days as a minimum.
   3. Advise Owner of start-up at least 72 hours in advance.

3.07 CLOSEOUT PROCEDURES

A. General Operating and Maintenance Instructions: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instructions in the proper operation and maintenance of the entire Work. Where installers are not expert in the required procedures, include instruction by the manufacturer's representatives.

B. Where applicable, provide instruction and training, including application of special coatings systems, at manufacturer's recommendation.

C. Provide a detailed review of the following items:
   1. Maintenance manuals
   2. Record documents and catalog cuts for each piece of equipment.
   3. Spare parts and materials
   4. Tools
   5. Lubricants
   6. Identification systems
   7. Control sequences
   8. Hazards
   9. Cleaning

D. Warranties, bonds, maintenance agreements, and similar continuing commitments.

E. Demonstrate the following procedures:
   1. Start-up

2. Shut-down
3. Emergency operations
4. Noise and vibration adjustments
5. Safety procedures
6. Economy and efficiency adjustments
7. Effective energy utilization.

F. Prepare instruction periods to consist of approximately 50% classroom instruction and 50% "hands-on" instruction. Provide minimum instruction periods as follows:

Systems or Equipment	Training Time (Hours)
Exhaust Fans and Louvers	4 hrs.
Electric Heaters	4 hrs.

Note: Consult individual equipment specification sections for additional training requirements.

G. Prepare a written agenda and summary of each training session and turnover to owner at completion of training.

END OF SECTION 230010

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the marking and identification materials for identifying mechanical equipment.

B. Mark and identify all mechanical equipment described herein, and as shown and specified in the Contract Documents.

1.02 REFERENCES

A. OSHA 29 CFR 1910 - Subpart J, General Environmental Controls

1.03 SUBMITTALS

A. Identification Scheme - Submit scheme of identification codes.

B. Samples - Submit samples of tags, attachments, labeled and identified.

C. Equipment Schedules - Submit mechanical equipment schedules, listing proposed equipment numbers, and their location and function.

D. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Seton

B. Bunting

C. W.H. Brady Company

2.02 MECHANICAL EQUIPMENT MARKERS

A. Identify all mechanical equipment, bare or insulated, installed in the rooms or on the roof, by means of lettered and numbered nameplate (not stenciled) identifying the equipment and service. Refer to the Drawings for equipment identifications. Nameplates shall be aluminum with permanent 1 ½ inch high white letters on a black background, mechanically affixed and installed in a readily visible location on the equipment. Coordinate the final equipment designation with the Owner.

B. In addition to markers, all mechanical equipment shall be furnished with the manufacturer’s identification plate showing the name of equipment, manufacturer’s name and address, date of purchase, model number and performance data.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Apply all tags in accordance with the manufacturer’s instructions.

END OF SECTION 230555

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section specifies requirements for testing, adjusting, and balancing of all air distribution systems, including the equipment and devices associated with each system.

B. The work includes setting speed and flow, adjusting equipment and devices installed for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to the mechanical installations specified in other Sections of the Specifications.

1.02 RELATED WORK

A. Drawings and general provisions of the Contract, including General Conditions, any Supplemental Conditions and Division 1 Specification Sections, govern the work of this section.

1.03 SUBMITTALS

A. Submit proof that the testing, adjusting and balancing agency meets the requirements of Section 1.04 “Quality Assurance”, and all other specified requirements.

B. Prior to performing the work, submit sample blank forms of the test reports that will be submitted by the entity performing work of this Section, indicating all data and parameters included.

C. Submit certified test reports, signed by the authorized representative of the testing and balancing agency. Certify the reports to be proof that the systems have been tested, adjusted and balanced in accordance with the selected reference standards (NEBB or AABC); are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at completion of the testing, adjusting and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Submittal of test report shall be in the following format:
   1. Draft Report: Upon completion of testing, adjusting and balancing procedures, prepare draft reports on the approved forms. Draft report may be handwritten, but must be complete, factual, accurate and legible. Organize and format draft reports in the same manner specified herein for the final reports. Submit two complete sets of draft reports. Only one complete set of draft reports will be returned.
   2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written and organized and formatted as described herein. Submit two complete sets of final reports.
      a. Report Format: Submit reports using the standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Include schematic systems diagrams. Enclose the report contents in a 3-ring binder. Divide the contents into the below listed divisions, separating them by divider tabs with titles descriptive of the contents:
         1) General Information and Summary.
         2) Air Systems.
      b. Report Contents: Provide the following minimum information, forms and data:
         1) General Information and Summary: Identify the testing, adjusting and balancing Agency, Contractor, Owner, Architect/Engineer, and Project on the inside cover sheet. Include addresses, and contact names and telephone numbers. Include a certification sheet containing the seal and name, address, telephone number and signature of the Agency’s responsible certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures, along with the proof of calibrations.

2) Include in the remainder of the reports the appropriate forms containing, as a minimum, the information indicated on the standard report forms prepared by AABC or NEBB, for each item of equipment and system. Prepare a schematic diagram for each item of equipment and system, to accompany each respective report form.

c. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards within a period not exceeding six months prior to conducting the test procedures.

1.04 QUALITY ASSURANCE

A. Test, adjust and balance systems and equipment by using competent mechanics regularly employed by a testing, adjusting and balancing Subcontractor whose primary business is the testing, adjusting and balancing of building mechanical systems. The testing, adjusting and balancing Subcontractor shall be a business established for a minimum of 10 years.

B. The testing, adjusting, and balancing Subcontractor shall be certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB).

C. Instrumentation type, quantity, and accuracy shall be as described in AABC's "National Standards for Field Measurement and Instrumentation, or Total System Balance, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

D. All instrumentation shall be calibrated at least every 6 months or more frequently if required by the instrument manufacturer.

1.05 PERFORMANCE REQUIREMENTS

A. Comply with all applicable Federal, State and Local laws, ordinances, regulations and codes, and the latest industry standards including, but not limited to the entities listed below for procedures, measurements, instruments and test reports for testing, adjusting and balancing work:
1. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
3. National Environmental Balancing Bureau (NEBB)
4. Associated Air Balance Council (AABC)

B. Set the fan air flow rate to be within five percent above the design value at design speed.

1.06 JOB CONDITIONS

A. Require the testing and balancing specialist to review his work with the respective manufacturers of the equipment and devices involved, and coordinate and schedule all work.

B. Furnish and install pressure taps, gauges, and other components as required for a properly balanced system, whether or not specified herein or shown on the Drawings, all at no additional cost to the Owner. Make all adjustment or replacement parts recommended by the testing and balancing specialist in strict accordance with the respective equipment manufacturer's recommendations.

C. Coordinate with the control manufacturer's representative to set the adjustment of the automatically operated dampers to operate as required.

1.07 GENERAL

A. The Owner will occupy the building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

B. Complete all tests specified herein to the satisfaction of the Architect/Engineer before final acceptance.

C. The Architect/Engineer, or his representative, is the sole judge of the acceptability of the tests. The Architect/Engineer may direct the performance of any such additional tests, as he deems necessary in order to determine the acceptability of the systems, equipment, material and workmanship. No additional payment will be made for any test required by the Architect/Engineer.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

A. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.

B. Obtain copies of approved shop drawings of all air handling equipment and the control diagrams, including intended sequence of operations.

C. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned, and is operable. Do not proceed with testing, adjusting and balancing until unsatisfactory conditions have been corrected in a manner approved by the testing and balancing specialist.

D. Examine the air systems to see that they are free from obstructions. Determine that all dampers are open, moving equipment is lubricated, clean filters are installed, and automatic controls are functioning; and perform other inspections and maintenance activities necessary for proper operation of the systems.

3.02 TESTING, ADJUSTING AND BALANCING

A. Notify the Owner 48 hours in advance of starting any tests. Do not perform any tests until acknowledgment of notification and approval has been received from the Owner.

B. Provide all necessary instruments and personnel for the tests. If, in the opinion of the Architect/Engineer, the results of such tests show that the Work has not complied with the requirements of the Contract Documents, make all additions or changes necessary to put the system in proper working condition and pay all expenses for all subsequent tests which are necessary to determine whether the Work is satisfactory. Any additional work or subsequent tests shall be carried out at the convenience of the Architect/Engineer.

C. Test all packaged equipment in strict accordance with the equipment manufacturer’s requirements.

D. Perform any and all other tests that may be required by the local municipality or other governing body, board or agency having jurisdiction.

E. Perform testing, adjusting, and balancing after leakage and pressure tests on air distribution systems have been satisfactorily completed.

F. Actuate all safety devices in a manner that clearly demonstrates their workability and operation.

G. Cut ductwork for installation of test probes to the minimum extent necessary to allow adequate performance of test procedure.

H. Perform tests and compile test data for all air systems.

I. Include a schematic diagram locating the fans and regulating devices for air systems.

J. All instruments used shall be provided by the entity performing the Work of this Section, and shall be accurately calibrated and maintained in good working order.

K. Air Systems
   1. Perform the testing, adjusting and balancing of air systems in accordance with the detailed procedures outlined in the referenced standards; including but not be limited to the following:
   2. Test, record and adjust fan rpm to meet design CFM requirements.
   3. Test and record motor full load amperes.
   4. Make a pitot tube traverse of main ducts and obtain design flow rate at fans.
   5. Test and record system static pressure, velocity pressure and total pressure.
   6. Test and adjust system for design air flow rate.
   7. Adjust all ducts to proper design flow rate.
   8. Seal openings in ductwork for pitot tube insertion with snap-in plugs after air balance is complete.

END OF SECTION 230594.12

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The Work specified as part of this Section consists of the work required to achieve operational and coordinated Sequences of Operation as described. Work includes coordination of functions of controllers supplied as part of equipment packages, interconnection of systems, provision and installation of all accessory devices required for complete system operation including devices not provided as part of equipment, coordination of start up and testing and demonstration of the operation of Sequences of Operation to the Owner and his representatives.

B. The control system operation of all equipment shall be subject to the operational modes, conditions and logic described in this Section and the controlled equipment manufacturer's recommendations.

C. Training of the Owner's personnel in the operation, trouble shooting, adjustment and repair of all system controls.

1.02 RELATED SECTIONS AND WORK

A. Division 26

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 GENERAL

A. General
1. Provide all low voltage control wiring and terminations as required to provide the intended sequences noted below.
2. Conform to the requirements of the Owner's standards for all electrical work and devices.

3.02 SEQUENCE OF OPERATION - ELECTRIC UNIT HEATER, EUH-1 THRU EUH-3

A. General:
1. The heater shall be provided with a remote mounted thermostat.

B. Heating:
1. The heating set point temperature shall be 55°F (adjustable). When the space temperature falls below the set point temperature, the heater shall turn on in order to maintain the set point temperature.

3.03 SEQUENCE OF OPERATION - ELECTRIC WALL HEATER, EWH-1

A. General:
1. Each wall heater shall be provided with an integral thermostat.

B. Heating:
1. The heating set point temperature shall be 55°F (adjustable). When the space temperature falls below the set point temperature, the heater shall turn on in order to maintain the set point temperature.

3.04 SEQUENCE OF OPERATION - EXHAUST FAN AND MOTORIZED LOUVER (EF-1 & L-1 & L-2)

A. General EF-1/L-1 & L-2:
   1. Fan to be provided with a remote mounted thermostat. Contract 'E' to provide a spring timer and HOA switch. The operation of EF-1 shall be interlocked with L-1 and L-2.
      a. Hand Mode: The exhaust fan shall run continuously and the associated motorized louver shall open.
      b. Off Mode: The exhaust fan shall be off and the associated motorized louver shall be closed.
      c. Auto Mode: The exhaust fan shall run and the associated motorized louver shall open when space temperature rises above the set point of 86°F (adjustable) or when activiated by the spring timer.

3.05 SEQUENCE OF OPERATION - EXHUAST FAN AND MOTORIZED LOUVER (EF-2 & L-3)

A. General EF-2/L-3
   1. Contract 'E' to provide door contactors, 7-day programmable timeclock and HOA switch. The operation of EF-2 shall be interlocked with L-3.
      a. Hand Mode: The exhaust fan shall run continuously and the associated motorized louver shall open.
      b. Off Mode: The exhaust fan shall be off and the associated motorized louver shall be closed.
      c. Auto Mode: The exhaust fan shall run and the associated motorized louver shall open for 15 minutes (adjustable) when one of the following occurs:
         1) The door contactor senses the entrance door has opened.
         2) As scheduled by the facility via the timeclock.

END OF SECTION 230993

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. UL-142 double wall outdoor steel storage tank for Diesel Fuel

1.02 QUALITY ASSURANCE

A. Governing Standards:
   1. ASTM Specification D4021-92 – UL Standards for Flammable Storage Systems MH906.
   2. NFPA 30 – Flammable and Combustible Liquid Code.
   3. STI-R912-00 – Installation Instructions for Shop Fabricated Stationary Aboveground Storage Tanks for Flammable Combustible Liquids.
   4. UL 142 – Standard for Aboveground Flammable Liquid Tanks.
   5. API 650 – Welded Steel Tanks for Oil Storage.
   6. API 620 – Design and Construction of Large, Welded, Low-Pressure Storage Tanks.

1.03 SUBMITTALS

A. Shop Drawings: Drawings shall include all critical dimensions and show locations of all fittings and accessories, including saddles. Material of construction shall be in accordance with Section 1.02 of this specification.

B. Catalog Data: Manufacturer's literature.

C. Certification Plate: UL labels for chemical products shall be affixed to each tank.

D. Installation Instructions: Submit five (5) copies of manufacturer's latest installation instructions.

E. Calibration Charts: Submit five (5) copies of manufacturer's latest calibration charts.

PART 2 - PRODUCTS

2.01 1,000 GALLON DOUBLE-WALLED ABOVEGROUND DIESEL FUEL STORAGE TANK

A. Manufacturer: Containment Solutions, Inc. or approved equal.

B. UL-142 Double Wall Lube Cube Tank Multi-Purpose, Model No. LCAA101MDS709.

C. Diesel Fuel Tank:
   1. Shall have a design capacity of 1,000 gallons and measure 4'-0" wide by 9'-4" long with a height of 5’-1”. The tank shall meet all applicable codes for the storage of diesel fuel.
   2. Refer to the contract drawings for additional tank requirements.

2.02 ACCESSORIES

A. Tank shall be labeled with a plate permanently affixed as indicated on the contract drawings and in accordance with Section 104300 - Tank Signage.

B. Provide one (1) tighfill top seal cap for each tank.

C. Provide one (1) testable overfill prevention valve for each tank.

D. Provide one (1) atmospheric vent cap for each tank.

E. Provide one (1) emergency gate valve for each tank.

F. Provide one (1) secondary vent cap for each tank.

G. Provide one (1) spill box at fill location of tank.

H. Provide one (1) spill box at fuel supply/return location of tank.

I. Provide anchor clips, set of 4, at bottom tank supports for each tank.

J. All other accessories as shown on the drawings.

2.03 COATINGS

A. The exterior surface of the tank shall be cleansed of foreign material and protected with a primer coat, bond coat and at least two coats of paint.

B. The standard color shall be chosen by the Owner.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Tank installation shall be in strict accordance with manu-facturer's recommendations, and the requirements of UL 80 and STI.
   1. An air test of the tank aboveground is required. Pressure should not exceed 5 pounds per square inch (psig) while a soap solution is applied to weld seams.
   2. Equipment to lift the tank shall be of adequate size to lift and lower the tank without dragging and dropping to ensure no damage to the tank or the coating.
   3. The tank shall be supported on saddles/skids provided by the tank manufacturer.

3.02 NOTIFICATION

A. Contractor shall notify the Engineer in writing a minimum of six (6) days prior to installation. This will allow the required minimum five (5) day notification of the Suffolk County Department of Health Services (SCDHS).

B. Contractor shall coordinate his actions with the SCDHS and the Engineer to allow observation of all significant phases of construction and testing.

3.03 WARRANTY

A. Tank shall be provided with manufacturer's 1-year warranty against defects in manufacturing, workmanship and materials.

3.04 TESTING AND STARTUP

A. Tank shall receive a final precision tank test. The test shall be a hydrostatic pressure test, air pressure test or equal on the tank. Tank shall be tested to a maximum of 5 psi. Tests shall be repeated until results satisfactory to the SCDHS and the Engineer are achieved. Costs for any required retesting shall be borne by the Contractor.

B. Written copies of all tests shall be delivered to the Engineer.

C. Contractor shall provide all materials and labor to startup and test all alarms and instruments connected to the tank and shall instruct Owner in their use.

END OF SECTION 231323

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide exhaust fans, as specified herein, of sizes and capacities scheduled and in locations shown on drawings.

1.02 REFERENCE CODES AND STANDARDS

A. Air Movement and Control Association Inc. (AMCA):
   1. 99 - Standards Handbook
   2. 200 - Publication, Air Systems
   3. 201-90 - Publication, Fans and Systems
   4. 202-88 - Publication, Troubleshooting
   5. 203-90 - Publication, Field Performance Measurement of Fan Systems
   6. 211-05 - Publication, Certified Ratings Program - Product Rating Manual for Fan Air Performance
   7. 300-96 - Standard Reverberant Room Method for Sound Testing of Fans
   8. 311-05 - Publication, Certified Ratings Program - Product Rating Manual for Fan Sound Performance
   9. 99-2408-69 - Operating Limits for Centrifugal Fans

B. Air Movement and Control Association Inc. (AMCA), American National Standards Institute (ANSI):
   1. 204-05 - Standards Balance Quality and Vibration Levels for Fans
   2. 210-99 - Standard Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
   3. 11-r1999 - Method of Evaluating Load Ratings of Bearings

C. National Fire Protection Association (NFPA):
   1. 70 - National Electrical Code
   2. 90A-02 - Standard for the Installation of Air-Conditioning and Ventilating Systems

D. Occupational Safety and Health Administration (OSHA):
   1. 1910.212 - General requirements for Machine Guarding

E. UL listed and labeled.

1.03 SUBMITTALS

A. Shop Drawings - Show fan layout, housing, materials, gauges, dimensions, weights and installation details

B. Product data - Manufacturer’s fan performance (data includes cfm, rpm, bhp, motor nameplate data, tip speed, outlet velocity and static pressure) and sound performance (data includes sound power level ratings by octave bands) as tested in accordance with AMCA Standards 210 and 300.

C. Fan performance curves - Submit curves for all fans with system performance shown, and for plus or minus 10 percent and plus or minus 20 percent change in fan rpm. Curves shall include plotted rpm, horsepower, cfm, static pressure, and fan surge line and operating point.

D. Certified AMCA Ratings - Submit ratings for air and sound performance.

E. UL Listing - Submit listing if specified.

1.04 QUALITY ASSURANCE

A. Factory balance each fan statically and dynamically, test run before shipment, and key fan wheel to fan shaft. Fans shall operate quietly and without pulsation or vibration. Conduct sound power level tests for each type fan at the factory in accordance with AMCA 300.

B. Fans shall operate in the stable range of their performance curves.

C. The fan external static pressures shown in the schedules are those required by the ductwork and apparatus, and do not include the internal and intake fan losses, inlet vanes or integral outlet dampers, inlet screens, outlet velocity heads or drive losses, unless otherwise noted.

D. Factory performance test each fan assembled in or as part of apparatus specified to be performance tested. Test shall display scheduled performance characteristics, using certified, calibrated testing instruments provided by the manufacturer of the apparatus.

E. All fan performance ratings shall be based up on factory tests performed in accordance with AMCA 210. One fan of each type specified shall have actual factory performance tests performed prior to shipment. All fans shall be certified by AMCA and carry its seal.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly indicating manufacturer, material, products included, and location of installation

B. Storage: Store materials in a dry area indoor, protected from damage, and in accordance with manufacturer’s instructions. For long term storage follow manufacturer's Installation, Operations, and Maintenance Manual

C. Handling: Handle and lift fans in accordance with the manufacturer’s instructions. Protect materials and finishes during handling and installation to prevent damage. Follow all safety warnings posted by the manufacturer

1.06 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
   1. Equipment shall be warranted to be free from defects in material and workmanship for a period of one (1) year from the date of shipment.
   2. Motors shall be warranted by the motor manufacturer for a period of one (1) year after shipment from the fan manufacturer.

PART 2 - PRODUCTS

2.01 DIRECT DRIVE SIDEWALL MOUNTED PROPELLER FANS

A. General Description:
   1. Fan shall be model AER as manufactured by Greenheck or approved equal.
   2. Fan arrangement shall be exhaust.
   3. Sidewall mounted applications.
   4. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number.

B. Wheel:
   1. Propeller shall be constructed of cast aluminum tapered airfoil blades and cast aluminum hubs.
   2. Securely attached to motor shaft with a standard square key, set screw and tapered bushing.
   3. Statically and dynamically balanced in accordance with AMCA Standard 204-05.
   4. The propeller and fan inlet shall be matched and shall have precise running tolerances for maximum performance and operating efficiency.

C. Motors:
   1. Motor shall be accessible for maintenance.
   2. Electronically Commutated Motor
      a. Motor enclosure: Open drip proof.
      b. Motor shall be a DC electronic commutation type motor (ECM) specifically designed for fan applications.
      c. Motors shall be permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase.
      d. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor.
      e. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed control option shall be as called for on schedules.
      f. Motor shall be a minimum of 85% efficient at all speeds.

D. Drive Frame:
   1. Frames and Panels shall be bolted construction.
   2. Drive frame assemblies and fan panels shall be galvanized steel or painted steel.
   3. Drive frame shall have formed channels and fan panels shall have pre-punched mounting holes, formed flanges and a deep formed one piece inlet venturi.

E. Options/Accessories:
   1. All options and accessories shall be as called for on the equipment schedules.

PART 3 - EXECUTION

3.01 GENERAL

A. Install fans, including all necessary structural supports and bracings as scheduled and located on the contract drawings in accordance with manufacturer’s instructions and approved submittals.

B. Install fan level: +/- 5 degrees vertical. Final installation shall be free of all leaks from both fan and associated ductwork.

3.02 START-UP, TESTING, DEMONSTRATION

A. Start-up fans after checkout to ensure proper alignment and phased electrical connections.

B. Test fans individually and as part of system.

C. Ensure fans are properly interlocked with intake louvers.

D. Demonstrate operation to Owner and instruct maintenance personnel in operation of equipment.

END OF SECTION 233416

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Electric Unit Heaters.

B. Electric Wall Heaters.

1.02 REFERENCES

A. Electric unit heaters shall meet the requirements of the National Electric Code (NEC) and shall be UL listed.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300 - SUBMITTALS.

B. Submit manufacturer's product data and installation instructions to Engineer.

C. Submittal data shall include capacity and size of each heater and wiring instructions.

1.04 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authroized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

PART 2 - PRODUCTS

2.01 ELECTRIC UNIT HEATERS - HIGH THROW

A. Electric unit heater shall be Model ASHU as manufactured by Stelpro or approved equal. Heater shall be suitable for horizontal mount. Refer to the drawings for mounting type.

B. Heater to be of the KW rating, voltage and phase specified in the schedule.

C. Unit cabinet shall be 18-gauge steel with adjustable louvers to provide control of discharged air and protective screen. Unit shall be finished with an epoxy-polyester powdercoat.

D. Heating element shall be Nichrome. Unit shall have thermal protection with an automatic reset.

E. Unit shall have a permanently enclosed lubricated ball bearing motor.

F. Electrical: All units shall have built-in contactors and low voltage control circuit transformers to provide single-source power connection. Factory mounted disconnect switches shall be provided. A wiring diagram and grounding lug shall be included in each control compartment.

G. Supports: Stainless steel hanger rods, double nuts, and ceiling/wall bracket.

H. All options and accessories shall be as called for on the equipment schedules.

2.02 ELECTRIC WALL HEATERS

A. Wall mounted electric automatic fan forced heaters shall be Model AWH as manufactured by QMark or approved equal. The heaters shall be UL listed and be designed for wall, recess, or surface mounting. Refer to equipment schedule for mounting type.

B. Heater Assembly: The heater assembly shall consist of a fan panel upon which is mounted all of the operational parts of the heater.

C. Heating Element: The heating element shall be of non-glowing design consisting of an 50/20 nickel chromium resistance wire enclosed in a steel sheath to which plate fins are copper brazed. It shall be warranted for 5 years.

D. Fan and Fan Motor: The fan shall be five-bladed aluminum. The fan motor shall be totally enclosed.

E. Fan Delay Switch: Fan control shall be of bi-metallic, snap action type, and shall activate fan after heating element reaches operating temperature. The fan shall continue to operate after the thermostat is satisfied and until the heating element is cool.

F. Thermostat: The tamper-proof thermostat shall be of the bi-metallic, snap-action type with enclosed contracts. It shall be completely concealed behind the front cover to become tamper proof.

G. Thermal Cutout: A thermal cutout shall be built into the system to shut off the heater in the event of over-heating.

H. Disconnect Switch: A double-pole single throw disconnect switch shall be mounted on the back box for positive disconnect of power supply. It will be completely concealed behind the front grid panel.

I. Back Box: The back box shall be designed for duty as a recessed rough-in box in either masonry or frame installations and for use with a surface mounting frame in surface mounting installations. The back box shall be 20-gauge galvanized steel and shall contain knockouts through which power leads are brought.

J. Front Panel: The front panel shall be of the bar grille type and shall be constructed of 16 gauge cold rolled steel, welded into a uniform grille and finished in baked enamel to direct the warmed air toward the floor. The front grille shall be surrounded by a decorative satin-finish aluminum frame.

K. Provide other accessories as described on the contract drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install unit in accordance with manufacturer's published installation instructions.

B. Do not install horizontal unit heaters closer than 12 inches to combustible materials in any direction.

END OF SECTION 238239

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Excavation and backfill for electrical work.

B. Primary power wiring and distribution system.

C. Secondary power wiring and distribution system.

D. Lighting.

E. Wiring devices.

F. Electrical control systems and interlock wiring.

G. Wiring for built-in equipment.

H. Distribution panels and switches.

I. Engine generator system and automatic transfer switch.

J. Sound acoustical generator enclosure.

K. Instrumentation and Controls.

1.02 RELATED WORK

A. Foundations and pads required for equipment furnished under this division of specifications.

B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting.

C. Flashing and sealing of conduits through outside walls.

D. Cutting and patching for electrical work, except for errors and omissions under this Division.

1.03 QUALITY ASSURANCE

A. It is understood that the rights and benefits given the Owner by the guarantees found in the technical specifications are in addition to and not in derogation of any rights or benefits found in the special and general provisions of the contract.

B. Electrical equipment provided under this Division shall be turned over in operating condition. Instruction on further operation and maintenance shall be included in the operating and maintenance instructions.

1.04 REFERENCES

A. Perform work in accordance with standards listed below. Where these specifications are more stringent, they take precedence. In case of conflict, obtain a decision from the Engineer.
   1. NFPA-70: National Electrical Code
   2. NFPA-101: Life Safety Code
   3. New York State Energy Code
   4. New York State Building Code
   5. Applicable New York State Administrative Code

6. Applicable Town Ordinances.
7. Electric utility rules and regulations.
8. Telephone utility rules and regulations.

1.05 PERMITS AND FEES

A. The Contractor shall obtain and pay for all permits, construction charges, fees, licenses, certificates, inspections and other use charges required in connection with the work.

B. Such permits include, but are not limited to:
1. Transportation and disposal of debris.
2. Temporary Electrical Services and Permanent Electrical Service.
3. Telephone Service.
4. Electrical Inspectors, Inc., or a pre-approved electrical inspection agency.
5. Road opening permits.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All materials and equipment used in carrying out these specifications shall have UL listing and label. Specifications and drawings indicate name, type, or catalog numbers of materials and equipment to be used as standards. Proposals shall be based on these standards. Contractor may use materials and equipment equivalent to those specified, subject to Engineer's approval.

PART 3 - EXECUTION

3.01 COORDINATION

A. Carefully examine specifications, drawings and project site to be thoroughly familiar with items which require electrical connections and coordination. Electrical drawings are diagrammatic and shall not be scaled for exact sizes.

B. Notify other Contractors of any deviations or special conditions necessary for the installation of work. Interferences between work of various contractors to be resolved prior to installation. Work installed not in compliance with specifications and drawings and without properly checking and coordinating as specified above shall, if necessary, be removed and properly reinstalled without additional cost to the Owner. Engineer to be mediating authority in all disputes arising on project.

C. Equipment shall be installed in accordance with manufacturer's recommendation. Where conflicts occur between contract documents and these recommendations, a clarification shall be requested of the Engineer for decision before preceding with such work.

D. Insofar as it is possible to determine in advance, advise masonry tradesmen to leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should the Contractor neglect doing this, any cutting and/or patching required to be done is at this Contractor's expense.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of work under this Division.

B. Correct unnecessary damage caused due to installation of electrical work, brought about through carelessness or lack of coordination.

C. Holes cut through floor slabs to be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs to be properly sealed, fire proofed and waterproofed.

D. Repairs to be performed with materials which match existing materials and to be installed in accordance with appropriate sections of these specifications.

3.03 TESTS

A. On completion of work, installation shall be completely operational and entirely free from ground, short circuits, and open circuits. Perform a thorough operational test in presence of the Engineer. Balance all circuits so that feeders to panels are not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests.

B. Furnish Engineer with a copy of such tests including identification of each circuit and readings recorded, also the main service ground resistance test as described in Section 260526 of these specifications. Test information to include ampere readings of all panels and major circuit breakers, isolation resistance reading of motors and transformers.

3.04 IDENTIFICATION OF EQUIPMENT

A. Properly identify the following:
1. Motor Starter Cabinets.
2. Distribution panels.
3. Disconnect switches.
4. Transfer switches.
5. Individually mounted circuit breakers.
6. Relays.
7. Pilot lights and control switches.
8. Service entrance equipment and main circuit breaker.

B. Use permanently attached black phenolic plates with 1/4-inch white engraved lettering on the face of each, attached with two sheet metal screws.

C. Panelboard identification plates shall indicate panel by name.

3.05 INSTALLATION

A. The Contractor shall carefully move and replace existing equipment, appliances and all related items, as required to conduct proposed work.

B. Install and conduct all work per applicable NEC, State and local codes.

END OF SECTION 260000

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wires and cables.

B. In general, the wires and cables included under this Section shall include, but not be limited to, the following:
   1. 600V power and control cable
   2. Instrumentation wires
   3. Communication cables

C. All conductors to be continuous from origin to panel or equipment termination without splices.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

B. NECA Standard of Installations.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

1.04 QUALITY ASSURANCE

A. Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacturing, installing and servicing of similar items with a history of successful production acceptable to the Engineer as specified herein and in accordance with the General Conditions.

B. Contractor shall submit the following information pertaining to the manufacturer(s):
   1. Complete literature, performance, and technical data describing the proposed equipment and listing of items made by the manufacturer.
   2. Location of closest service office from which this equipment shall be serviced.
   3. Location of closest parts inventory for item installation.

1.05 COORDINATION

A. Coordination:
   1. Coordinate wire and cable required with the equipment being furnished by others for the satisfactory operation of the equipment or system.
   2. Review installation procedures under other sections and contracts and coordinate them with the work specified herein.
   3. Notify other prime contractors in advance of the installation of the work included to provide them with sufficient time for installation and coordination of interrelated items that are included in their contracts and that must be installed in conjunction with the work included in this Section.

1.06 PROJECT CONDITIONS

A. Verify that embedded conduit, in masonry and concrete, is installed as shown on the Drawings prior to the work being enclosed by others.

B. The Contractor shall be present at all concrete pours made by the General Contractor.

C. Conductor sizes are based on copper at 75°C.

D. Wire and cable routing shown on Drawings is approximate unless dimensioned or specifically called for such as where conduit is to be embedded in concrete or masonry. Route wire and cable as required to meet project conditions and shall be routed above ceilings, directly under joists, in pipe trenches, where available, and in masonry. Where exposed conduit is permitted, it shall be run to maximize wall space.

E. Field verify destination location to determine cable routing.

F. Where wire and cable routing is not shown for proposed destination, determine exact routing and lengths required. Routing shall be reviewed with the Engineer.

PART 2 - PRODUCTS

2.01 CONDUCTORS

A. Install products in accordance with manufacturer's recommendations.

B. Single copper conductors with 600-volt insulation.

C. Minimum size of feeder conductors and grounds shall be No. 12 AWG.

D. Insulation: No. 12 AWG and No. 10 AWG, provide ANSI/NFPA 70, Type THWN-2 for interior circuits and type XHHW-2 for exterior circuits. Exterior circuits shall be considered circuits where any portion of the circuit is run exterior of the building, in which case the entire length of the circuit shall be continuous wire of Type XHHW-2.

E. Use solid conductor for feeder and branch circuits, 10 AWG and smaller.

F. All conductors shall include complete set of manufacturer's markings for insulation and conductor size.

G. Manufacturers shall be SOUTHWIRE, PRYSMIAN GROUP, OKONITE, or approved equal.

H. Provide white colored neutral conductors; provide black, color coded phase conductors; provide green colored ground conductors.

2.02 300 VOLT INSTRUMENTATION SIGNAL CABLE - FOR INDOOR USE

A. Indoor Application:
   1. The 300-volt instrumentation signal cable for indoor use shall consist of single or multiple twisted pairs or triads of coated, stranded copper conductors with polyvinyl chloride (PVC) insulation and nylon jacket. Each individual pair or triad of wires shall have an aluminum/polyester tape shield with a tinned copper drain wire. For multiple pair or triad cables, an overall aluminum/polyester tape shield with a tinned copper drain wire shall enclose the individual wire assemblies. The overall jacket shall be PVC. Cables shall have a 105°C rating.
   2. The conductors shall be annealed, tin-coated copper with Class B stranding per ASTM B8. Minimum size conductor shall be AWG No. 16.
   3. The insulation shall be PVC. The insulation thickness shall be 15 mils.
   4. Individual Conductor Insulation: The jacket over each individual wire shall be nylon and shall have a thickness of 4 mils.
   5. The shield for each individual pair or triad shall be an aluminum/polyester tape. The shield shall be 1.35 mils thick and shall be overlapped to provide 100% coverage. The shield

shall also contain a 7-strand tinned copper drain wire which shall be a maximum of two sizes smaller than the conductors. All individual shields shall be completely isolated from each other.

6. The overall shield for multiple pair or triad cables shall be an aluminum/polyester tape. The shield shall be 2.35 mils thick and shall be overlapped to provide 100% coverage. The shield shall also contain a 7-strand tinned copper drain wire which shall be the same size as the conductors.
7. The overall jacket shall be PVC and shall meet the requirements of UL 13.
8. The jacket thickness shall be as follows:

Wire Size	No. of Pairs	No. of Triads	Jacket Thickness
16 AWG	1	-	35 Mils
16 AWG	2,4	-	50 Mils
16 AWG	8,10,12	-	60 Mils
16 AWG	-	1	35 Mils
16 AWG	-	2,4	50 Mils
16 AWG	-	8	60 Mils
16 AWG	-	12	70 Mils

9. Manufacturers and their products shall be equal to:
   a. BELDEN
   b. OKONITE
   c. SOUTHWIRE
   d. PRYSMIAN GROUP
   e. Or approved equal

B. Outdoor Use in Conduits:
1. The 300-volt instrumentation signal cable for outdoor use in conduits shall consist of single or multiple twisted pairs or triads of coated, stranded copper conductors with polyvinyl chloride (PVC) insulation and nylon jacket. Each individual pair or triad of wires shall have an aluminum/polyester tape shield with a tinned copper drain wire. For multiple pair or triad cables, an overall aluminum/polyester tape shield with a tinned copper drain wire shall enclose the individual wire assemblies. The overall jacket shall be chlorinated polyethylene (CPE). Cables shall have a 105°C rating.
2. The conductors shall be annealed, tin-coated copper with Class B stranding per ASTM B8. Minimum size conductor shall be AWG No. 16.
3. The insulation shall be PVC. The insulation thickness shall be 15 mils.
4. The jacket over each individual wire shall be nylon and shall have a thickness of 4 mils.
5. The shield for each individual pair or triad shall be an aluminum/polyester tape. The shield shall be 1.35 mils thick and shall be overlapped to provide 100% coverage. The shield shall also contain a 7-strand tinned copper drain wire which shall be a maximum of two sizes smaller than the conductors. All individual shields shall be completely isolated from each other.
6. The overall shield for multiple pair or triad cables shall be an aluminum/polyester tape. The shield shall be 2.35 mils thick and shall be overlapped to provide 100% coverage. The shield shall also contain a 7-strand tinned copper drain wire which shall be the same size as the conductors.
7. The overall jacket shall be CPE and shall meet the requirements of UL 13.
8. The jacket thickness shall be as follows:

Wire Size	No. of Pairs	No. of Triads	Jacket Thickness
16 AWG	1	-	35 Mils
16 AWG	2,4	-	50 Mils
16 AWG	8,10,12	-	60 Mils

Wire Size	No. of Pairs	No. of Triads	Jacket Thickness
16 AWG	-	1	35 Mils
16 AWG	-	2,4	50 Mils
16 AWG	-	8	60 Mils
16 AWG	-	12	70 Mils

9. Manufacturers and their products shall be as follows:
   a. BELDEN
   b. OKONITE
   c. SOUTHWIRE
   d. PRYSMIAN GROUP
   e. Or approved equal

2.03 4-PAIR CATEGORY 6 UNSHIELDED TWISTED PAIR CABLE

A. Manufacturers: Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
   1. Belden Corporation, Carmel, IN (800) 246-2673.
   2. Avaya, Basking Ridge, NJ (800) 344-02232.
   3. Berk-Tek, Incorporated, New Holland, PA (800) 237-5835.
   4. CommScope, Hickory, NC (800) 982-1708.
   5. Draka Comteq, Franklin, MA (888) 541-7100.
   6. General Cable, Highland Heights, KY (800) 424-5666.
   7. Mohawk/CDT Leominster, MA (978) 537 9961.
   8. NORDX/CDT, Worcester, MA (800) 331-0779.
   9. Superior Essex, Atlanta, GA. (800) 685-4887.
   10. Tyco Electronics, Harrisburg, PA (800) 522-6752.

B. Conductors: 4 twisted pair - 24 AWG, solid copper w/ RJ-45 connector ends
   1. Individually insulated plenum rated conductors under common plenum rated sheath unless entire cable is installed within conduit/EMT or if area where cable is installed is not considered a return air plenum according to any applicable codes.
   2. Complies with individual characteristics established in ANSI/TIA/EIA-568-B, and all addendums for Category 6 cable performance specification.
   3. Overall Nominal Diameter: .365 x .165 in.
   4. Nominal Impedance: 100 ohms plus or minus 15 percent.
   5. Certified capable of performing to minimum 350 MHz.

C. Mechanical Characteristics
   1. Operating temperature: -20°C to +80°C
   2. Bulk cable weight: 29 lbs./1000 ft.
   3. Maximum recommended pulling tension: 45 lbs.
   4. Minimum bend radius: 1 in.

D. Flame test: UL1666 Riser

E. Electrical Characteristics:
   1. Nom. Mutual Capacitance @ 1 KHz 15.0 pF/ft
   2. Maximum Capacitance Unbalance (pF/100 m) 49.2 pF/100 m
   3. Nominal Velocity of Propagation 70 %
   4. Maximum Delay (ns/100 m) 510 @ 100MHz ns/100 m
   5. Maximum Delay Skew (ns/100m) 25 ns/100 m
   6. Maximum Conductor DC Resistance @ 20 Deg. C 9 Ohms/100 m
   7. Maximum DCR Unbalance @ 20 Deg. C 3 %

8. Max. Operating Voltage - UL 300 V RMS

2.04 MECHANICAL CONNECTORS

A. Conductor tapping connectors shall be BURNDY Servit split bolt, Series KS and KS3, or approved equal.

B. Split bolt connectors shall use BURNDY Type SC Servit cover on indoor applications.

C. Terminal lugs shall be BURNDY Universal Terminal Series. Terminal lugs shall be sized for proper ampacity and proper number of conductor holes. Each conductor shall occupy only one hole on a terminal lug.

D. Conductor tapping connectors for multiple conductors shall be BURNDY Series V-Tap with V-Tap covers, and V-Blok mounting platforms.

2.05 BELOW GRADE EXTERIOR SPLICES

A. Manufacturer: 3M or approved equal

B. Model: 72-N series for inline splices

C. Model: 90-B1 for WYE splices

D. Splices shall be weatherproof, made with epoxy resin UL listed for direct burial.

E. For use with all exterior pull boxes and hand holes where splices are made.

F. Provide all connectors and crimp couplings as required.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:
1. Make terminations in accordance with cable manufacturers instructions for the particular type of wire and cable.
2. Splices are not allowed in the underground duct and manhole systems. If splices are required, the Contractor shall obtain approval in writing from the Engineer prior to splicing.
3. All splices shall be in made in terminal boxes.

B. Wire and Cable Sizes: The sizes of wire and cable shall be as shown on the Contract Drawings, or if not shown, as approved by the Engineer. Minimum size wire shall be No. 12 AWG for all power, lighting and receptacle circuits. Wires for control circuits shall be No. 14 AWG minimum. Wire for instrumentation circuits shall not be smaller than No. 16 AWG. If due to field routing the voltage drop exceeds 2.5%, the size of conductors shall be increased such that 2.5% is the maximum voltage drop incurred.

C. Number of Wires: The number of wires indicated on the Contract Drawings for the various control, indications, and metering circuits were determined for general schemes of control and for particular indication and metering systems. Coordinate wiring schemes with equipment schematics.

D. Wiring Identification: All wiring shall have a unique wire number and be labeled at both ends. Wire numbers shall correspond with the equipment terminal wire numbers. Where no wire

numbers are indicated, the Contractor shall assign wire numbers. Wire numbers shall not be duplicated.

E. Cable Identification Tags: The Contractor shall furnish all labor and materials and affix in a permanent way to each cable in manholes, cable compartments and vaults, junction boxes, pull boxes and points of termination, a laminated plastic tag, bearing clearly printed, the cable number indicated on the Contract Drawings or some other approved identification number or symbol. All cables shall be temporarily tagged with its full ID number immediately after it has been pulled.

F. Wiring Supplies: Only electrical wiring supplies manufactured under high standards of production and meeting the approval of the Engineer shall be used. Friction tape shall be in accordance with ASTM D69.

G. Training of Cable: Furnish all labor and material required to train cables around cable vaults within buildings and in manholes in any outdoor underground duct system. Sufficient length of cable shall be provided in each manhole and vault so that the cable can be trained and racked in an approved manner. In training or racking, the radius of bend of any cable shall be not less than the manufacturer's recommendation. All manhole cables shall be arc and fireproofed.

H. Connections at Control Panels, Limit Switches and Similar Devices:
   1. Where stranded wires are terminated at panels, and/or devices connections shall be made by solderless lug, crimp type ferrule or solder dipped.
   2. Where enclosure sizes and sizes of terminals at limit switches, solenoid valves, float switches, pressure switches, temperature switches, and other devices make 7-strand, No. 12 AWG, wire terminations impractical, the Contractor shall terminate external circuits in an adjacent junction box of proper size and shall install No. 14 AWG stranded wires to the junction box in a conduit.

I. Pulling Temperature: 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 of 40°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 degrees F and pulling shall be completed during the work day for which the cable is removed from the protected storage.

J. Color Coding:
   1. Conductor jacket shall be color coded as follows:

AC POWER

480V/277 Volt 3 phase	**208Y/120 Volt 3 phase (PSEGLI)**	**208Y/120 Volt 3 phase (NEC)**	**240/120 Volt 3 phase (PSEGLI)**	**240/120 Volt 3 phase (NEC)**
Phase A Brown	Phase A Blue	Phase A Black	Phase A Blue	Phase A Black
Phase B Orange	Phase B Black	Phase B Red	Phase B Black	Phase B Orange (HiLeg)
Phase C Yellow	Phase C Red	Phase C Blue	Phase C Orange	Phase C Blue
Neutral White	Neutral White	Neutral White	Neutral White	Neutral White
Ground Green	Ground Green	Ground Green	Ground Green	Ground Green

2. Control (Per ICEA Method 1, K-2):

WIRE NUMBER	COLOR
1	Black
2	Red
3	Blue
4	Orange
5	Yellow
6	Brown
7	Red With Black
8	Blue With Black
9	Orange With Black
10	Yellow With Black
11	Brown With Black
12	Black With Red
13	Blue With Red
14	Orange With Red
15	Yellow With Red
16	Brown With Red
17	Black With Blue
18	Red With Blue
19	Orange With Blue

3. DC Power
   a. Positive Lead - RED
   b. Negative Lead - BLACK
4. Instrumentation Signal
   a. Pairs - Black and White
   b. Triads - Black, Red and White
5. Equipment Ground - GREEN

K. Instrumentation Cable Installation:
   1. Where instrumentation cables are installed in panels, etc., 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.
   2. Grounding of cable shield shall be accomplished at one point only, unless otherwise required by instrumentation systems manufacturer.
   3. Special instrument cable shall be as specified or recommended by the vendor of the equipment or instruments requiring such wiring. Installation, storage, terminations, etc., shall be per manufacturer's recommendations.

3.02 IDENTIFICATION

A. Identify wire and cable under provisions of Section 260553.

B. Identify each conductor with its circuit number.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014500.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Field Testing:
   1. Wires and cables shall be tested before being connected to motors, devices or terminal blocks.
   2. If tests reveal defects or deficiencies, the Contractor shall make the necessary repairs or shall replace the cable as directed by the Engineer, without additional cost to the Owner.
   3. All tests shall be made by and at the expense of the Contractor who shall supply all testing equipment.

E. Continuity Tests: All cables, wires and shields shall be tested for continuity. Testing for continuity shall be by test light or buzzer.

F. Insulation-Resistance Tests:
   1. 600V power and control cables and wires shall be tested for their insulation-resistance values. Test shall utilize a megohmmeter with applied voltage to be 1000VDC for one (1) minute. Insulation-resistance test shall be performed on each conductor with all other conductors grounded. The resistance value shall be 20 megohms or greater.
   2. 300V instrumentation signal cable shall be tested from conductor to conductor, conductor to ground, and conductor to shield using a digital volt-ohm meter. The resistance value shall be 10 megohms or greater.

END OF SECTION 260519

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

1.03 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 COMPONENTS

A. Ground clamps:
   1. OZ ELECTRICAL MANUFACTURING COMPANY, Type "CG" for connection to water main piping and Type "GC" for connection to ground rod; with cable installed parallel or 90 degrees to pipe/rod under separate clamp.
   2. Or equal by STEEL CITY or APPLETON

B. Raceways, conductors, outlet boxes, pull and junction boxes to be furnished in accordance with applicable sections of these specifications.

C. Rod Electrode: Solid Copper, 3/4-inch diameter, 10 feet long.

D. Wire: Copper, sized to meet NFPA 70 requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:
   1. Clean all conductive surfaces on equipment to be grounded, to assure good electrical continuity.
   2. Effectively bond all grounding conductors to grounding rod electrodes, equipment enclosures and ground busses.
   3. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.
   4. Install service entrance building ground as per NEC and Local Utility requirements.
   5. Service entrance shall be bonded to street side of first flange or coupling of incoming main water line with heavy duty ground clamp. Bonding conductor to be sized in accordance with NFPA 70.
   6. Building steel shall be bonded to ground bus on main service with a conductor the same size as in B.1 below.
   7. Install new service grounds and grounding systems for new service as per Local Utility and NEC requirements.

8. Generators shall have a dedicated grounding system for a separately derived system for switching neutrals.

B. Feeder/Branch Circuits:
   1. All circuits shall have a separate green grounding conductor in conduit sized in accordance with NFPA 70. Minimum size of conductor shall be No. 12 AWG.
   2. Flexible conduit will not be approved as achieving continuity of ground. All flexible conduit to have a jumper wire sized to ampacity of branch breaker and to be connected to conduit system on both ends; this applies to fixtures, motors, controls, etc.

C. Transformers:
   1. Transformers shall be grounded and grounding conductors and conduits sized in accordance with NFPA 70.

3.02 TEST

A. Test ground on main service. Ground system resistance shall be no greater than 10 ohms using test equipment similar to a "Biddle" test. Test data to be submitted to the Engineer for approval and such approved test data to become a part of the Record Documents.

END OF SECTION 260526

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. System of supporting devices and hangers for support or bracing for conduit, electrical equipment, safety switches, fixtures, panelboards, outlet boxes, junction boxes and cabinets.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

1.03 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. Provide appropriate corrosion-resistant supporting devices and hangers for electrical equipment, as manufactured by ERICO PRODUCTS, INC., CADDY FASTENERS, STEEL CITY, MINERALLAC or equivalent.
   1. "Z" purlin clips.
   2. Conduit clips.
   3. Beam clamps (universal and vertical flange).
   4. Beam clamps (set screw type).
   5. Combination push-in conduit clips.
   6. Combination conduit hanger clamps.
   7. Flexible conduit clips.
   8. Special combination conduit clips.
   9. One hole steel straps.
   10. Conduit hangers.

B. Provide materials, sizes and types of anchors, fasteners and supports to carry the loads of equipment, wire in conduit and conduit.

2.02 CHANNEL SUPPORT SYSTEM

A. Channel systems and supports shall be manufactured by KINDORF/THOMAS & BETTS, or approved equal.

B. Channels shall be 1-1/2" x 1-1/2".

C. Channels and all associated accessories and bolts shall be hot dipped galvanized.

D. Channels shall have 9/16" bolt holes on 1-1/2" centers.

E. Provide end caps for all channels.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Secure conduits to within 3 feet of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed 10 feet in accordance with currently effective edition of the National Electric Code.

B. In seismic zones, support conduits 1 inch and smaller at 6 foot intervals.

C. Install clamps secured to structure for feeder and other conduits routed against structure. Use drop rods and hangers to support conduits run apart from the structure.

D. Provide and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures, panelboards, etc.

E. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. Prepainted or galvanized support material is not required to be painted or repainted.

F. Do not use chains, perforated iron, baling wire or tie wire for supporting conduit runs. Use of clips to support conduit to top of t-bar ceiling grid will not be permit-ted.

G. Obtain permission from Engineer before drilling or cutting structural members.

H. Install surface mounted cabinets and panelboards with a minimum of four anchors.

I. Do not fasten supports to pipes, ducts, mechanical equipment and conduit.

J. Install products in accordance with manufacturer's instructions.

END OF SECTION 260529

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Conduit system with associated couplings, connectors and fittings. Conduits to be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.
   1. Conduit Use - Rigid Galvanized Conduit:
      a. All interior and exterior circuits above and below ground.
   2. Conduit Use - PVC Sch. 80
      a. Secondary service power feeds from PSE&G transformers only.
   3. Conduit Use - PVC coated rigid galvanized conduit.
      a. All circuits in Chlorine Room.
   4. Conduit Use - Flexible Liquid-tight Metal Conduit:
      a. Connecting motors, generators and other equipment subject to vibration, maximum length - 3 feet.
      b. Passing through building expansion joints.
      c. Tank Mixer Control Panel and Tank Mixer Junction Box
         1) Terminate conduit with male thread end for panel mount with maximum length of 3 feet.
   5. J-Hooks
      a. For use above finished ceilings for telephone, PA, CAT 6 data and fire alarm cable only.

B. Device Boxes: Provide each fixture switch, receptacle and other wiring device with a box of appropriate size and depth for its particular location use unless indicated otherwise.

C. Pull boxes, junction boxes and wire troughs

1.02 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI/NFPA 70 - National Electric Code.

C. NECA Standard of Installation.

D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

E. NEMA TC 3 - PVC Fittings for use with Rigid PVC conduit and tubing.

F. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

G. ANSI/NEMA OS1 - Sheet-steel outlet boxes, device boxes, covers and box supports.

H. NEMA 250 - Enclosures for electrical equipment (1000 volts maximum).

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Working Drawings:
   1. Prior to equipment submission, submit a list of proposed manufacturers with the products they produce proposed for the contract.
   2. Manufacturer’s catalog cuts for the conduit, boxes, fittings and supports proposed for use.

3. Construction details of conduit racks and other conduit support systems with seismic restraint details and calculations signed by a licensed Engineer.
4. Scaled working drawings showing proposed routing of all conduits, inclusive of conduits routed above grade on exterior support structures, 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.

1.04 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by Underwriters Laboratories, Inc.

B. Conform to requirements of ANSI/NFPA 70.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017839.

B. Accurately record actual routing of all conduits.

1.06 FIELD SAMPLES

A. Provide under provisions of Section 014500.

B. Provide field sample of conduit two each at 2 feet in length.

C. Provide field sample of expansion/deflection fitting, two each.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products in accordance with manufacturers' recommendations.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing abovegrade. Provide appropriate covering.

1.08 PROJECT CONDITIONS

A. Verify all conduit routings by field measurements.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system. Provide all required sweeps, boxes and fittings.

PART 2 - PRODUCTS

2.01 RIGID GALVANIZED CONDUIT

A. Rigid conduit shall be hot dipped, galvanized, or electro-galvanized steel by Wheatland, Triangle, Republic or approved equal.

B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO., EFCOR or approved equal. Catalog numbers used below are

those of THOMAS & BETTS CORP. based on 3/4-inch size and are considered standards by which equivalents are to be judged.

C. ERICKSON couplings, Series 676 or approved equal, shall be used where neither length of conduit can be rotated.

D. Conduit connectors shall be threaded type. Set screw and compression type connections ARE NOT acceptable.

E. Sealing fitting locknuts shall be Series 142SL.

F. Steel or malleable iron insulated bullet hub, Series 370-379, complete with sealing "O" ring. DO NOT use "die cast" material.

G. Entrance ells shall be Series 1491 or approved equal.

H. Combination coupling shall be Series 531 for connecting rigid galvanized conduit to electrical metallic tubing.

2.02 PVC CONDUIT

A. PVC conduit shall be manufactured by WHEATLAND, TRIANGLE REPUBLIC or approved equal.

B. Description: NEMA TC 2; Schedule 80 PVC.

C. Fittings and Conduit Bodies: NEMA TC3.

2.03 PVC COATED METAL CONDUIT

A. PVC Coated Metal Conduit shall be PLASTI-BOND RED by Robroy Industries or equal.

B. Description: NEMA RN 1; galvanized rigid steel conduit with external PVC coating, 40 mil thick and red urethane internal coating.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; galvanized steel fittings with external PVC coating and red urethane internal coating to match conduit shall be provided in all spaces where PVC coated metal conduit is installed.

D. Junction and Pull Boxes: Galvanized steel boxes with external PVC coating and red urethane internal coating to match conduit shall be provided in all spaces where PVC coated metal conduit is installed.

E. Conduit Supporting Hardware: Galvanized steel hardware with external PVC coating and red urethane internal coating to match conduit shall be provided in all spaces where PVC coated metal conduit is installed.

2.04 HAZARDOUS LOCATION SEALING HUB

A. Hazardous location sealing hubs shall be O-Z/GEDNEY EYH, EYH-SG or approved equal.

B. Contractor shall provide hazardous sealing fittings of different types and configurations to facilitate the installation as manufactured by O-Z/GEDNEY or approved equal.

C. Sealing compound and fiber shall be O-Z/GEDNEY type EYC and EYF.

2.05 DUCT SEAL

A. RectorSeal or approved equal.

B. Model #: 81881

2.06 J-HOOKS

A. TO BE USED ABOVE FINISHED CEILING ONLY. FOR TELEPHONE, PA, CAT 6 DATA AND FIRE ALARM CABLE ONLY. ALL EXPOSED TELEPHONE, PA, CAT 6 DATA AND FIRE ALARM CABLE SHALL BE IN CONDUIT.

B. Erico Caddy HP J. Hook Series or approved equal.

C. Provide wire retainers for all.

D. Provide mounting hardware and accessories as required.

E. Spacing of J-Hooks and supports shall not exceed 5’-0” on center.

2.07 FLEXIBLE LIQUID-TIGHT METAL CONDUITS AND FITTINGS

A. Liquid-tight flexible metal conduit shall be ANACONDA or approved equal.

B. Description: Interlocked steel construction with PVC jacket.

C. Provide flexible liquid-tight conduits and fittings as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO. or approved equal. Catalog numbers used below are those of the THOMAS & BETTS CORP., based on 3/4" size and are to be considered as standards by which equivalents are to be judged. All conduit shall be liquid-tight flexible type, UL type UA, or suitable for exposure to continuous or intermittent moisture.

D. Flexible liquid-tight connectors shall be Series 5333 or approved equal.

2.08 OUTLET AND DEVICE BOXES

A. Acceptable Manufacturers: Raco, General Electric or approved equal.

B. Sheet Metal Outlet Boxes - All concealed boxes shall be NEMA OSI, galvanized steel:
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported. Provide 1/2" male fixture stubs where required.

C. Concrete Ceiling Boxes: Concrete type.

D. Cast Boxes: All exposed surface mounted boxes shall be NEMA FB1, Type FD, cast feralloy. Provide gasketed cover by box manufacturer.

2.09 PULL BOXES

A. All pull boxes used for this project shall be minimum LIPA B-3-6 or specifically approved equal for all customer installed power and control circuits.

B. Provide H-20 Cast-Iron Traffic Load Cover. Cover shall have 3” high logo “Electric”.

2.10 JUNCTION BOXES

A. Acceptable Manufacturers: RACO, GENERAL ELECTRIC or approved equal.

B. Sheet metal boxes: NEMA OS1, galvanized steel.

C. Covers: Galvanized steel.

2.11 WIRE TROUGH

A. Wireways shall be manufactured by Square D, Class 526, rain tight trough or approved equal.

B. Wireway shall be completely enclosed with removable covers.

C. Construction: 16 Gauge Galvanized Steel. 8-inch and 12-inch wire trough shall be 14-gauge galvanized steel.

D. Finish: ANSI-49 epoxy paint applied by cathodic electro-deposition paint process over a corrosion resistant phosphate preparation.

E. UL listed.

2.12 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT THREAD COMPOUND

A. KOPR-SHIELD or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF CONDUITS

A. Minimum size of conduits shall be 3/4-inch.

B. Minimum conduit depth shall be 24" below grade, measured to the top of the conduit on exterior underground installations.

C. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors and fittings.

D. All threaded conduits and fittings shall have KOPR-SHIELD compound applied to all threads prior to assembly.

E. Make bends or offsets with standard ells or field bends with an approved bender.

F. Run concealed conduits in direct line with long sweep bends or offsets. Run exposed conduits parallel to and at right angles to building lines. Group multiple conduit runs in banks.

G. Secure conduits to all boxes and cabinets with double locknuts and bushings so system will be electrically continuous from service to all outlets.

H. Install conduit in accordance with NECA Standard of Installation.

I. Cap ends of conduits to prevent entrance of water and other foreign material during construction.

J. Complete all conduit systems before pulling conductors.

K. Support conduits under provisions of Section 260529.

L. Provide approved expansion joints or fittings and bonding jumpers where conduits in concrete pass through building expansion joints.

M. Provide cable supports in conduits rising vertically in accordance with the National Electric Code, Article 300-19.

N. Provide No. 12 AWG copper pull wires or nylon cord in all empty conduits. Steel wire not acceptable as pull wire.

O. Install conduit to preserve fire resistance rating of partitions and other elements.

P. Ground and bond conduit under provisions of Section 260526.

Q. Where neither length of conduit can be rotated, ERICKSON couplings Series 676 shall be used.

R. In areas where enclosed and gasketed fixtures and weatherproof devices are specified, where rigid conduit enters a sheet metal enclosure, junction box and outlet box, and not terminated in a threaded hub, a steel, or malleable iron nylon insulated bullet hub, complete with recessed sealing "O" ring, shall be used, Series 370-379 . DO NOT use die cast material.

S. Conduits shall not be installed within concrete slabs unless specifically noted in contract documents; no exceptions.

T. Where conduits running overhead pass through building expansion joints, install flexible liquid tight conduit of same size with sufficient slack to allow conduits on either side of expansion joint to move a minimum of 3-inches in any direction. Provide supports as required on each side of expansion joint, all in accordance with seismic requirements of specific area.

U. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.

V. Arrange supports to prevent misalignment during wiring installation.

W. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

X. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

Y. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

Z. Do not attach conduit to ceiling support wires.

AA. Arrange conduit to maintain headroom and present neat appearance.

AB. Route exposed conduit parallel and perpendicular to walls.

AC. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

AD. Route conduit in and under slab from point-to-point.

AE. Do not cross conduits in slab.

AF. Maintain adequate clearance between conduit and piping.

AG. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104°F (40°C).

AH. Bring conduit to shoulder of fittings; fasten securely.

AI. Use conduit hubs with sealing locknuts to fasten conduit in damp and wet locations.

AJ. Install no more than equivalent of three 90-degree bends on interior locations between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch size.

AK. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

AL. Do not use dissimilar strap or clamp supports. Provide dielectric tape, fittings, straps, and bushings where dissimilar metals are used.

AM. Where fittings for liquid-tight flexible conduit are brought into an enclosure with a knockout, a gasket assembly, consisting of one piece "O" ring, with a Buna-R sealing material, Series 5200, shall be installed on outside of box. Fittings shall be made of either steel or malleable iron only, and shall have insulated throats or insulated bushings.

AN. A copper ground wire sized in accordance with NEC shall be installed on the inside of the conduit as a jumper around flexible conduit to assure a continuity of ground.

AO. Install a copper jumper across all flexible conduit including lighting fixtures, controls and other utilization equipment.

AP. Install liquid-tight flexible conduit in such a manner as to prevent liquids from running on surface toward fittings.

AQ. Allow sufficient slack conduit to reduce the effect of vibration.

AR. Complete all conduit systems before pulling the conductors.

AS. Support in accordance with requirements of National Electric Code.

3.02 INSTALLATION OF BOXES

A. Install boxes concealed in finished walls.

B. Locate boxes to prevent moisture from entering or accumulating within them.

C. Support boxes independently of conduit, as required by the National Electric Code.

D. Provide 4" x 1-1/2" octagonal, 4" x 1-1/2" square or 4" x 2-1/8" square ceiling outlet boxes.

E. All boxes, conduit bodies, and handholes shall be installed in a manner which meets the accessible and readily accessible reuirements of the NEC, including in building with suspended ceilings and hold down clips.

F. Where required to hang a specific fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.

G. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed concealed in concrete block walls. For increased cubic capacity, provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gang-type outlet boxes only in drywall construction.

H. Provide 4-11/16" square outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls for telephone outlets. Single gang device boxes are not acceptable.

I. Provide fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlet only for ceiling fixture outlets.

J. Provide condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere or damage or mar the appearance of the installation.

K. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed, in accordance with the National Electric Code.

L. Effectively close unused openings in boxes with metal plugs or plates.

M. Set boxes so that front edges are flush with finished surfaces.

N. Support boxes from structural members with approved braces.

O. Install blank device plates on outlet boxes left for future use.

P. Provide bushings in holes through which cords or conductors pass.

Q. Install boxes so that the covers will be accessible at all times.

R. Electrical boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only in each framing space and that openings do not exceed 16 square inches. All clearance between such boxes and the gypsum board shall be completely filled with joint compound or approved fire-resistive compound. The wall shall be built around outlet boxes larger than 16 square inches so as not to interfere with the wall rating.

3.03 INSTALLATION OF PULL BOXES, JUNCTION BOXES AND WIRE TROUGHS

A. Provide junction boxes as shown on Drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4-inch square and 2-1/8-inches deep. Provide screw covers for junction boxes.

B. Install boxes in conduit runs wherever necessary to avoid long runs or too many bends. Do not exceed 100-foot runs without pull boxes. Install pull boxes at all 90-degree bends.

C. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered adequate support.

D. Install boxes with covers in accessible locations. Size boxes in accordance with the National Electric Code.

E. Do not install pull boxes or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box.

F. Coordinate installation of exterior pull boxes with General contractor to establish elevations of finished grades and pavements. All castings shall have chimney adjustment of + 6".

3.04 CONDUIT LOCATIONS

A. Route all conduit concealed in walls or above finished ceilings. Provide boxes and conduits concealed in walls for all power and controls.

B. J-Hooks are only permitted to be used above finished ceilings for telephone, PA, CAT 6 data and fire alarm cable.

C. Contractor shall not route conduits over pump motors, roof hatches and trolly beams which would prevent removal of pump motors.

END OF SECTION 260533

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Conduit markers.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300 - SUBMITTALS.

B. Product Data: Provide catalog data for nameplates, labels and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Underwriters Laboratories, Inc. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

B. Locations:
1. Pump starter cabinet.
2. Distribution panelboards.
3. All control switches and pilot light devices.
4. Transfer Switches.
5. Generator Enclosure.
6. Enclosed circuit breaker.

C. Letter Size:
1. Use 1/4 inch (6 mm) letters for identifying all control pilot lights.

D. Labels: Embossed adhesive tape, with 3/16” (5mm) white letters on black background. Use for identifying existing equipment, distribution panels, switchboards, disconnect switches, and individual electrical devices.

2.02 WIRE MARKERS

A. Manufacturers:

1. 3M ELECTRICAL SPECIALTY DIV., Product Scotch Code.
2. THOMAS & BETTS CORP., Product E-Z Code.
3. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: Epoxy film tape type wire markers.

C. Locations: Each conductor at panelboards, auxiliary gutters, pull boxes, outlet and junction boxes, circuit breakers and each load connection.

D. Legend:
1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
2. Control Circuits: Control wire number indicated on interconnection diagrams on drawings.

2.03 CONDUIT MARKERS

A. Manufacturers:
1. THOMAS & BETTS CORP.
2. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: Self-sticking vinyl; black letters on orange background.

C. Location: Furnish markers for each conduit longer than 6 feet (1.8 m).

D. Spacing: 20 feet (6 m) on center.

2.04 UNDERGROUND WARNING TAPE

A. Manufacturers:
1. THOMAS & BETTS CORP., Model NAF-0700.
2. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: 6 inch (150 mm) wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.02 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws, rivets or adhesive.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

D. Apply conduit markers at 20 foot (6 m) intervals.

E. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches (75 mm) below finished grade.

3.03 ELECTRICAL EQUIPMENT IDENTIFICATION

A. The Contractor shall identify all existing circuits in existing distribution panels, switchboards and disconnect switches to remain.

B. Label all circuits identifying the load served including all individual circuit breakers.

C. Label all new circuit breakers and switches used for new feeder and branch circuits.

D. Contractor shall furnish a minimum of 5 custom engrave three-layer laminated plastic labels with up to 20 words per label as directed by the engineer/owner in addition to the required labels for all pilot devices, switches, controls and timers.

END OF SECTION 260553

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surge protection device.

1.02 STANDARDS

A. The specified suppressor shall be designed, manufactured, tested and installed in compliance with:
   1. American National Standards Institute and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.11, C62.41 and C62.45).
   2. Federal Information Processing Standards Publication 94 (FIP PUB 94).
   3. National Electrical Manufacturer Association (NEMA LS-1).
   4. National Fire Protection Association (NFPA 20, 70, 75 and 78).
   5. Underwriters Laboratories (UL 1449).
   6. CAN/C22.2 No. 8-M1986; CSA Electrical Certification Notice No. 516.
   7. The system individual units shall be UL listed under UL 1449 Standard for Transient Voltage Surge Suppressions (TVSS) and the surge ratings shall be permanently affixed to the TVSS.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. MCG ELECTRONICS, INC., Deer Park, New York.

B. Approved equal.

2.02 MANUFACTURED UNITS

A. Surge suppression shall be series Surge Free Model No. 400LS.

2.03 SYSTEM REQUIREMENTS

A. The specified surge protective device shall provide effective high energy surge diversion for application ANSI/IEEE C62.41-1991 Location Category C3 environments. Testing per ANSI/IEEE C62.45-1992 using ANSI/IEEE C62.41 Category C3 waveforms and amplitudes. UL 1449 listing. The specified surge protective device shall provide:
   1. 400,000 transient amps, per phase of surge protection.
   2. Peak surge current ratings must be independently tested and verified.
   3. All mode protection, L-N, L-G, L-L, N-G.
   4. Integral disconnect with safety dead front.
   5. Each MOV protected from over-current, thermal overload and monitored individually.
   6. Self diagnostics with comprehensive LED bar graph on front panel showing the exact % level of protection available.
   7. Audible fault alarm with silence switch.
   8. Event counter, indication of time and date of last event (battery backup for time and date).
   9. Remote alarm relay contacts (surge protected), Form C.
   10. Micro-Z low impedance installation cable.
   11. Twenty year warranty on entire system.
   12. LIFETIME “NO NONSENSE” WARRANTY ON FIELD REPLACEABLE POWER MODULES AND FUSES.

B. Environmental Requirements:

1. Magnetic Fields: Connection shall be made using low impedance Micro-Z cabling provided with the suppressor for maximum magnetic field cancellation. Unit shall be shunt-installed with no series connected elements.
2. Operating Temperature: Operating temperature range shall be -40° to +71° C (-40° to +160° F).
3. Storage Temperature: Storage temperature range shall be -40° to +85° C.
4. Relative Humidity: Operation shall be reliable in an environment with 0% to 95% non-condensing relative humidity.
5. Operating Altitude: The system shall be capable of operation up to an altitude of 13,000 feet above sea level.
6. Operating Voltage: Maximum continuous operating voltage shall be no less than 115% and no greater than 140% of the nominal rated line voltage.
7. Power Frequency: The power frequency range shall be 47 to 440 Hertz.

C. Electrical Requirements:
1. Unit Operating Voltage Requirements:

Voltage:	Description:	Joules (8/20us):	Vpeak L-N (20kV, 10kA):	Vpeak L-N (6kV, 500A):
277/480 VAC	3phase, 4W + gnd, wye	93600	1130V	1000V

2. Unit shall be installed in parallel with the protected equipment. No series connected protective elements shall be used.
3. The maximum surge current capacity per phase of the specified system, based on the standard IEEE 8/20 microsecond waveform, shall be at least: 1 Event at 400 kA. The surge life (8/20us) shall be at least 10,000 @ 19 kA occurrences. The transient suppression capability shall be bi-directional and suppress both positive and negative impulses.
4. The suppressor shall be capable of interrupting a 200 kA, short circuit current delivered from the AC power line. The interrupt capability must be confirmed and documented by a recognized independent testing laboratory.
5. The suppressor shall be designed so as to minimize the internal surge path impedance. Direct point-to-point internal wiring is inherently inductive and not acceptable. Connection to the power service shall be constructed for best performance.
6. Equipment shall be as manufactured by MCG Electronics, Inc.: Model: 400LS-Family or engineering department approved equal with supporting test data.

D. Protection System Components:
1. Replaceable modules: The suppressor shall be constructed using field replaceable protection modules. The suppressor shall have individually fused and monitored 40mm Metal Oxide Varistors (MOV's), including neutral to ground protection mode. Each module will provide five times (5X) redundant protection, with three modules per each phase and five fuses per module. The status of each module shall be locally monitored with a green LED that becomes red in a fault condition. The transient peak rating of the fuse shall be coordinated with the Ipeak handling capability of the MOV so that the surge path capability is not limited by the series fusing. In addition, each MOV shall incorporate a thermal disconnect means to remove a shorted MOV safely from the protection system.
2. Self-Diagnostics: Red, green and yellow solid state LED indicators shall be provided on the hinged front cover to indicate protection status. An illuminated green LED indicates power is present at the protector on all phases, and an illuminated red LED shall indicate that one or more of the modules have reduced protection. An illuminated yellow LED shall indicate a suppression event. Both front panel and internal LEDs are required to provide power and fault indications in the event of even the loss of a single fuse or MOV. Relay operation shall be in a fail-safe operating mode (i.e., continuously energized so that power

failure, reduced protection, or a break in the remote monitoring line will cause a fault indication at the remote monitor).

3. Remote Alarm Capability: Relay alarm contacts shall be provided for remote alarm monitoring capability of unit status. Form C normally open and normally closed contacts shall be provided with voltage and current limiting protection.
4. Audible Alarm: The specified system shall be equipped with an audible alarm which shall be activated when any one or more of the modules has a reduced protection condition. A mute option shall be provided for the audible alarm.
5. Advanced Diagnostic LED Display: A front panel, microprocessor controlled LED display, in the form of a bar graph, will indicate the protection status of each MOV on each phase including neutral to ground. A event counter will display number of suppressed transient events with a time and date stamp.
6. Integral Disconnect: Unit shall be provided with dead front disconnect to remove power from protector for maintenance access. The disconnect should not be accessed from the front panel unless the unit meets the minimum clamp voltage requirements.
7. NEMA 12 Enclosure: 14 gauge steel, with stainless steel hardware.

PART 3 - EXECUTION

3.01 INSTALLATION AND MAINTENANCE

A. The unit shall be installed as shown in the construction document in accordance with the manufacturer's printed instruction to maintain warranty. All local and national codes must be observed.

B. Units shall be installed as close as possible to the load side lugs of the transfer switch to which it is connected using low impedance Micro-Z cabling.

C. A 3-pole disconnect shall be provided to insure safety of maintenance personnel.

3.02 TWENTY YEAR WARRANTY

A. Manufacturer to provide twenty (20) year warranty to cover repair or replacement with a new device. Manufacturer to provide no cost replacement of fused protection modules for the life of the suppressor.

END OF SECTION 261823

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Dry type transformers.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

B. NEMA ST20 - Dry Type Transformers for General Applications.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA and impedance ratings and characteristics, tap configurations, insulation system type and rated temperature rise.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Dry type transformers shall be manufactured by General Electric Type QL.

B. Approved equal.

2.02 EQUIPMENT REQUIREMENTS

A. Three-phase and Single-phase general purpose dry type transformers be self-cooled, with ratings (KVA) as indicated on the drawings.

B. Shall meet or exceed DOE 2016 efficiency requirements.

C. Copper windings.

D. Sound levels not to exceed the following:
   1. 0-9 KVA: 40 db.
   2. 10-50 KVA: 45 db.
   3. 51-150 KVA: 50 db.
   4. 151-300 KVA: 55 db.
   5. 301-500 KVA: 60 db.
   6. 501-700 KVA: 62 db.

E. Three-phase transformers rated above 15 KVA to be insulated with UL listed Class 220 rated materials; and have a maximum average full load temperature rise of 115 degrees C.

F. Transformers to have voltage ratios as indicated on drawings. Transformers between 15 KVA and 300 KVA to be provided with six 2-1/2% full capacity taps, two above and four below primary rated voltage.

G. Nameplate: Include transformer connection data.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install transformers in accordance with manufacturer's recommendations.

B. Provide both primary and secondary protection as shown on drawings.

C. Set transformer plumb and level.

D. Provide grounding and bonding in accordance with provisions of Section 260526.

E. Transformers shall be installed where indicated on drawings.

3.02 FIELD QUALITY CONTROL

A. Check for damage and tight connections prior to energizing transformer.

B. Measure primary and secondary voltage and make appropriate tap adjustments.

END OF SECTION 262200

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Distribution panelboards.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

B. NECA Standard of Installation.

C. NEMA AB1 - Molded Case Circuit Breakers.

D. NEMA PB1 - Panelboards.

E. NEMA PB1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

F. NEMA ICS2 - Industrial Control Devices, Controllers and Assemblies.

G. NEMA KS1 - Enclosed Switches.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, and circuit breaker arrangement and sizes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. New Panelboards
   1. Panelboards shall be manufactured by Siemens.
   2. Approved equal.

2.02 PANELBOARD REQUIREMENTS

A. Provide panelboards of circuit breaker, dead-front safety type, UL labeled, and meeting all applicable requirements of the National Electrical Manufacturers Association.

B. Provide panelboards with lugs (both main lugs and branch circuit lugs) suitable and UL approved for both aluminum and copper conductors.

C. Provide electrically isolated neutral bars.

D. Provide separate ground bars complete with lugs or connectors on bar.

E. Provide key operated door and door lock. Door shall prevent access to operate circuit breakers.

F. Provide panelboards with sequence phased bus bars or distributed phase bussing for voltage and phase as indicated on drawings.

G. Refer to drawings for numbers of branch circuits, their ratings, number of poles, arrangements, etc.

H. Provide typed circuit directory cards.

I. Provide front filler plates for unused breaker knockouts.

J. Refer to drawings for Ratings and Features.

K. All bus bars, including ground bars shall be tin-plated copper.

L. All circuit breakers shall be bolt-on type.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized grounding conductor installed in the same conduit as the phase and neutral conductors under provisions of Section 260526.

B. Install all circuits using a common neutral bus bay in accordance with the National Electric Code. Balance all circuits to achieve not greater than 7% unbalanced neutral current in panel feeders.

C. Provide six circuit breaker handle lock-on devices for each lighting and miscellaneous power panelboard for installation by the contractor on circuits as directed by the Engineer to prevent unauthorized personnel from turning off circuits to controls, unit heaters, autodial alarm system, etc. Provide spare lock-on devices over to the Engineer.

D. Install panelboards in accordance with NEMA PB 1.1.

E. Install panelboards plumb.

F. Height: 6 feet (2 m) to top of panel board.

G. Provide typed circuit directory for each branch circuit panelboard. Handwritten circuit directory cards will not be accepted. Revise directory to reflect circuiting changes required to balance phase loads.

H. Provide a typed circuit directory in accordance with NEC sections 110.22 and 408.4. Circuits shall be labeled with detailed information describing the switches function and equipment location.

I. For all existing circuits terminated to a new panelboard, contractor shall trace out and update the circuit directory in accordance with NEC sections 110.22 and 408.4. Include all costs for this work in base bid.

J. Revise directory to reflect circuiting changes required to balance phase loads.

K. Provide engraved plastic nameplates under the provisions of Section 260553.

L. Panelboards shall be installed where indicated on drawings.

3.02 FIELD QUALITY CONTROL

A. Maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION 262400

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Switches, receptacles, device plates and other wiring devices as indicated on Drawings.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

B. NEMA WD1 - General Purpose Wiring Devices.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Provide manufacturer's catalog information showing dimensions, colors and configuration.

1.04 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 SWITCHES

A. Manufacturers: HUBBELL, BRYANT, GENERAL ELECTRIC.

B. Single pole, 20 amp, 120/277 VAC, NEMA WD-1, heavy duty, UL20.

C. Device Plate: Stainless steel.

2.02 RECEPTACLES

A. Manufacturers: HUBBELL, BRYANT, GENERAL ELECTRIC.

B. 20 amp, 125 VAC, NEMA WD-1, heavy duty.

C. 20 amp, 125 VAC, NEMA WD-1, heavy duty, ground fault circuit interrupter.

D. Duplex type.

E. Device Plate: Stainless steel.

2.03 EMERGENCY KILL MUSHROOM SWITCH

A. Acceptable Manufacturers: SQUARE D Model No.: 9001KR9P1RH1321 or approved equal.

B. Operator: 2-POSITION MAINTAINED PULL-MAINTAINED PUSH ILLUMINATED FLASHING mushroom head pushbutton. Switch head shall only be flashing in the “pushed” position.

C. Mushroom Head: 2-1/4-inch diameter head.

D. Nameplate: Large 2.92-inch square, Red nameplate with engraved logo “Emergency Stop”, unless noted otherwise on drawings.

E. Enclosure: Heavy duty, one opening, sheet steel enclosure, NEMA 12.

2.04 CHEMICAL RECEPTACLES AND PLUG ENDS

A. Acceptable Manufacturers: HUBBEL or approved equal.

B. 30A, 125 VAC, NEMA L5-30R, Safety-Shroud twist lock receptacle Model No. HBL2610.

C. 30A, 125 VAC, NEMA L5-30P, Safety-Shroud twist lock plug Model No. HBL2611S.

2.05 MANUAL MOTOR RATED THERMAL SWITCH

A. Acceptable Manufacturers: SQUARE D, Class 2510, Type KG1A, Type KG2C (3-pole, 600V) or approved equal.

B. Contractor shall coordinate voltage, phase and current rating with equipment.

2.06 CONTACTORS

A. Manufacturers: Square D, Model No. LO1000V02.

B. 4 pole, 30 amp, open type contactor.

C. Electrically held coil, 120VAC.

D. Quantity required: Two (2)

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mounting:
   1. Mount all switches 46-inches above finished floor to center line of switch unless noted otherwise.
   2. Mount all receptacles 18-inches above finished floor to center line of receptacle unless noted otherwise.
   3. Install switches with OFF position down.

B. Polarity: Properly wire all receptacles so that the hot wire, the neutral wire and the ground wire connect to the proper terminal on all receptacles.

C. Grounding: Install all devices in boxes specified under Section 260533 and install a No. 12 green ground wire from device grounding terminal to the outlet box in accordance with the National Electric Code.

D. Install device plates on switch, receptacle and blank outlets in full contact with wall surface.

E. Provide new SO cord for all chemical pumps and install plug end to match receptacle.

3.02 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

END OF SECTION 262726

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Disconnect switches.

B. Enclosed Circuit Breakers.

1.02 REFERENCES

A. NEMA KS-1 - Enclosed Switches.

B. FS W-S 865 - Switch, Box (Enclosed), Surface Mounted.

C. NEMA AB1 - Molded Case Circuit Breakers.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Include outlet drawings with dimensions and equipment ratings for voltage, capacity, horsepower and short circuit current ratings.

1.04 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.01 DISCONNECT SWITCHES

A. Disconnect switches shall be GENERAL ELECTRIC, heavy-duty Type TH or approved equal.

B. 75ºC conductor ratings.

C. Ratings: 600VAC

D. Quick-break, quick-make, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

E. Suitable for use as service entrance equipment.

F. UL listed for Class R 200,000 RMS amps, symmetrical IC.

G. Class R fusing kit.

H. Enclosures: Refer to drawings.

2.02 MOLDED CASE CIRCUIT BREAKERS

A. Install molded case circuit breakers for Main Circuit Breaker, Generator Circuit Breaker and Panel Circuit Breakers.

B. Molded Case Circuit Breaker:

1. Manufacturer: SIEMENS
   a. 125 Amp, 3 Pole Type ED6.
   b. 250 Amp, 3 Pole Type HFD6.
   c. 400Amp, 3 Pole Type HJD6.
   d. 600Amp, 3 Pole Type HLD6.
   e. 800Amp, 3 Pole Type HMD6.
2. AIC Rating: 65,000 amperes.
3. Thermal magnetic with interchangeable trip

C. Enclosure
1. Manufacturer: SIEMENS
2. Rating: NEMA 1 (for interior use) or NEMA 4X Stainless Steel (for exterior use).
3. External Throw.
4. Suitable for Service Entrance Equipment (where applicable).

D. Main Protective Devices 1200A and Above shall be Siemens Type WL Insulated Case Breaker. The main breaker shall have a Dynamic Arc Flash Sentry. The main breaker shall have a dual protective setting capability with graphic waveform display, i.e. the Siemens WL breakers ETU776 trip unit or equal. The main breaker will allow the installer to set two different trip curves into one breaker. One curve will be set for standard operating mode and the second curve, with instantaneous protection shall be set for arc flash mode. The switchboard shall be outfitted with a 24 VDC power supply, CubicleBus digital input module, annunciator panel with flashing light and a UPS power supply. The arc flash mode shall be actuated by a keyed. The breakers with frames rated 1200 amps or higher shall be equipped with Dynamic Arc Flash Sentry to comply with NEC 2014 240.87.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Removed temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Provide switches/enclosed circuit breakers at locations as indicated on drawings.

D. Refer to disconnect switch schedule on drawings for ampacity ratings, fuse sizes, number of poles and enclosure ratings.

E. Install fuses in fusible devices.

F. Install engraved nameplates on each switch and enclosed circuit breaker identifying the following:
1. Switch designated.
2. Load served.
3. Power origination.

3.02 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit breaker trip ranges.

END OF SECTION 262816

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Motor starters.

1.02 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Include electrical ratings, dimensions, mounting, materials, running overcurrent protection, branch circuit overcurrent protection, wiring diagrams, starting characteristics, interlocking and accessories.

C. Submit a summary list to the Engineer indicating and identifying each motor controller installed, including catalog numbers for the correct size of protective devices for the motor controllers.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

B. NEMA No. ICS-1, General Standards for Industrial Control and Systems; No. ICS-2, Industrial Control Devices, Controllers and Assemblies; No. ICS-6, Enclosures for Industrial Con-trol and Systems.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with NEMA ICS 2.3.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Solid State Reduced Voltage Starter (RVSS):
   1. WEG SSW-06.
   2. Specifically approved equal.

B. Full Voltage Non-Reversing and Reversing (FVNR):
   1. SIEMENS, Class 14.
   2. Specifically approved equal.

2.02 MOTOR STARTERS

A. Motor starters shall have the following features:
   1. Enclosed in NEMA 1 enclosure.
   2. Circuit breakers within the motor controller enclosures shall have external operating handles with lock-open padlocking provisions and shall indicate the ON and OFF positions.
   3. Motor Control Circuits:
      a. Shall operate at not more than 120 volts.

b. Shall be grounded except as follows:
   1) Where isolated control circuits as shown.
   2) Where manufacturers of equipment assemblies recommend that the control circuits be isolated.
c. Incorporate a separate, heavy duty, control transformer within each motor controller enclosure to provide the control voltage for each motor operating over 120 volts.
d. Incorporate overcurrent protection for control power transformers in accordance with NFPA 70.

4. Overload Current Protective Devices:
   a. SIEMENS, Solid State Model ESP100 overloads for all contactors including bypass contactors. Provide only SIEMENS thermal overloads on all output contactors for variable speed drives.
   b. One for each pole.
   c. Manual reset on the door of each motor controller enclosure to reset Motor from any condition which tripped motor, such as high pressure, overload or incomplete valve cycle.
   d. Correctly sized for the associated motor's rated full load current.
5. Provide three (3) N.C. and (3) N.O. auxiliary contacts, H-O-A,O-C-A, sequence selectors selector switches, pilot lights, and other devices and accessories as shown on the Drawings for each starter.
6. Enclosures:
   a. Shall be the manufacturer provided NEMA Type 1.
   b. Doors mechanically interlocked to prevent opening unless the breaker or switch within the enclosure is open.
   c. Thoroughly clean and paint the enclosures at the factory with manufacturer's prime coat and standard finish.
7. Pilot lights shall be press-to test 30.5 mm Heavy Duty LED Oiltight pushbuttons.
8. Pushbuttons and selector switches shall be 30.5 mm Heavy Duty Oiltight.

B. Motor controllers incorporated with equipment assemblies shall also be designed for the specific requirements of the assemblies.

2.03 SOLID STATE REDUCED VOLTAGE STARTER

A. Solid state reduced voltage starter and accessories to be factory installed in the motor control center.

B. The starter shall be rated for 200-575V +/- 10%, 50-60Hz +/- 10%. Control Voltage shall be rated for 100-240V +/- 10%.

C. The starter shall provide the following standard “starting” modes:
1. Linear Torque control for Start.
2. Variable Torque control for Start.
3. Pump Control.
4. Current Limit Start.
5. Voltage ramp Start.
6. Voltage ramp Start with current limit Start.
7. Full Voltage Start.
8. Remote analog control.
9. Soft Start with Selectable Torque Boost.
10. Slow Speed time controlled.
11. Slow Speed external controlled.
12. Dual Ramp Start.

D. The Controller shall provide the following standard “stopping” modes:

1. Linear Torque control for Stop.
2. Variable Torque control for Stop.
3. Pump Control.
4. Voltage ramp Stop.
5. Coast to Stop.
6. Remote analog control Stop.
7. DC injection Braking.
8. Slow Speed time controlled.
9. Slow Speed external controlled.
10. DC-Brake at slow speed.
11. Dual Ramp Stop.
12. Accurate position stop control.
13. Bypass control (Sequence Stop).

E. The starter shall provide the following additional features:
1. Jogging forward and reverse.
2. 4 parameters sets (externally selectable)
3. Analog output (programmable and selectable - 0-1VDC or 4-20mA)
4. Built-in Display (w/ optional Remote Display).

F. The starter shall provide the following standard “Operation” interfaces:
1. Integral Keyboard.
2. Remote.

G. The starter shall provide the following optional Operation interfaces:
1. Ethernet IP.
2. Serial communication RS 232/485 Modbus RTU.
3. Profibus DP.
4. DeviceNET.
5. Interbus-S.
6. Lonworks.
7. FIP IO.
8. Saflink.
9. External Display for mounting on enclosure door.

H. The starter shall provide the following Protection features. The protection shall be maintained when bypass contactor is supplied.
1. Motor Thermal Overload.
2. Soft Start thermal over temperature.
3. PTC input
4. Motor Shaft Torque (Max) machine process protection.
5. Motor Shaft Torque (Min) machine process protection.
6. Phase Imbalance.
7. Phase reversal.
8. Over voltage.
9. Under voltage.
10. Locked Rotor.
11. Excessive Starts per hour for application.
12. Phase loss input/output.
13. Motor output loss.

I. The starter shall provide the following standard Monitoring functions. The monitoring functions shall be maintained when bypass contactor is supplied.
1. Three Phase Current (average).
2. Three Phase Voltage (average).

3. Current in L1, L2, L3.
4. Voltage between L1-L2, L1-L3, L2-L3.
5. Shaft Power in kW/HP (selectable).
6. Motor thermal capacity.
7. Power factor.
8. Torque in Lbs./ft. or Nm (selectable).

J. The starter shall provide the following standard Alarm functions. The alarm functions shall be monitored during bypass contactor operation.
1. Line failure.
2. Phase imbalance.
3. Over temperature-motor.
4. Over temperature-Soft Starter.
5. Shorted SCR.
6. Open SCR.
7. Locked Rotor.
8. Motor Output loss.
9. Overload - Shaft Torque.
10. Underload - Shaft Torque.
11. Phase imbalance.
12. Over voltage.
13. Under voltage.
14. Excessive Starts.
15. Phase reversal.
16. Event list 15 latest alarms.

K. The starter shall be of modular construction, consisting of a Control Module and Power Stack.

L. All PCB’s shall be compatible with the full range power stack.

M. All phases should be controlled during start/stop.

N. The power stack shall consist of six SCR’s mounted on a heatsink assembly for ratings up to and including 1250 amps.

O. The starter shall be DIN Rail mountable up to 145A.

P. DIN Rail mountable units should be mountable without space at side.

Q. Starters 180A and larger shall allow for convenient connection of bypass contactor without modification of standard assembly.

R. Starter Control Module:
1. Mechanical features:
a. The control module assembly shall consist of a power supply, logic control circuitry, silicon controlled rectifier (SCR) firing circuitry. I/O circuitry, a digital programming keypad, dual LED Displays.
b. The PCB’s shall be designed for integral mounting on the control module and shall be compatible with the full range of current ratings - 30 amps to 1250 amps.
c. The control modules shall be easily removed from the power stack, without the need to disassemble associated printed circuit board assemblies.
d. Control terminals shall be easily accessible and located on the front bottom of the device. The terminals shall be UL rated for 300 Volts, 15 amps maximum, and accept a maximum of two wires.

e. Digital parameter adjustment shall be provided through a built-in keypad. Analog potentiometer adjustments, DIP or rotary switches, or plug-in jumpers are not acceptable.
f. Dual built-in alphanumeric, LED displays shall be provided for controller set-up, diagnostics, status and monitoring. The Control Keypad and Display shall have the option for remote mounting.
g. A serial communication port shall be provided as standard. Communication protocol interface modules shall be built in option available for connection to Remote I/O, Devicenet, PROFIBUS, Interbus S, Lonworks, FIP IO and RS 232/485 Modbus RTU.
h. A minimum of three auxiliary contacts shall be provided for customer use. These shall be programmable as follows:
    1) One form C (SPDT): Fault (dedicated).
    2) Two single pole NO: Multifunction (programmable). Ratings: 8A at 250VAC, 2000VA Inrush, B300 NEMA.

2. Electrical features:
    a. The PCB shall provide digital microprocessor control and supervision of all controller operation, including SCR pulse firing control.
    b. The PCB power supply shall be self-tuning to accept control power input from 100 to 240, 50/60 Hz.
    c. The SCR firing circuitry shall incorporate a latch circuit for three-wire control.
    d. Reverse operation of the motor shall be standard in the jog mode without the use of a reversing contactor.
3. User Adjustments:
    a. The two acceleration start ramps shall have individual adjustments from 1 to 60 seconds.
    b. The two acceleration stop ramps shall have individual adjustments from 2 to 120 seconds.
    c. The initial torque setting shall be adjustable from 0 to 200% of motor torque.
    d. The end torque setting shall be adjustable from 50 to 200% of motor torque.
    e. Current limit starting shall be adjustable from 150% to 500% of the motor's full load current.
    f. A selectable Torque Boost feature shall be available to set a current level from 300-500% of the motor's full load current rating. The time period shall be adjustable from 0.1 to 2.0 seconds.
    g. Locked rotor function shall be adjustable between 1 to 10 seconds.
    h. Slow speed shall be adjustable up to 60 seconds or up to 100 external pulses.
4. Protection Diagnostics:
    a. Motor protection shall be as follows:
        1) Meets applicable standards and codes as a motor thermal overload protection device.
        2) Shaft Power measurement without the use of external electro-mechanical sensors.
        3) Overload trip classes of 10, 20 and 30 shall be provided and user programmable.
        4) Electronic thermal memory shall be provided for enhanced motor protection.
        5) Shaft overload and underload protection shall be available through the controller.
        6) All protections shall remain in effect if bypass contactor is supplied.
    b. When fault conditions are detected, the controller shall inhibit starting or shut down SCR pulse firing.
5. Pump Control:
    a. The standard feature pump control shall be implemented to provide closed loop control of a motor to match the specific torque requirements of centrifugal pumps for both starting and stopping. This shall aid in eliminating the phenomena commonly reference to as "water hammer". Methods utilizing Soft Start with Soft Stop shall not be acceptable.

b. Closed loop control with linear ramps shall be achieved without using external sensors or feedback devices.
c. Pump stop shall be initiated without the need for a dedicated Pump Stop input.
d. The Pump Stop times shall be user adjustable from 0 to 120 seconds.

S. Starters rated for 30A to 145A shall consist of three modules. The three modules shall be mounted on a single heatsink. The heatsink shall be isolated from the power modules and shall have grounding provisions. Power modules rated 30A to 145A shall be encapsulated and shall include two power-switching semi-conductors and control module interface cables. Power connections on units 30-145 amps shall be bus bar type to accommodate wide range of cabling.

T. Back-to-back SCR pairs shall be the only power switching semiconductor means acceptable. Diode/SCR combinations shall not be acceptable. Semi conductor fuses shall be required.

U. Starter shall be built for continuous operation without need for bypass contactors, either external or internal, for any reason other than when the starter is mounted in a non ventilated enclosure.

V. SCRs shall have the following minimum repetitive peak inverse voltage ratings: 200 to 575V: 1600V.

W. For starters rated 30A to 145A, transient protection with snubber circuit including RC-net and capacitors against electrical noise shall be standard.

X. Starters rated 180A and larger will include heavy duty MOV surge absorbers and R-C snubbers as standard.

Y. Starters shall deliver its rated current in ambient temperature ranging from 0ºC to +40ºC. The starter shall be able to operate up to 50ºC. The ambient storage temperature shall be -25ºC to +70ºC.

Z. The starter shall be operable in relative humidity of 5 to 95%, non-condensing.

AA. The starter shall be suitable for operation up to altitudes of 3000 feet (1000 meters) without derating.

AB. The starter shall perform without malfunction from showering arc tests of 500V to 1500V (NEMA ICS 2-230).

AC. The starter shall perform without malfunction when subjected to 3000V surges at a rate of 100 bursts per second for 10 seconds (IEEE STD 472).

2.04 FULL VOLTAGE STARTERS

A. All Full Voltage Starters shall be NEMA rated for the load it serves.

B. Manufacturers: SIEMENS, Class 14.

2.05 MISCELLANEOUS CONTROLS AND EQUIPMENT

A. Provide phase failure/phase reversal relays and voltage sensitive relays for undervoltage and overvoltage protection for all phases. Relays shall be SIEMENS, or approved equal. The Contacts for these relays shall be in series with all Motor Starter Control Circuits.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in accordance with NFPA 70 and as shown on the Drawings.

B. All starters shall be factory installed in Motor Control center.

3.02 DESCRIPTION OF CONTROL, SOLID STATE STARTER/ISOLATION INPUT/OUTPUT/BYPASS CONTACTORS

A. Refer to the Description of Controls specification for control requirements of all motor controllers. Contractor is responsible for coordinating with system integrator for proper operation of motor controllers and all associated equipment. Any discrepancies shall be brought to the attention of the Engineer immediately for final coordination.

B. In the AUTOMATIC position the H-O-A selector switch will provide control power to the motor starter circuit through the isolation and output contactors and solid-state starter.

C. In the HAND position of the H-O-A switch the motor shall start and run whether or not the automatic control “ON” contacts are energized.

END OF SECTION 262913

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Magnetic motor starters.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NECA "Standard of Installation," published by National Electrical Contractors Association.

C. NEMA ICS 2 - Industrial Control Devices, Controllers and Assemblies.

D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

E. NEMA KS 1 - Enclosed Switches.

1.03 SUBMITTALS

A. Refer to drawing for starter sizes on schedules.

B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

C. Test Reports: Indicate field test and inspection procedures and test results.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with NEMA ICS 2.3.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. SIEMENS, Class 17

B. Substitutions: Under provisions of Section 012500

2.02 AUTOMATIC CONTROLLERS

A. Combination Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Motor starters shall be NEMA rated.

C. Coil operating voltage: Coordinate voltage required with equipment to be installed and associated contactor(s).

D. Auxiliary contacts: NEMA N/O and N/C contacts rated up to 10 Amp. SIEMENS Model No. 49AAFO and 49AAFC.

E. Overload Relay: NEMA ICS; melting alloy overload.

F. Enclosure: As shown in contract drawings.

G. Circuit Breaker Disconnect Switch with external lockable handle.

2.03 PRODUCT OPTIONS AND FEATURES

A. Auxiliary Contacts: NEMA ICS 2, 1 each normally open/closed contacts.

B. Motor running and overload indication lights. Pilot lights shall be heavy duty 30.5 mm oiltight press-to-test by SIEMENS or equal.

C. Selector Switches: Hand-off-automatic selector switch shall be heavy duty 30.5 mm oiltight by SIEMENS or equal.

D. Manual reset push button for overload.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install enclosed controllers size as indicated, on starter schedule, in accordance with manufacturer's instructions.

B. Install enclosed controllers plumb in locations indicated on drawings. Provide supports in accordance with Section 260526.

C. Select and install overload heater elements in motor controllers to match installed motor characteristics.

D. Provide engraved plastic nameplates for each starter.

E. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor and voltage/phase rating.

END OF SECTION 262914

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Automatic transfer switch.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NEMA ICS 1 - General Standards for Industrial Control and Systems.

C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.

D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Submit product data for transfer switches showing overall dimensions, electrical connections, electrical ratings, environmental restrictions, voltage, short circuit ratings, enclosure details and all accessories.

C. Submit manufacturer’s installation instructions. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product.

D. Submit manufacturer’s operation and maintenance manual as part of shop drawing submittal.

1.04 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 017823.

B. Include instructions for operating equipment.

C. Include instructions for operating equipment under emergency conditions.

D. Identify operating limits which may result in hazardous or unsafe conditions, whether switch is being operated automatically or manually.

E. Document ratings of equipment and each major component.

F. Include manufacturer’s recommended routine preventative maintenance schedule.

G. List any special tools, maintenance materials and recommended spare parts.

1.05 EXTRA SERVICES

A. The supplier shall include as a part of the package a 5-year warranty and 5-year planned maintenance agreement at no additional cost to the Owner. The agreement shall include, as a minimum, one service call per year. The services must be performed by the authorized distributor of the equipment furnished and may not be subcontracted. The following services shall be performed once a year.
   1. Check switches for loose, bare or broken wiring (replace as needed).
   2. Test transfer switch operation, time delays and manual operators.
   3. Test transfer switch operations and plant exerciser.

B. Manufacturer's Instructions: The manufacturer's instructions shall indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product.

C. Training: The manufacturer shall be responsible for scheduling an in-person training session with the owner to provide comprehensive instruction on the operation of the automatic transfer switch and generator following their installation.

1.06 REGULATORY REQUIREMENTS

A. Conform to all applicable national, state, city or local codes for standby electrical systems.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Transfer switch shall be ONAN Model X-Series D Frame.

B. Transfer switch shall be supplied and warranted for 5 years, including a five-year planned maintenance agreement by the single system source supplier. No exceptions.

C. Proposal for any substitute equipment shall provide complete submittal data, as specified to the Engineer for approval or disapproval. Physical dimensions of transfer switches are based on ONAN Model X-Series. Substitute equipment shall be field verified for adequate equipment spacing relative to other equipment to be installed in the same locations.

D. It is intended that all products specified herein be of standard ratings, therefore, the ampere ratings, withstand and closing ratings, etc., shall be the manufacturer's next available larger size of rating until the specifications are exactly met.

2.02 AUTOMATIC TRANSFER

A. Description: NEMA ICS 2; automatic transfer switches.

B. The switches shall be mechanically held, electrically operated and shall be interlocked mechanically and electrically to insure that normal power and emergency power mixing is impossible. The automatic transfer switches shall be suitable for use with emergency sources.

2.03 AUTOMATIC TRANSFER SWITCH

A. Sequence of Operation: Automatic switching shall occur from normal power to emergency power when there is a phase reversal or when any phase of the normal power drops between an adjustable voltage range of 75 to 98% voltage and to automatically restore the load to normal when all phases are between an adjustable voltage range of 75 to 98% normal voltage or phase rotation is corrected.

B. Main switch contacts shall be high-pressure silver alloy in order to improve interrupting and withstand capabilities. Main contacts shall be rated for 600 volts AC minimum. Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent interphase flashover.

C. Transfer switches shall be equipped with transparent protective covers over all live parts of the switch. These covers are to serve as protection to operators or service personnel from contact with live parts, and from contact with arcing by-products if the switches operate with the door

open. Barriers shall be transparent to allow for visual inspection for contact position and for damage.

D. Automatic transfer switches utilizing components of molded case circuit breakers are not acceptable.

E. All transfer switches and accessories shall be UL listed and labeled, tested per UL Standard 1008 and CSA approved.

F. Solid state undervoltage sensors shall simultaneously monitor all phases of both sources. Pick-up and drop-out setting shall be adjustable between 75 and 98% of system voltage. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage. Switches that do not monitor all three phases of both normal and emergency sources will not be acceptable.

G. Provide frequency sensing relay which will not permit transfer to emergency power until the generator set is operating at 60 Hz.

H. Control wiring shall be terminated interlocking, plug-type connectors. Operating current for the transfer shall be obtained from the source to which the load is to be transferred.

I. The controls shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time, as follows:
   1. Source 1 OK.
   2. Start Generator Set.
   3. Source 2 OK.
   4. Transfer Timing.
   5. Transfer Complete.
   6. Retransfer Timing.
   7. Retransfer Complete.
   8. Timing for Stop.

2.04 RATINGS

A. Ratings shall be as follows:
   1. Voltage: 277/480 volts, three phase, four wire, 60 Hz.
   2. Switched Poles: 4, (overlapping neutral not acceptable).
   3. Load Inrush Rating: Combination Load.

B. All automatic transfer switches shall meet the following withstand ratings as a minimum. In order to protect the system under current or possible future conditions, whether protected by circuit breakers or current limiting fuses, the transfer switches must meet both of the following molded case circuit breaker and current limiting fuse withstand and closing ratings as a minimum. Ratings are stated in symmetrical RMS amperes for three phase faults.
   1. Transfer Amperage: 600
   2. WCR @ 480 Volts W/Molded Case C/B'S: 60,000
   3. WCR @ 480 Volts W/Current Limit Fuses: 200,000

C. Transfer switches shall be continuously rated in ambient temperatures of -40 to +50 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet.

2.05 AUTOMATIC SEQUENCE OF OPERATION

A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.

B. Time Delay to Start Alternate Source Engine Generator: 0 to 15 seconds, adjustable.

C. Engine Start: Automatic controls shall signal the engine-generator set to start upon a signal from normal source sensors, after time delay to start has terminated.

D. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.

E. Time Delay Before Transfer to Alternate Power Source: 2 to 120 seconds, adjustable.

F. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.

G. Time Delay Before Retransfer to Normal Power: 0 to 30 minutes, adjustable; bypass time delay in the event of the alternate source failing.

H. Time Delay Before Engine Shut Down: 0 to 10 minutes, adjustable, of unloaded operation; factory set at 5 minutes.

I. Engine Exerciser: An Exerciser shall, once a week, start the generator set, transfer building load to the generator sets and after a set period of time, transfer the building load back to normal power. It shall be readily accessible and easy to start. Exercisers shall be furnished with load/no load selector switches. Provide bypass exerciser controls if the normal source fails during the exercise period.

2.06 ENCLOSURE

A. Enclosures: Transfer switch enclosure shall be NEMA 1. All controls which will be located on cabinets shall be key operated. Manual operating handles and all control switches, (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet doors. Transfer switches with manual operating handles and/or non key-operated control switches located on the outside of the cabinet do not meet this specification and are not acceptable.

2.07 ACCESSORIES

A. Indicating Lights: Mounted in cover of enclosure to indicate the following. Source light for AC power loss shall be 30.5 mm heavy duty oiltight press-to-test by SIEMENS.
   1. NORMAL SOURCE AVAILABLE.
   2. EMERGENCY SOURCE AVAILABLE.
   3. NORMAL SWITCH POSITION.
   4. EMERGENCY SWITCH POSITION..
   5. AC POWER FAILURE.

B. Emergency Kill Switch Pushbutton (Maintained): When depressed shall shut down generator. This switch shall be in series with new exterior emergency kill switch.

C. Transfer Switch Main Shaft Auxiliary Contacts: Two normally open; two normally closed. Wired to terminal block for easy access for indication of switch position. Rated at 10 Amps continuous and 250 VAC maximum.

D. Transfer switches are to be equipped with permanently attached operating handles and quick-break, quick-make mechanisms suitable for normal operation under load. Loose manual operating handles that need to be field attached for operation will not be acceptable.

E. All transfer switches shall be provided with a field adjustable time delay during the switching in both directions, during which time the load is isolated from both power sources, to allow load residual voltage to decay before closure to opposite source. The delay feature shall have an adjustable range of 0 to 7.5 seconds. Phase angle monitor/inphase type monitors are not acceptable.

F. Provide a voltage monitoring relay and pneumatic time delay relay control circuit to energize a relay contact when power to the load terminals of the transfer switch is lost for a pre-selected time interval. The voltage phase monitor relay shall monitor 3-phase voltage, phase failure, phase reversal and voltage imbalance. The phase monitor shall have a normally closed contact in Series with a time delay relay. The pneumatic time delay relay shall have a 0-5 minute timer with automatic reset when power is restored to the coil. The normally open contact of the time delay relay shall be input to the PLC.

G. Provide generator remote annunciator located inside the building. Interface generator set controls with battery charger and fuel tank alarms for all status conditions. Provide all power, control wiring including conduits.

H. Provide a Signal Module Option: Provides relay output contacts for sending information to the building monitoring and control system. Relay outputs include: source 1 connected/available, source 2 connected/available, not in auto, test/exercise active, failed to disconnect, failed to synchronize, failed to transfer/retransfer, and elevator control pre-transfer signal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation of transfer switches shall be in accordance with manufacture requirements. Provide applicable U.L. labeling for installed system.

3.02 POWER OUTAGE

A. After the transfer switch is installed, the Contractor shall be responsible to inspect the installation and field verify that the switch has been installed per manufacturer’s recommendations. Owner’s operating personnel shall be instructed on the use and service requirements of the transfer switch by the manufacturer. A minimum of two (2) hours in person manufacturers training is required.

3.03 DEMONSTRATION

A. Demonstrate operation of transfer switch under provisions.

END OF SECTION 262917

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Variable frequency controller.

1.02 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Shop Drawings: Include front and side views of enclosures with overall dimensions and weights shown; conduit entrance locations and requirements; and nameplate legends.

C. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

D. Test Reports: Indicate field test and inspection procedures and test results.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

F. Manufacturer's Field Reports: Indicate start-up inspection findings.

G. Manufacturer's recommended spare parts list.

1.03 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and tested by Underwriters Laboratories, Inc. as suitable for purposes specified indicated.

PART 2 - PRODUCT

2.01 MANUFACTURERS

A. Yaskawa iQPump1000.

B. Approved equal.

2.02 DESCRIPTION

A. Provide enclosed variable frequency controllers suitable for operating the indicated loads. Conform to requirements of NEMA ICS 3.1.

B. Minimum efficiency at full load: 98 percent.

2.03 ENVIRONMENT RATINGS

A. Operating Ambient: 0 degrees C to 40 degrees C.

B. Relative Humidity: 5 to 95% non-condensing, all power ratings.

C. Altitude: 3,300 feet (1,000 meters) maximum without derating.

D. Vibration: 0.006 inches (0.152 mm) displacement, 1G peak.

E. Shock: 15G peak for 11ms duration (+-1.0 ms).

2.04 INPUT POWER RATINGS

A. Voltage:	460V AC +-10%
B. Frequency:	48 to 62 Hz
C. Phase:	3-phase
D. Motor Horsepower:	Refer to drawings for H.P. sizes
E. Line Transient Protection:	Line transients up to 5,000 volts peak. 320 Joules phase-to-phase 380 Joules phase-to-ground.
F. Logic Power Ride-Thru:	2 seconds or longer -- subject to the integrity of user supplied external circuits.
G. Drive Characteristics:	Drive shall use isolated gate bi-polar technology.
H. Control Logic Noise Immunity:	Showering arc transients from 350 to 2,000 volts peak.
I. Voltage:	**Drive Rating BOO3-B200** 0 to applied input voltage, 230V AC, maximum output voltage cannot exceed applied input voltage.
J. Frequency Range:	0 to 250 Hz with local programmable minimum and maximum limits
K. Frequency Resolution:	**Digital** Preset speeds (serial interface or pulse train input) to 0.005 Hz of set frequency within the minimum and maximum limits. **Analog** Equal divisions between minimum and maximum limits to the nearest 0.005 Hz as a function of signal type. Local speed pot, 1003 divisions. Remote speed pot, 633 divisions. 4 to 20 mA input (TB2, Terminals 4 and 6), 726 divisions.
L. Frequency Regulation:	Digital Frequency Source: 0.0013% of set frequency, 0 to 40°C temperature range.
M. Volts-per-Hertz:	Fully programmable - Minimum 1 to 14.3 V/Hz through local programming.
N. Intermittent Overload Capability:	Programmable MOPC from 50 to 150% of rated output current for up to 1 minute maximum.
O. Carrier Frequency:	Carrier frequency shall be adjustable up to 15 Khz. No exceptions.

2.05 DRIVE ACCESSORIES

A. Display: Provide integral digital display to indicate output voltage, output frequency, and output current. Display shall be flush mounted on VFD enclosure door.

B. Input Signal: - 20 mA DC.

C. Disconnecting Means: Include integral circuit breaker on the line side of each controller.

D. One (1) 0 to 30 mA D.C. ammeter to monitor 4-20 mA input signal from PID controller. (3-1/2" square minimum).

E. Hand-Off-Automatic Selector Switch.

F. Drive-Bypass Selector Switch

G. Ten (10) turn speed control pot.

H. Isolation contactor (NEMA Rated).

I. Output/Bypass contactors (NEMA Rated).

J. Auxiliary NO and NC contacts.

K. The starter shall provide the following optional Operation interfaces:
   1. Ethernet IP.
   2. Serial communication RS 232/485 Modbus RTU.
   3. Lonworks.
   4. External Display for mounting on enclosure door.

L. Three (3) programmable preset speeds to be initiated through contact closure.

M. Lightning/surge arrestor with individual line to line and individual line to ground protection. Clamping voltage levels shall be specifically sized for the applied system voltage.

N. Provide solid state overload relay on load size of bypass contactor and thermal overload relay on load side of output contactor as manufactured by SIEMENS.

O. Fast-acting fuses on load side of main circuit breaker sized in accordance with manufacturers recommendations.

P. Isolated 4-20 mA input for follower signal input.

Q. Smart Keypad: Key pad shall have 1K memory for downloading information to any drive. Removable flush mounted on enclosure door.

R. 4-20 mA scaled output proportional to drive speed. Input to PLC.

S. Drive shall have three inputs for preset speeds initiated by remote contacts.

T. Drive shall have speed contacts to close when speed is reached and be input to the PLC.

U. Drive shall have fault and not in Auto Contacts and shall be input to the PLC.

V. Provide 3-5% Line/Input Reactor for all VFDs specified.

W. For VFDs located 100 feet or greater from the motor they are controlling, Contractor shall provide an appropriate 3-5% Load/Output Reactor, DV/Dt Filter, or Sine Wave Filter as recommended by the manufacturer. Refer to drawings for applicability.

2.06 VARIABLE SPEED DRIVE SYSTEM

A. The variable speed drive system shall include a diode bridge converter, filter network and a transistorized inverter section. Base driver signals used to control firing of the power transistors shall be designed with optically-coupled-isolators for optimum drive protection. The output must be sinusoidal wave, pulse width modulated, voltage wave form for reduced harmonic heating in the motor. The systems shall include all the necessary control circuits, synchronizing the equipment and protective devices as required by design. The drive unit shall be able to

withstand a phase-to-phase and a phase-to-ground short without damage to the drive unit. The systems protection as a minimum shall provide the following:

Current Limit:	115% of rated current
Overcurrent:	180% of rated output current IET (trip fault)
Shortcircuit:	Phase-to-phase (trip fault)
Overvoltage:	High D.C. bus voltage (trip fault)
Undervoltage:	20% below line voltage (trip fault)
Momentary Power Failure:	30 to 500 milliseconds
Burn-out:	D.C. bus fuse protection or 3 phase input fusing
Terminal Strip for Remote Alarms:	Fault contact (Form C)
Digital Indication Individual Fault Condition:	Overcurrent of a transistor. Output overcurrent or shortcircuit. Overcurrent while running. Thermal overload. Overvoltage of the D.C. bus due to regeneration. Overvoltage of the D.C. bus due to high line voltage. Overtemperature of the enclosure. Ground fault.
LED Indication:	D.C. bus capacitator charge
Stall Protection:	Prevents current limit activation during overload condition to prevent stall
Ground Fault:	Detects output shortcircuit due to a ground (trip fault)
Voltage Limit:	Prevents the overvoltage of the D.C. bus during deceleration
Accel & Decel Time:	Fully programmable.

The control shall contain system adjustments. The adjustments shall be by potentiometers. The potentiometer shall be accessible through the front portal door on the unit which prevents exposure to lethal voltage to the operator.

The system parameters shall be shown on the digital display meter before, during and after the adjustment. The digital display shall indicate the actual setting of the adjustment, not percentage of setting. The following adjustment shall be provided:

Acceleration:	0.1 to 60 seconds
Deceleration:	0.1 to 60 seconds
Upper Frequency Limit:	0 to 80 Hz
Lower Frequency Limit:	0 to 80 Hz
Auto Reference Bias:	0 to 80 Hz
Auto Reference Gain:	0 to 80 Hz

The unit shall be self-protecting to prevent any misadjustments by the operator. The upper limit cannot be set below the lower limit, and will signal the operator of this misadjustment.

2.07 DESIGN

A. Employ microprocessor based inverter logic isolated from power circuits.

B. Employ IGBT inverter system.

C. Adjustable carrier frequency up to 15 KHz.

D. Employ switching power supply operating off DC link.

E. Design for ability to operate controller with motor disconnected from output.

F. Design to attempt five automatic restarts following fault condition before locking out and requiring manual restart.

G. In the event of sustained power loss, the control shall shut down safely without component failure. In the event of momentary power loss, the control shall shut down safely without component failure. Upon return to power the system shall automatically return to normal operation, being able to restart into a rotating motor, regaining positive speed control without power failure.

2.08 FABRICATION

A. Wiring Terminations: Match conductor materials and sizes indicated.

B. Enclosure: Manufacturer provided NEMA Type 1.

C. Finish: Manufacturer's standard enamel.

2.09 SOURCE QUALITY CONTROL

A. Inspect and production-test each product specified in this section.

B. Test shall include simulated operation.

C. Notify engineer at least five (5) days prior to test. Owner or Engineer may witness test.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Controllers shall be within manufacturer provided enclosure.

B. Install controller in accordance with manufacturer's written instructions and NEMA ICS 3.1.

C. Tighten accessible connections and mechanical fasteners after placing controller.

D. Select and install overload heater elements in controllers to match installed motor characteristics.

E. Provide engraved plastic nameplates under the provisions of Section 260553.

F. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full, load amperes, code letter, service factor, and voltage/phase rating.

3.02 ADJUSTING

A. Make final adjustments to installed drive to assure proper operation of system. Obtain performance requirements from installer of driven loads.

3.03 DEMONSTRATION

A. Demonstrate operation of controllers in automatic and manual modes.

B. Provide the services of the manufacturer's trained personnel to completely check the VFD system installations and adjust the drive for operation. An additional period shall be included for trained personnel at the time of acceptance and field tests. A minimum amount of six days and three trips shall be required for this work.

C. Manufacturer's trained personnel, after initial field startup shall remove all logic PC boards for the pump program logic and install and adjust a spare set of PC boards. These boards shall remain in the drives and the initial boards shall be provided as spares.

D. Service Contract - Provide a one-year service contract for the pump control system. Service contract shall include the services of a manufacturer trained engineer to provide preventive maintenance service and calibration of the equipment. At least four routine service trips shall be made as scheduled by Owner. In addition, whenever trouble occurs with the system, a serviceman shall come and repair/replace defective parts at no additional cost. All parts required for repair shall be included at no additional cost. This service contract shall take effect one year after acceptance of the equipment and after the one-year guarantee period has lapsed.

END OF SECTION 262923

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator set.

B. Exhaust piping, fittings, silencer and insulation.

C. Control panels.

D. Battery and charger.

E. Vibration isolation.

1.02 REFERENCES

A. NEMA AB1 - Molded Case Circuit Breakers.

B. NEMA MG1 - Motors and Generators.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. ANSI/NFPA 70 - National Electric Code.

E. NFPA 110 - Emergency Standby Systems.

F. NFPA 30 - Flammable and Combustible Liquids Code.

G. NFPA 37 - Installation of Stationary Engines.

H. NFPA 101 - Life Safety Code.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, electrical diagrams including schematic and interconnection diagrams.

C. Product Data: Provide data showing dimensions, weights, ratings, interconnection points and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, radiator and derating schedules, operating performance, exhaust flow data, and cooling system data. Submit generator alternator output curves, duration curves and temperature data on the complete genset individual components.

D. Test Reports: Indicate results of performance testing including 0.8 power factor test at 100 percent load.

E. Prototype Test Reports: Submittals will not be received without submission of prototype test reports. No exceptions.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product. Provide typical system interconnection wiring diagrams.

G. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

H. Manufacturer's Field Reports: Submit under provisions of Section 017500. Indicate procedures and findings.

1.04 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017823.

B. Operation Data: Include instructions for normal operation.

C. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 110.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years experience, and with an authorized distributor offering 24-hour parts and service availability within 50 miles of the project. The manufacturer shall fabricate the engines, generators and control panel. Automatic transfer switches and generator enclosures shall be supplied, warranted and serviced by a single system source supplier.

B. Supplier: Authorized distributor of specified manufacturer with minimum six years documented experience with specified products and factory-trained service technicians. The supplier must be factory authorized to perform warranty service on the entire system, including but not limited to, the engines, generators, control panels and automatic transfer switches. The supplier must show proof of factory trained service technicians on all components.

C. The complete engine generator system shall be standard of a single manufacturer. It shall be factory built, tested and shipped by this single manufacturer.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70 and NFPA 110.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.08 EXTRA SERVICES

A. The single source supplier shall provide as part of the package a 5-year warranty and 5-year planned maintenance agreement at no additional cost to the Owner. This warranty shall cover the generator system, transfer switches and generator enclosures. Agreement shall include, as a minimum, one service call per year. The services must be performed by the authorized distributor of the equipment furnished, and may not be subcontracted. The following services shall be performed once a year.
   1. Replace engine-lubricating oil and remove used oil from premises.
   2. Replace oil and fuel filters.
   3. Check oil/water separator. Remove water from premises.

4. Check coolant system for proper levels and condition. Replace coolant filters and add corrosion inhibitor as needed.
5. Check air filter.
6. Check and clean crankcase breathers.
7. Check turbocharger free-spin and end play.
8. Check and adjust belts as required.
9. Check engine for loose, bare or broken wiring. Replace as needed.
10. Fuel tanks and lines to be inspected for the purpose of determining if excessive sludge or rust is collecting.
11. Check entire equipment for fuel or water leaks.
12. Check condition of batteries and report any action necessary for recharging or replacing.
13. Start and run all engines, check temperatures and pressures.
14. Test engine safety shutdown systems.
15. Test all transfer switches operation and time delays.
16. Submit a report of this inspection to the Owner and advise of any further work required.

B. Training: The manufacturer shall be responsible for scheduling an in-person training session with the owner to provide comprehensive instruction on the operation of the automatic transfer switch and generator following their installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. ONAN CORPORATION, Minneapolis, Minnesota, or specifically approved equal.

B. Proposal for any substitute equipment shall provide complete submittal data, as specified in Section 012500 - Substitution Procedures and specified herein, to the Engineer for approval or disapproval. The supplier must submit detailed sizing calculations for each generator to verify models are capable of picking up the entire loads with voltage dips as herein specified.

C. Approval of Substitute Equipment: Design has been based on ONAN Model Generators. If substitute equipment is approved, the contractor shall be responsible for the charges of any necessary revisions to the plans and specifications, drawings, and project documentation; and charges related to equipment spacing, enclosure sizes, foundation sizes, mounts, electrical wiring, ventilation equipment, fuel, exhaust components, etc., as well as any engineering costs. Also, the supplier must furnish a list of completed installations, including name, address and telephone number of at least five comparable installations which can prove the proposed products have operated satisfactorily for three years.

D. It is intended that all products specified herein be of standard ratings, therefore, the KW and KVA, starting KVA and maximum allowable voltage dip, ratings, etc., shall be the manufacturer’s next size or rating to exactly meet the specifications. No exceptions.

2.02 SYSTEM REQUIREMENTS

A. The engine generator shall start and provide continuous power to the loads with 100 percent block loading at the time of transfer.

2.03 DIESEL ENGINE GENERATOR SET

A. Rating: The AC engine generator set, ONAN Model 450DFEJ and shall be rated by the manufacturer for standby operation at 450 kW / 563 kVA at 0.8 PF, 60 Hz, 1800 RPM for use at 277/480 volts, 3 phase,4 4 wire. Ratings shall be at an elevation of 1000 feet above sea level, and at 4 degrees F.

1. Voltage regulation shall be +/- 0.5 percent of rated voltage for any constant load between no load and rated load.
2. Frequency regulation shall be isochronous under varying from no load to 100% rated load.
3. Random Voltage Variation: The cyclic variations in RMS voltage shall not exceed +/- 0.5% of rated speed for constant loads from no load to rated load, with constant ambient and operating temperature.
4. Random Frequency Variation: Speed variations for constant loads from no load to rated load shall not exceed plus or minus 0.25% of rated speed, with constant ambient and operating temperature.
5. AC Waveform Total Harmonic Distortion: The sum of AC voltage waveform harmonics, from no load to full linear load, shall not exceed 5% of rated voltage (L-N, L-L, L-L-L) and no single harmonic shall exceed 3% of rated voltage.
6. Telephone Influence Factor: TIF shall be less than 50 per NEMA MG1-22.43.
7. The diesel engine generator set shall be capable of picking up 100% of nameplate KW and power factor in one step with the engine generator set at operating temperature, in accordance with NFPA Standard 110, Paragraph 5-13.2.6.
8. The maximum allowable engine BMEP on the engine shall not exceed 318 psi at 100% rated load.
9. The engine generator shall start and provide power to the loads in the following step starting sequence with a maximum instantaneous voltage dip of 35% and a maximum frequency dip of 10%.
10. Refer to generator appendix for generator list of loads.
11. The generator shall at a minimum provide the following performance:
    a. The generator as a packaged unit (engine, alternator and controls) provide a minimum of 2,429 SKVA.
    b. The alternator performance shall be designed to provide a minimum of 1,900 locked rotor KVA at a maximum voltage dip of 35%.
    c. Contractor shall provide and install one (1) zero to thirty minute time delay relay for each piece of mechanical equipment listed in the generator list of loads appendix. Contractor shall integrate time delay relay with start/stop signal of associated equipment, and install time delay relay in accordance with each mehcanical equipment manufacturer's installation instructions. Exact time delay setting for each relay shall be coordinated during installation and start-up of mechanical equipment and generator such that mechanical equipment is started and stopped in accordance with the steps listed in the generator list of loads appendix.

B. The following performance verifications shall be provided for substitute generators.
1. Submit five copies of generator sizing program based upon the specified step/starting sequence and associated voltage/frequency dips and required starting KVA.
2. As part of the substitution requirements the contractor shall enter all design step/starting sequence loads into the manufacturer’s generator sizing program to verify model proposed by substitute manufacturer meets the specified requirements for ambient temperature, site altitude, voltage dip, frequency dip, and starting KVA. Generator sizing program shall be issued to Engineer for review and approval.

2.04 AC GENERATOR, REGULATOR AND EXCITER UNIT

A. The AC generator, exciter and voltage regulator shall be designed and manufactured by the engine generator set manufacturer as a complete generator system.

B. The AC generator shall be synchronous, four pole, revolving field, dripproof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan and directly connected to the engine with flexible drive discs. The armature shall have skewed laminations of insulated electrical grade steel, two-thirds pitch windings in order to minimize field heating and voltage harmonics. The rotors shall have amortissuer (damper windings) layer wound mechanically wedged winding construction. The rotors shall be dynamically balanced. The

exciters shall be brushless, three phase, with full wave silicon diodes mounted on the rotating shaft and a surge suppressor connected in parallel with the field winding. Field discharge resistors shall not be acceptable. Systems using three wire solid state devices (such as SCRs or transistors) mounted on the rotor shaft shall not be acceptable.

C. All insulation system components shall meet NEMA MG1 standard temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 105 degrees C to provide additional allowance for internal hot spots. The main generator and exciter insulation systems must be suitably impregnated for operation in severe environments for resistance to sand, salt and sea spray.

D. Generator shall be a Permanent Magnet Generator (PMG). Permanent magnet generators shall provide excitation power to the automatic voltage regulator for immunity from voltage distortion caused by nonlinear SCR controlled loads on the generator. The PMG's shall sustain main field excitation power for optimum motor starting and to sustain short circuit current for selective operation and coordination of system overcurrent devices.

2.05 ENGINE GENERATOR SET CONTROLS

A. The generator sets shall be provided with microprocessor-based control systems which are designed to provide automatic staring, monitoring, and control functions for the generator set. The control systems shall also be designed to allow local monitoring and control of the generator sets, and remote monitoring and control as described in this specification. The controls shall be mounted on the generator sets, and shall be vibration isolated and prototype tested to verify the durability of all components in the system under vibration conditions encountered. The controls shall be UL-508 labeled, CSA282-M1989 certified, and meet IEC-8528 part 4. All switches, lamps and meters shall be oil-tight and dust-tight, and the enclosure doors shall be gasketed. There shall be no exposed points in the controls (with the door open) that operate in excess of 50 volts. The controls shall meet or exceed the requirements of Mil-Std 461C part 9, and IEC Std. 801.2, 801.3 and 801.5 for susceptibility, conducted and radiated electromagnetic emissions. The entire controls shall be tested and meet the requirements of IEEE587 for voltage surge resistance. The generator set mounted controls shall include the following features and functions:
   1. The generator control panel shall provide a network interface for the future Scada System. This network interface shall communicate all the generator status, control, display messages, troubleshooting and safety features as described below. Software shall be available for interfacing PLC Software with generator control panel communications. This interface and software development will be performed by another contract.
   2. Three position control switch labeled RUN/OFF/AUTO. In the RUN position the generator set shall automatically start, and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
   3. Red "mushroom-head" push-button EMERGENCY STOP switch. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
   4. Push-button RESET Switch: The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
   5. Generator Set AC Output Metering: The generator set shall be provided with a metering set with the following features and functions:
      a. Digital metering set, 0.5% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three phase voltages (line to neutral or line to line) simultaneously.
   6. Generator Set Alarm and Status Message Display: The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, and

existing alarm and shutdown conditions. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on a digital display panel:

a. Low Oil Pressure (alarm)
b. Low Oil Pressure (shutdown)
c. Oil Pressure Sender Failure (alarm)
d. Low Coolant Temperature (alarm)
e. High Coolant Temperature (alarm)
f. High Coolant Temperature (shutdown)
g. Engine Temperature Sender Failure (alarm)
h. Fail to Crank (shutdown)
i. Overcrank (shutdown)
j. Overspeed (shutdown)
k. Low DC Voltage (alarm)
l. Low Coolant Level (alarm or shutdown-selectable)
m. High DC Voltage (alarm)
n. Weak Battery (alarm)
o. Low Fuel-Daytank (alarm)
p. High AC Voltage (shutdown)
q. Low AC Voltage (shutdown)
r. Under Frequency (shutdown)
s. Over Current (warning)
t. Over Current (shutdown)
u. Short Circuit (shutdown)
v. Ground Fault (alarm)
w. Over Load (alarm)
x. Emergency Stop (shutdown)
    1) In addition, provisions shall be made for indication of two customer-specified or future alarm or shutdown conditions. These two alarm conditions shall be interfaced with leak detection/overfill alarm panel for overfill and leak detection. Labeling of the customer specified or future alarm or shutdown conditions shall be of the same type and quality as the above specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate the generator set is not able to automatically respond to a command to start from a remote location.

7. Engine Status Monitoring: The following information shall be available from a digital status panel on the generator set control:
    a. Engine Oil Pressure (psi of kPA)
    b. Engine Coolant Temperature for left and right block temperatures (degrees F or C; both)
    c. Engine Oil Temperature (degrees F or C)
    d. Engine Speed (rpm)
    e. Number of Hours of Operation (hours)
    f. Number of Start Attempts
    g. Battery Voltage (DC volts)
8. Control Functions: The control system shall provide for the following functions:
    a. The control system provided shall include a cycle cranking system, which allows for user selected crank time, reset time, and number of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods.
    b. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.

c. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and ramping function to control engine speed and limit exhaust smoke while the unit is starting. The governor control shall be suitable for use in paralleling applications without component changes.
d. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
e. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure condition.

9. Alternator Control Functions: The generator set control shall include the following alternator control functions:
   a. The generator set shall include an automatic voltage regulation system which is matched and prototype tested with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control build up of AC generator voltage to provide a linear rise and limit overshoot. The systems shall include a torque-matched characteristic, which shall reduce output voltage in proportion to frequency below a threshold of [58-59] HZ. The voltage regulator shall include adjustments for gain, damping and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alpha-numeric LED readout to indicate setting level.
   b. The voltage regulation system shall include provisions for reactive load sharing and electronic voltage matching for paralleling applications. Motorized voltage adjust pot is not acceptable for voltage matching.
   c. Controls shall be provided to monitor the output current of the generator set and initiate an alarm when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator.
   d. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition when total load on the generator set exceeds the generator set rating for in excess of 5 seconds.
   e. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
   f. An AC over/under voltage monitoring system which responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.
   g. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25VDC or more than 32VDC. During engine starting, the low voltage limit shall be disabled, and if DC voltage drops to less than 14.4 volts for more than two seconds a “weak battery” alarm shall be initiated.
   h. The control system shall include a ground fault monitoring relay. The relay shall be adjustable from 100-1200 amps, and include adjustable time delay of 0-1.0 seconds. The relay shall be for indication only, and not trip or shut down the generator set. Note bonding and grounding requirements for the generator set, and provide relay which will function correctly in system as installed.

10. Control Interfaces for Remote Monitoring: All control and interconnection points from the generator set to remote components shall be brought to a separate connection box. No field connections shall be made in the control enclosure or in the AC power output enclosure. Provide the following features in the control system:

a. Form “C” dry common alarm contact set rated 2A @ 30VDC to indicate existence of any alarm or shutdown condition on the generator set.
b. One set of contacts rated 2A @ 30VDC to indicate generator set is ready to load. The contacts shall operate when voltage and frequency are greater than 90% of rated condition.
c. A fused 10 amp switched 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.
d. A fused 20 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.
e. The control shall be provided with provisions for connection of remote monitoring equipment as described herein or shown on the drawings.

2.06 ENGINES

A. The diesel engine shall be manufactured by Cummins Engine Company and designed specifically for generator set duty. The diesel engine shall be 4 cycle, diesel fueled, direct injection, 1800 RPM, with forged steel crankshaft and connecting rods. Minimum engines shall be 912 cubic inches. Engines shall have a minimum of 6 cylinders. The cylinder blocks shall be cast iron with replaceable wet liners and have four valves per cylinder. The engines shall be turbocharged and aftercooled.

B. Two cycle engines will not be acceptable.

C. Electronic governor systems shall provide automatic isochronous frequency regulation. The engine governing systems shall not utilize any exposed operating linkage.

D. The engines shall be cooled by a unit-mounted closed loop radiator system including belt-driven pusher fan, coolant pump and thermostat temperature control. The cooling systems shall be rated for full rated load operation in 104 degrees F (40 degrees C) ambient condition. The cooling capability of the generator sets shall be demonstrated by prototype tests on a representative generator set model conducted by the generator set manufacturer; calculated data from the radiator manufacturer only is not sufficient. Radiators shall be provided with a duct adapter flange permitting the attachment of an air discharge duct to direct the radiator air outside according to the manufacturer’s instructions.

E. Rotating parts shall be guarded against accidental contact per OSHA requirements.

F. The maximum radiator cooling air shall not exceed 25,000 scfm. The maximum alternator cooling air shall not exceed 2,190 scfm for the genset. The maximum allowable static restriction shall not exceed 0.5 inches of water. The entire cooling air system is based on the above data. All costs incurred if an alternate manufacturer is purchased shall be the responsibility of the electrical contractor. These costs shall include costs to all other trades as well as any associated engineering fees.

2.07 ENGINE ACCESSORY EQUIPMENT

A. The engine generator sets shall include the following accessories:
1. Fuel-Pressure Gauge.
2. Electric starters capable of three complete cranking attempts without overheating, before overcrank shutdown (75 seconds).
3. Positive displacement, mechanical, full pressure, lubrication oil pumps. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicators. Provide bypass oil filters.

4. Engine driven, mechanical, positive displacement fuel pumps. Fuel filters with replaceable spin-on canister elements. Replaceable heavy duty dry element air cleaners with restriction indicators and safety element. Flexible fire rated supply and return fuel lines.
5. Engine mounted battery charging alternators, 35 ampere and solid-state voltage regulators.
6. Fuel water separators.
7. Anti-condensation heater for alternator.
8. Power distribution panel shall be provided as specified on drawing(s). All electrial power distribution panels shall be provided as per associated panel schedule on drawing(s). All termination lugs and bus bars shall be constructed of tin-plated copper.

2.08 BASES

A. The engine-generator set shall be mounted on a heavy duty steel base to maintain proper alignment between components. The engine-generator set shall incorporate battery trays with battery holddown clamps on the base rails. Provisions for stub up of electrical connections shall be within the footprint of the generator set base rails and within the basetanks as specified in the housing section of the specification. Vibration isolators, spring type, shall be provided to be mounted under the generator set base.

2.09 GENERATOR SETS CIRCUIT BREAKERS

A. Generator main circuit breaker shall be solid state UL listed, molded case type, rated as listed below. Circuit breakers shall be mounted in a separate NEMA 1 enclosure and be shipped completely wired to the gensets. No exceptions. Enclosures shall include neutral blocks for field connection.

B. Solid State circuit breakers shall be 100% rated: Refer to drawings for sizes.

C. Circuit breaker (CB) shall be long time current and instantaneous pickup with solid state trip unit. CB shall have visible mechanical fault indicator and push button trip.

D. Circuit breakers shall be rated at 65,000 AIC.

E. Provide auxiliary contacts on breaker position.

2.10 EXHAUST SYSTEMS

A. One exhaust silencer shall be provided for the generator set. The silencer shall be super critical grade. The silencer shall reduce total noise a minimum of 40 dBA at three feet.

B. The exhaust silencer shall be HARCO super critical bottom inlet/side outlet Model 5214-SFH-8 shall be mounted inside the sound attenuated enclosure. Provide all fittings, reducers, couplings elbows and spool pieces.

C. All exterior fittings, accessories and bolts shall be type 304 stainless steel. Provide heat resistant gaskets between all flanged connections to serve as dielectric protectors.

D. The maximum gas flow shall not exceed 3110 cfm. The exhaust gas temperature shall not exceed 865 degrees F. The maximum back pressure shall not exceed 41 inches of water. The design of the entire exhaust system is based on the above data. If a substitution of model specified is made, all costs incurred to redesign as well as costs to other trades to modify the layout shall be the complete responsibility of the electrical contractor.

E. Provide stainless steel flexible exhaust connections for the engine as required for connection between the engine exhaust manifolds and exhaust lines in compliance with applicable codes and standards.

F. Provide an exhaust system condensation trap with manual drain valve to trap and drain off exhaust condensation and to prevent condensation from entering the engine.

G. Provide a suitable weather cap at the stack outlet with all necessary flanges and fittings for proper installation. The weather cap shall have the proper counter weights attached to prevent banging while generator is unloaded.

H. Thermal jacket for interior exhaust lines and silencer by FIRWIN CORP. or engineered approved equal. Jacket thickness shall be sufficient to maintain a surface temperature of less than 200 degrees F.

I. Exhaust mufflers shall be installed by enclosure manufacturer so their weight is not supported by the engines.

2.11 ACCESSORIES

A. Vibration isolators: Spring type.

B. Starting and control Batteries: Two (2) 24 volt starting batteries each genset, lead acid type, 24 volt DC (12 volt DC will not be accepted), sized to accommodate 45 seconds of cranking at an ambient of 0 degrees F without being recharged.

C. Battery Chargers: One 10 amp voltage regulated battery charger shall be provided for each engine-generator set. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30 VDC for remote indication of :
   1. Loss of AC Power - red light.
   2. Low Battery Voltage - red light.
   3. High Battery Voltage - red light.
   4. Power ON - green light (no relay contact).

D. Block Heaters: Thermostatically controlled jacket water heater shall be supplied for each genset with a minimum size shall be 1400 watts. Input voltage of heaters shall be 208 VAC 1 phase.

2.12 ENCLOSURE

A. The generator set shall be provided with a factory-installed sound attenuated level 2 housing which allows the generator set to operate at full rated load in the ambient conditions previously specified. The enclosure shall reduce the sound level of the generator set while operating at full rate load to a maximum of 75 dBA at any location 7 meters from the generator set in a free field environment. Housing materials used shall be steel. Fiberglass and plastic are not acceptable. Acoustical materials used shall be oil and water resistant. No foam materials shall be used.

B. The enclosure shall include hinged doors for access to both sides of the engine and alternator, and the control equipment and a hinged rear see-through control door. Key-locking and padlockable door latches shall be provided for all doors. Door hinges shall be stainless steel.

C. The enclosure shall be provided with an exhaust silencer which is mounted on top of the enclosure, and allows the generator set package to meet specified sound level requirements. Silencer and exhaust shall include a rain cap and rain shield.

D. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color using a two step electrocoating paint process, or equal meeting the performance requirements specified below. Metal part surfaces shall be prepared, primed and painted. The painting process shall result in a coating which meets the following requirements:
   1. Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.
   2. Gloss, per ASTM D523, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.
   3. Crosshatch adhesion, per ASTM D3359, 4B-5B.
   4. Impact resistance, per ASTM D2794, 120-160 inch pounds.
   5. Salt spray, per ASTM B117, 1000+ hours.
   6. Humidity, per ASTM D2247, 1000+ hours.
   7. Water Soak, per ASTM D2247, 1000+ hours.

E. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts will not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work. The enclosure shall be built and tested by the engine generator manufacturer.

2.13 SOURCE QUALITY CONTROL

A. To provide proven reliability of the system, three series of tests shall be performed: prototype model tests, production model tests and field tests. The manufacturer shall provide documentation demonstrating satisfactory prototype and production test results. Generator sets that have not been prototype tested and factory tested at 0.8 PF will not be acceptable.

B. Generator Set Factory Production Tests and Evaluation: These tests and evaluations must have been performed on a prototype generator set representative of the Model specified. A summary of the generator set testing results shall be submitted for review. The manufacturer's standard series of components development tests on the generator system, engine and other major components shall also be performed and available for review, but shall not be acceptable as a substitute for prototype testing on the complete representative generator set prototype.

C. Torsiograph Analysis and Test: The manufacturer of the generator set shall verify that the engine generator set, as configured, is free from harmful torisional stresses. The analysis shall include correlation of empirical data from tests on a representative prototype. The empirical data must include spectrum analysis of the torsional transducer output within the operating speed range of the engine generator set. Calculations based on engine and generator separately are not acceptable.

D. Temperature Rise Test: Complete thermal evaluation of a prototype generator rotor and starter must include actual measurement of internal generator and exciter temperatures by embedded detector method, and measurement of average temperature rise by resistance method. No position measured any place in the windings may exceed the temperature rise limits of NEMA for the particular type of insulation system used. Resistance method temperature rise data shall be confirmed by a full load test on the generator set prototype to include conducted and radiated heat from the engine.

E. Short Circuit Test: A test on a prototype generator set shall have demonstrated that the generator set is designed to withstand the mechanical forces associated with a short circuit condition. With the generator set operating at rated load and speed, the generator terminals must be short circuited on all three phases for a duration of 20 seconds. At the conclusion of this test, the generator set must be capable of full load operation.

F. Endurance Run Test: A minimum of 500 continuous hours of endurance testing with a representative generator set prototype operating as defined by the manufacturer's standby rating shall have been performed. Endurance testing shall be used to verify structural soundness and durability.

G. Maximum Power Test: With the prototype generator set at normal operating temperature and with all power consuming auxiliaries in place, the maximum power available at rated speed shall be determined with the governor set at its fuel stop. The generator set shall maintain this power for a minimum of two minutes.

H. Linear Vibration Test: A test for in-line motion of components occurring along a repeatable path shall meet the manufacturer's acceptance criteria.

I. Cooling System Test: A cooling system test shall demonstrate the ability of the generator set cooling system to maintain normal operating temperature while operating at full rated load and power factor at the highest ambient temperature (122°F) of the system rating. Cooling air requirements, radiator air flow and maximum allowable restriction at radiator discharge, shall be verified by this test.

J. Maximum Motor Starting KVA: Motor starting KVA shall be determined by test, based on a sustained RMS recovery voltage of at least 90 percent of no load voltage with the specified load KVA at near zero power factor applied to the generator set.

K. Transient Response, Steady State Speed Control and Voltage Regulation: Prototype generator set tests shall demonstrate consistent performance as follows; stable voltage and frequency at all loads from no load to full rated load, consistent frequency backwidth with steady state load, maximum voltage and frequency kp on load acceptance and rejection and restoration to steady state after sudden load changes. Transient response is a complete generator set (engine, generator, exciter, and regulator) performance criteria and cannot be established on generator data alone.

L. Witnessed Generator Set Factory Production Tests: On the equipment to be shipped, an 8-hour test shall be performed at rated load and 0.8 PF. These tests shall include certified data to document the following: run at full load, maximum power, voltage regulation, transient and steady state governing, single step load pickup and safety shutdowns. Provide a factory certified test record of the production testing. Certified test record shall be sealed by a licensed professional engineer. The contractor and/or equipment supplier at their expense shall coordinate and provide all transportation and lodging for the Owner and an Owner's engineering representative to witness the above stated factory-test.

2.14 WARRANTY

A. Provide a 5-year manufacturer's limited warranty, including 100% parts and labor, ONAN Option L031. The complete electrical power system, including but not limited to, generator set, controls, associated switches, enclosures, and accessories, as provided by the single source manufacturer, shall be warranted by the manufacturer against defects in materials and workmanship for a period of five (5) years from the date of system startup. Coverage shall include parts, labor, travel expenses, and labor to remove/reinstall the equipment, per ONAN's standard published limited warranty. Supplier must be factory authorized to perform warranty service on the entire system, including, but not limited to, the engine, the generator, the control panels, and the automatic transfer switches.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install engine generator and all appurtenances in accordance with manufacturer's recommendations.

B. Enclosure manufacturer shall install all exhaust components as shown on the drawings and as required to comply with NFPA 37 and local codes and regulations. Components shall be sized to assure full load operation without excessive backpressure sized as per manufacturer's recommendations with actual site dimensions when installed as shown on the drawing. Make provisions as required for pipe expansion and contraction.

C. Coordinate installation of anchor bolts with generator enclosure manufacturer.

D. Installation shall comply with applicable State and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

3.02 FIELD QUALITY CONTROL

A. Initial startup and field acceptance tests are to be conducted by the authorized representative of the system manufacturer who supplies the equipment.

B. Test data shall be collected and recorded on the following: time of day, coolant temperature, operating oil pressure, battery charging rate, cranking time, crank-to-rated frequency time, voltage and frequency overshoot, load assumption-to-steady state voltage and frequency stabilization time, operating voltage, frequency, current, kilowatts and power factor. All data shall be taken every fifteen (15) minutes.

C. Procedure: Generator manufacturer shall conduct a six (6) hour load bank test at 1.0 power factor for each generator set. Contractor shall provide load bank for testing generator set at 100% load. Contractor is not permitted to use load bank specified as part of the testing requirements. Load bank test shall test generator at full nameplate KW rating. Generator manufacturer's representative shall record test data, as described in (B) above. Test data shall be tabulated and typed for submission and approval by the engineer for final acceptance. No handwritten field notes will be allowed.

END OF SECTION 263213

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Overfill/leakage alarm panel.

B. Remote alarm.

C. High and low level alarm probe.

D. Secondary containment alarm probe.

1.02 RELATED SECTIONS

A. Section 014100 - Regulatory Requirements.

B. Section 012500 - Substitution Procedures.

C. Section 260533 - Raceways and Boxes for Electrical Systems.

D. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.04 SYSTEM DESCRIPTION

A. Overfill and Leakage Alarm: System capable of sensing and indicating product overfill and leakage of fuel oil storage tank. System shall be capable of sensing WARNING, LOW and FULL level conditions.

1.05 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide technical data for alarm system.

C. Shop Drawings: Indicate pertinent dimensions, lengths of probes, plan layout of equipment, mounting details, construction details, required clearances, power requirements and wiring diagrams.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Underwriters Laboratories, Inc. Include instructions for storage, handling, protection, examination, preparation, installation and starting of prod-ucts.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017823.

B. Operation Data: Indicate procedures and methods required for proper operation of alarm system.

C. Maintenance Data: Provide spare parts list and name of local parts supplier.

1.07 REGULATORY REQUIREMENTS

A. Conform to the requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suit-able for purpose specified and shown.

1.08 COORDINATION

A. Coordinate with all adjacent mechanical work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. OMNTEC/ELECTROLEVELS MFG., INC.

B. Substitutions shall be permitted only after receiving written approval from the Engineer.

C. Substitutions shall be acceptable and approved by the Suffolk County Department of Health Services.

2.02 COMPONENTS

A. Magnetostrictive Tank Level Gauge/Overfill Alarm Probe: Model MTG-RS-R5F2.

B. Secondary Containment Alarm Probe: Model BX-PDS Series.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify all openings in tank are properly located and sized and ready to receive work of this section.

3.02 PREPARATION

A. Clean all parts and components of the alarm system such that they are free from dirt, water and other debris.

3.03 INSTALLATION

A. Installation shall comply with Suffolk County Department of Health Services requirements.

B. Install magnetorestrictive probe at location indicated on the plans. Magnetostrictive probe to serve as high and low level alarms.

C. Install secondary containment alarm probe between the inner and outer walls of the fuel tank and located 1/4 inch (6 mm) above the bottom inner surface of the outer tank wall.

D. New alarm probes to be integrated with exisitng Omntec Proteus-X panel.

END OF SECTION 263217

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Charger/rectifier unit.

B. Inverter unit.

C. Batteries.

1.02 REFERENCES

A. IEEE 519 - Guide for Harmonic Control and Reactive Compensation of Static Power Converters.

B. NEMA PE 1 - Uninterruptible Power Systems.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. NFPA 70 - National Electrical Code.

1.03 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Operation Data: Description of operating procedures.

C. Maintenance Data: Description of servicing procedures; list of major components; recommended remedial and preventive maintenance procedures; spare parts list.

1.04 WARRANTY

A. Provide one (1) year warranty, including parts and factory service.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. APC American Power Conversion Corp. - Model BR1000MS: 1000VA

2.02 UNINTERRUPTIBLE POWER SUPPLY

A. Components:
   1. Batteries.
   2. Rectifier/charger to maintain battery charge and to provide input to inverter when utility power is available.
   3. Inverter to provide power to load during normal operation.
   4. Static switch to transfer load automatically and without disturbance between inverter and utility power.
   5. Manual switch to bypass static switch for maintenance.
   6. Monitors, sensors and control circuits.
   7. Design Standards: IEEE 519 and NEMA PE 1.

2.03 SYSTEM RATINGS AND OPERATING CHARACTERISTICS

A. Performance Requirements.

B. System Configuration shall be the non-redundant, line-interactive type. All power connections, in and out, AC and DC, shall enter from the bottom or rear of the UPS cabinet. Compression-type terminal blocks shall be standard connections.

C. System Operation.

D. During normal operation, utility power is delivered to the load through the tap-switching power conditioner, while DC is delivered to recharge the batteries through the bi-directional converter. At the same time, the bi-directional on-line converter provides the regulation of voltage to the UPS output. AC output provided to load should be galvanically isolated from input including neutral.

E. In case of UPS failure, when any part of the converter system fails so as to adversely affect the quality of the UPS performance, 100% of the load shall be automatically be provided by the power conditioner through the power transformer.

F. The manual bypass switch shall be a standard feature, selecting clean, regulated AC from the UPS output, or raw AC power from the UPS input terminal blocks.

G. When the utility power suffers and outage, or when it is out of tolerance , the battery bank shall supply DC power without any switching required and thus maintain the UPS in action. During such operation, the load power shall remain within the limits set below.

H. Battery charging shall be automatic based upon battery state of charge. The charging current is limited to prevent damage to the batteries, which will be the specially sealed, maintenance-free type.

I. Summary of Characteristics - The characteristics specified in this section are the minimal ones to be considered.

J. Input to UPS:
   1. Nominal Voltage: 120 VAC + 20%, -30%, 1-phase, 3-wire, plus ground.
   2. Frequency: 60 Hz +3 Hz.
   3. Input Power Factor: Between .9 leading and .8 lagging at full loads and nominal input voltage.
   4. Input Current Distortion: Less than 5% at full load and nominal input voltage.

K. Output to UPS:
   1. Voltage: 120 VAC, 1-phase, 3-wire, including ground.
   2. Voltage Regulation:
   3. +3% for all load conditions.
   4. Wave Form: Sine wave.
   5. Frequency: 60 Hz +0.1% Slew Rate: 1 Hz/sec, synchronized to input +0.5, +1.0, +2.0 or +3.0 Hz selectable.
   6. Harmonic Distortion: Maximum 5% RMS total harmonic distortion (THD) and maximum of any single harmonic of 3%.
   7. Audible Noise: 50 dBA at 1 meter.
   8. Efficiency: 95% AC to AC.

L. Battery System:
   1. A sealed maintenance-free battery, full wired and enclosed in a matching cabinet shall be provided.

M. Equipment: Environment:

1. Temperature and Humidity: The UPS shall be capable of operating between +10°C and 40°C, with a relative humidity between 0 and 95%, non-condensing. The non-operating temperature range shall be between -20° and +60°C.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install inside instrumentation cubicle.

3.02 WARRANTY AND SERVICE REQUIREMENTS

A. Manufacturer shall warrant the UPS to be free from defects in design, material and workmanship under normal use and service for a period of one (1) year from shipment.

B. Manufacturer shall guarantee a maximum response time of 24 hours.

3.03 DEMONSTRATION

A. Demonstrate proper operation of the uninterruptible power supply by simulating an outage.

3.04 INTERFACING WITH NEW CONTROL SYSTEMS

A. Contractor shall provide power from the UPS receptacles to new UPS power terminal blocks located in the new and existing instrumentation and control cubicles. Label "UPS 120V control power".

B. Contractor shall provide 120volt power feeds for the following electrical equipment.
   1. Programmable logic controller.
   2. Indicator recorders power supply.
   3. All communication equipment.

END OF SECTION 263353

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Communication System.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code.

1.03 SUBMITTALS

A. Submit product data under provision of Section 013300.

B. Submit installation instructions and operation and maintenance manuals after approval of shop drawing and prior to installation of equipment.

C. Submit schematics and wiring diagrams for the new system and existing controls.

D. Contractor shall submit shop drawings for the fiber optic/Ethernet network for engineer's approval.

PART 2 - PRODUCTS

2.01 COMMUNICATION SYSTEM INTEGRATION

A. Broadband ethernet service at the booster station shall be new including but not limited to incoming utility cabling and equipment, modem, and all associated accessories.

B. Communication system shall be designed, tested and integrated by the single source instrumentation control system supplier.

C. The contractor shall provide satisfactory evidence to the engineer that the instrumentation system supplier has demonstrable qualifications in performance of this kind of work with a minimum of five (5) years related experience to substantiate:
   1. That the instrumentation system supplier has been regularly engaged in providing similar services and equipment for a minimum of 5 years.
   2. That the instrumentation system supplier has provided installations of comparable scope and complexity, with references.
   3. That the instrumentation system supplier has a service center within 50 miles of the project location
   4. That the instrumentation supplier has an office within 50 miles of the project site complete with the following:
      a. Spare parts including PLC's, power supplies, I/O cards and processors.
      b. Office has a minimum of two (2) field technicians staffed full time at this office which provides 24-hour, 7 days a week service with a minimum response time of 2-hours.
      c. Office has a minimum of two (2) PLC programmers staffed full time at this location.
      d. Office has a minimum of two (2) electrical engineers staffed full time at this location experienced with SCADA systems, PLC's and knowledge of water supply system operations.
      e. The District and District's engineer shall have the right to inspect office, spare part supply and meet and interview service technicians, PLC programmers and engineers as part of determining qualification of system integration.
      f. No shop drawing submittals shall be made, nor any equipment delivered or installed with respect to instrumentation or control prior to the contractor having obtained written approval of the instrumentation system supplier.

g. The contractor shall bear full responsibility for the communication system. The contractor shall have the instrumentation system supplier:
   1) Design the communication system and monitoring system described in these specifications.
   2) Prepare shop drawings for submittal by the contractor to the engineer.
   3) Provide the necessary information or modifications to the shop drawings to obtain approval.
   4) Supervise the installation.
   5) Perform debugging, testing, maintenance and operation of all radio communications and dial-up back-up modem systems.

h. The communications system supplier shall prepare for submission by the contractor, detailed point-to-point wiring diagrams. Engineering services shall be provided by the instrumentation system supplier during start-up and testing as required by other sections of the specification.

i. The contractor shall require the instrumentation system supplier to verify all connections and operational features of all equipment controlled, directly or indirectly, by equipment furnished under this contract prior to submission of shop drawings, schematics shall show all remote connections and respective input/output terminals of all such equipment.

j. The contractor shall have the instrumentation system supplier develop and provide details for installation of all field mounted communication equipment, transmitters, receivers, etc. per recommended practices of the equipment manufacturer and in a manner acceptable to the engineer. Such details shall include specific location, method of support and connection details, as a minimum.

k. Qualified personnel of the communications system supplier shall be provided, as specified hereinafter, for the purpose of instructing the owner's personnel in the operation, maintenance and troubleshooting of all instrumentation systems and related equipment.

l. It is the intent of this specification that all devices, insofar as practical shall be purchased from a single manufacturer to simplify maintenance and operation.

2.02 FIBER OPTIC ETHERNET SWITCH (FOES)

A. Manufacturer shall be ADVANTECH Model EKI-7559SI/MI (8+2 SC Type Fiber Optic Managed Industrial Ethernet Switch with Wide Temperature).

B. APPROVED EQUAL

C. 8-port fiber optic to Ethernet converters shall have at a minimum the following parameters.
   1. Communications:
      a. Standard: IEEE802.3, IEEE802.3u, IEEE802.3z, IEEE802.3x, IEEE802.3ad, IEEE802.1d, IEEE802.1w, IEEE802.1p, IEEE802.1Q, IEEE802.1x
      b. LAN: 10/100Base-T(X), 100Base-FX
      c. Transmission Distance:
         1) Ethernet: Up to 100m
         2) Fiber (Multi-mode): up to 2 km (EKI-7559MI)
         3) Fiber (Single-mode): up to 30km (EKI-7559SI)
      d. Transmission Speed: Up to 100 Mbps
   2. Interface:
      a. Connectors:
         1) 8 x RJ-45 ports
         2) 2 x SC type fiber-optic connectors
      b. LED Indicators:
         1) PWR, PWR1, PWR2, R.M., P-Fail. 10/100T(X): Link/Activity, Duplex/Collision
      c. Console: RS-232 (RJ-45)

3. Network Management:
    a. Configuration:
        1) Web browser, Telnet, Serial console, TFTP, SNMPv1/v2c/v3, Port Speed/Duplex Configuration
    b. Security:
        1) IP Access security, port security, DHCP Server, Port and IP Binding, 802.1X Port Access Control
4. Power:
    a. Power Comsumption: Max. 8.4W (EKI-7559MI/SI)
    b. Power Input: 12-48 Vdc, reduant dual inputs
5. Mechanism:
    a. Mounting: DIN-rail, Wall

D. Provide all required power supplies, RJ-45 and SC connectors, Cat 6 and Fiber Optic patch cords as required for a complete installation.

2.03 VPN APPLIANCE

A. Manufacturer shall be SONICWALL, INC., Model: TZ370

B. FIREWALL
1. Firewall Throughput: 750 Mbps
2. GAV Throughput: 100 Mbps
3. IPS Throughput: 300 Mbps
4. Anti-Malware Inspection Throughput: 100 Mbps
5. IMIX Throughput: 200 Mbps
6. Maximum Connections: 50,000
7. Maximum UTM Connections: 50,000
8. New Connections/Sec: 5,000
9. Nodes Supported: Unrestricted
10. Denial of Service Attack Protection: 22 classes

C. SECURITY SERVICES
1. Deep Packet Inspection Services
2. Content Filtering Service (CFS)
3. Enforced Client Anti-Virus and Anti-Spyware
4. Comprehensive Anti-Spam Service
5. Application Intelligence

D. NETWORKING
1. IP Address Assignment
2. NAT Modes
3. VLANs
4. DHCP
5. Routing
6. Authentication
7. User Database
8. VoIP

E. SYSTEM
1. Zone Security
2. Schedules
3. Object-based/Group-based Management
4. DDNS: Providers include dyndns.org, yi.org, no-ip.com and changeip.com

5. Management and Monitoring: Local CLI, Web GUI (HTTP, HTTPS), SNMP v2, Global management with SonicWALL GMS
6. Logging and Reporting: Viewpoint, Local Log and Syslog
7. Hardware Failover
8. Anti-Spam: RBL support, Allowed/Blocked Lists, Optional SonicWALL Anti-Spam Desktop
9. Load Balancing: Outgoing and Incoming
10. Standards: TCP/IP, UDP, ICMP, HTTP, HTTPS, IPSec, ISAKMP/IKE, SNMP, DHCP, PPPoE, L2TP, PPTP, RADIUS, IEEE 802.3

F. HARDWARE
1. Interfaces: 5x1 GbE, 1 USB, 1 Conole
2. RAM: 1 GB
3. Power Input: 100 to 240 VAC, 50-60 Hz, 1 A
4. Max Power Consumption: 9.4 W/11.7 W (TZ 100W)
5. Total Heat Dissipation: 32 BTU/33 BTU (TZ 100W)
6. Certifications: VPNC AES
7. MTBF: 8 Years Minimum

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install a communication network system including VPN appliances, network switches, wiring and accessories as shown on Contract Drawings. Interface with new communication utility modem(s) and other equipment as required. Coordinate with communication utility as required.

3.02 FIBER OPTIC COMMUNICATIONS

A. Install a communication network system including network switches, Fiber Optic Ethernet switches, Ethernet cables, wiring and accessories.

3.03 MANUFACTURER'S FIELD SERVICE

A. Provide operating instruction manuals which includes the following information:
1. System specifications.
2. Electrical power requirements.
3. Application considerations.
4. Assembly and installation procedures.
5. Power up procedures.
6. Troubleshooting procedures.
a. Provide two (2) eight (8) hour days of manufacturers operation and maintenance procedures for training District personnel. Training procedures shall include troubleshooting, adjustment, calibration and replacement procedures.

END OF SECTION 264010

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Interior and exterior luminaries and accessories.

B. Emergency lighting and units.

1.02 REFERENCES

A. NEMA WD 6 - Wiring Devices - Dimensional Requirements.

B. NFPA 70 - National Electric Code.

C. NFPA 101 - Life Safety Code.

D. LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurements of Solid-Sate Lighting Products

E. LM-80-08, IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide dimensions, ratings, performance data and installation instructions.

D. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

E. All foot candle calculations and photometrics must be provided with substitute products. Photometrics shall include a room by room analysis showing walls, room names and room numbers. Calculation points shall be 2 feet on center, measured at 30" above the floor. Maintained foot candle levels shall meet or exceed those listed in Section 2.03B of this specification. On each drawing, provide a table showing the Room Name, Room Number, Maximum Light Level, Minimum Light Level, Average Light Level, Min:Max Ratio and, IES File Model Number.

F. All substitute LED light fixtures and LED retrofit lighting kits must be Design Lights Consortium (DLC) qualified.

G. All substitute LED replacement lamps must be listed by Energy Star as Certified Light Bulbs.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

1.05 EXTRA PRODUCTS

A. Section 017800 - Closeout Submittals.

B. LED Fixtures: At completion of installation, deliver to Owner.
   1. Five (5%) percent of additional fixtures for each type specified on the light fixture schedule with a minimum of one (1) fixture.

PART 2 - PRODUCTS

2.01 LIGHTING UNITS

A. Refer to lighting fixture schedule on drawings for fixture manufacturer, catalog number, and fixture description.

B. Provide electronic energy saving ballasts. Where dimming is shown on drawings, provide dimmable type ballasts.

C. All fixtures equipped with emergency battery packs shall have test light and switch accessible and visible from the room floor.

2.02 LIGHTING FIXTURE NOTES

A. MOUNTING: Electrical Contractor is responsible for reviewing all mounting arrangements prior to ordering any products. Electrical Contractor is responsible for ordering all of the proper fixtures, mounting hardware and miscellaneous fasteners to complete project. Fixtures to be secured to the structure from a minimum of two points, at opposing ends of the fixture when ceiling recessed or surface mounted. Four points shall be secured where necessary for the fixture to be parallel and tight to underside of ceiling. All recessed fixtures to fit tight to ceiling to eliminate all light leaks. Trim kits, when not secured internally to fixture, shall be secured to structure at a minimum of two points.

B. MOUNTING: Prior to submitting and ordering any light fixture, Contractor is responsible for verifying adequate mounting clearances for all light fixtures that are to be recessed into a grid type ceiling. Where new ceilings are to be installed, contractor shall coordinate with ceiling installers for exact mounting heights and required mounting spaces.

C. FINISHES: All exposed portions (permanent or adjustable) of fixtures to be finished by the manufacturer in a finish as specified.

D. Fixtures shall come pre-assembled and complete with all sockets (incandescent to be spring supported), lamp ends, ballasts, transformers, fixture ends, trim rings, plates, and low density mounting kits (as required) for a complete installation.

E. VOLTAGE: As noted on the lighting fixture schedule. Contractor is responsible for field verifying available voltage(s) and ordering fixtures, ballasts, and transformers accordingly.

F. ORDERING: It is solely the responsibility of the Contractor to order fixtures, lamps, mounting brackets and accessories so that the fixtures will be installed and operating upon Owner Occupancy opening. Contractor is responsible for all delays because of his/her lack of effort to order the products in a timely manner.

G. SHIPPING: The light fixture manufacturer shall mark the fixture type as indicated on the contract drawings and/or shop drawings on the respective carton when shipping luminaries. The Contractor shall be responsible for checking each carton immediately upon receipt for verification that fixtures are undamaged and no contents are missing. All discrepancies must be reported to shipper and manufacturer immediately; otherwise the Contractor shall be responsible for items which are lacking or damaged.

2.03 WARRANTY

A. All light fixtures shall have a 5-year manufacturer’s warranty. Warranty shall begin on date of substantial completion.

2.04 SUBSTITUTIONS

A. All rooms' average lighting shall be 35 fc with max/min value being less than 4.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install fixtures in accordance with manufacturer's instructions.

B. Mount fixtures in locations as shown on drawings and as called for in schedule on electrical drawings. Determine type of ceiling to be installed in each space from drawings and schedules and furnish fixtures suitable for the exact type.

C. Joints in fixture wiring shall be made using wire nuts, pre-insulated Scotch locks, or other approved mechanical means of connection.

D. Adjustable type fixtures shall be adjusted by the Contractor to illuminate intended area to satisfaction of the Engineer.

E. Surface fixtures in or on plastered or drywall ceilings shall be supported from pieces of support channel spanning across main support channels and shall not depend on ceilings for support.

F. Coordinate fixture locations to clear diffusers, ductwork, piping, etc.

G. Maintain integrity of enclosures on all enclosed and gasketed fixtures. Minimize number of enclosure penetrations and make such penetrations water and dust tight with appropriate gasketing and fittings.

H. Fixtures are to fit tight against construction to eliminate light leaks.

I. Recessed downlights are to be provided with adjustable mounting bars/frames for drywall or lay-in ceilings as required. Fixtures shall be securely fastened to the ceiling framing member by mechanical means such as bolts, screws, rivets, or listed clips identified for use with the type of ceiling framing members and fixtures.

J. Support recessed fixtures 2 foot x 2 foot and larger using a minimum of four independent wire hangers, one on each corner, of same gauge as ceiling suspension system supported from building structure independent of ceiling framing. Install earthquake clips to secure recessed grid-suspended luminaries in place.

K. Wall-mounted fixtures shall be mounted plumb with building lines and installed with proper box and cover hardware.

L. Surface-mounted fixtures are to cover mounting hardware. Use a canopy that is no longer than the length and width of the fixture and at a height that is no higher than required to mount the fixture absolutely vertical. Fixtures shall be plumb and shall align with building lines and with each other. Support surface mounted luminaries on grid ceiling directly from building structure. Secure to prevent movement.

M. Stem-mounted fixtures are to be mounted to be absolutely vertical or horizontal. Install suspended luminaries using pendants supported from swivel hangers or in accordance with details shown in drawings. Provide pendant length required to suspend luminaire at indicated height. Support stem-mounted fixtures directly from the building structure.

N. Install recessed luminaries using accessories and firestopping materials to meet regulatory requirements for fire rating. In fire rated ceilings, recessed luminaries must carry one-hour UL fire rating classification.

O. Install all accessories specified with each fixture. Install recessed luminaries to permit removal from below.

P. Bond products and metal accessories to branch circuit equipment grounding conductor.

Q. At completion of installation and before turning over to owner, clean and remove all dirt and smudges from all lighting fixtures including lenses, louvers and reflectors.

END OF SECTION 265000

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Programmable logic controllers.

B. Input/output hardware.

C. Programmer/programming requirements.

1.02 REFERENCES

A. NEMA ICS 1 - General Standards for Industrial Control and Systems.

B. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers and Assemblies.

C. NEMA ICS 3 - Industrial Systems.

D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Submit shop drawings indicating layout of completed assemblies, interconnecting cabling, dimensions, weights, external power requirements and a complete I/O list of control points.

C. Submit wiring and schematics diagrams for the new PLC's and existing controls.

1.04 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five (5) years documented experience, which maintains service facilities within 50 miles of project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. ALLEN BRADLEY Model CompactLogix with 5380 Controller.

B. Approved equal.

2.02 PROGRAMMABLE LOGIC CONTROLLER HARDWARE CHARACTERISTICS

A. The Programmable Controller shall have downward compatibility whereby all new module designs can be interchanged with all similar modules in an effort to reduce obsolescence.

B. The Controller shall have the capability of addressing up to 960 local discrete points or 240 local analog points. The digital calculations is based upon 32 points per module * 30 local modules (maximum for CompactLogix). The analog calculations is based upon 8 channels per module * 30 local modules (maximum for CompactLogix).

C. The 30 maximum local I/O modules can be installed in up to 3 local I/O banks. Each bank will be a seamless extension to the local bank but will be electrically isolated from the other banks.

D. The Programmable controller shall have the ability to be updated electronically to interface with new modules.

E. All hardware of the Programmable Controller shall operate at an ambient temperature of 0 to 60 degrees C (32 to 140 degrees F), with an ambient temperature rating for storage of -40 to +85 degrees C (- 40 to +185 degrees F).

F. The Programmable Controller hardware shall function continuously in the relative humidity range of 5% to 95% with no condensation.

G. The Programmable Controller shall have the ability to communicate with multiple distributed I/O racks or devices configured with multiple I/O modules. CIP Networks that allow distributed I/O ControlNet, EtherNet/IP, and DeviceNet.

H. Connections can be made to other remote CompactLogix inputs and outputs over Devicenet.

I. Connections can be made to other remote Point inputs and outputs bridging through Devicenet, EtherNet/IP, or ControlNet.

J. Connections can be made to remote Flex inputs and outputs over Devicenet, ControlNet or EtherNet/IP. Each Flex I/O input and output module shall be mechanically joined to form an assembly. These assemblies with their respective modules shall contain up to 256 (8 modules x 32pts/module) unique points.

K. Connections can be made to remote ControlLogix inputs and outputs over Devicenet, ControlNet or EtherNet/IP. For remote ControlLogix I/O, each input and output module shall be mechanically joined in a Chassis to form a bank. These banks with their respective modules shall contain up to 512 (16 modules x 32pts/module, using a 17 slot chassis) unique points.

L. Real Time Produced/Consumed Connections can made and data seamless exchanged between multiple CompactLogix Controllers or CompactLogix controllers and any other Logix based controller.

M. The Programmable Controller shall use multiple independent, asynchronous scans. These concurrent scans shall be designated for processing of input and output information, program logic, and background processing of other processor functions. Input and output devices located in the same backplane (local I/O) as the CPU will be produced at the rate of configured RPI (Requested Packet Interval).

N. It shall be possible to communicate with distributed I/O racks or other PLCs via fiber optic cable by inserting fiber optic converters into the links. The fiber link must support distances between converters up to 6500 cable feet on “RIO” or 12 KM on ControlNet. Redundant fiber optic cabling shall be an option.

O. The Programmable Controller shall have the ability to support multiple data communications links by using ControlNet, DeviceNet, Ethernet, and DH-485 networks.

P. The Programmable Controller shall have at least one dedicated serial port, which supports RS-232-C signals. It shall be accessible in control logic and provide support for DF1 Master, DF1 Point to point, DF1 Slave and DH-485 communication protocols. Alternatively, it must be usable for programming and data monitoring purposes. The serial port will also provide support for ASCII communications.

2.03 MEMORY CHARACTERISTICS

A. The program storage medium shall be of a battery backed RAM.

B. Memory shall contain battery back-up capable of retaining all stored program data through a power failure. A low battery condition must be detectable in ladder logic, but shall not automatically generate a major fault. A low battery condition will generate a minor fault and will be detectable in ladder logic and will be indicated on a diagnostic indicator mounted on the front of the controller.

C. The controllers shall provide the capability to use CompactFlash as nonvolatile memory storage. The CompactFlash card shall be available from the supplier as an industrial rated device suitable for use in the same environment as the controller. The CompactFlash shall support a Windows file system allowing multiple files to be stored on the card. The user can manually trigger the controller to save or load from CompactFlash and also configure the controller to load from CompactFlash on power up or when an issue is detected with the data in RAM. Additionally, when memory is restored a user selectable option to be restored in Run mode or Program mode shall be provided.

D. The operator should be able to backup volatile memory, including data, and program logic onto a CompactFlash storage device. In addition, the controllers current firmware should also be stored on the CompactFlash card.

E. All user memory in the processor not used for program storage shall be allocable from main memory for the purpose of data storage. The Programmable Controller system shall be capable of storing 3 data types:
   1. Predefined.
   2. User-defined.
   3. Module-defined

F. If contacts or entire rungs are intentionally deleted from an existing logic program, the remaining program shall be automatically repositioned to fill this void. Whenever contacts or entire rungs are intentionally inserted into an existing program, the original program shall automatically be repositioned to accommodate the enlarged program. All rung comments shall maintain their original links.

G. It shall be possible to program application logic more than once into memory.

H. The number of times a normally open (N.O.) and/or normally closed (N.C.) contact of an internal output can be programmed shall be limited only by the memory capacity to store these instructions.

I. The number of times a timer or counter can be programmed shall be limited only by the memory capacity to store these instructions.

J. Control logic programs shall have immediate access to the subelements of control structures by address and subelement mnemonic, such as timer accumulator value, timer done bit, or PID Process Variable value.

K. Data in the controller should be user defined and tag based and not restricted to any fixed data register format.

2.04 INPUT/OUTPUT (I/O) CHARACTERISTICS

A. The input characteristics shall be provided in 10-31 VDC and 4-20 mA analog current. All input circuits shall have optical isolation (1,500 volt minimum) and filtering to guard against high voltage transients from the externally connected devices.

B. The output characteristics shall be provided in 10-31 VDC, relay contact, and analog current.

C. The I/O modules for the modular PLC systems shall be available in 4, 8 or 16 points depending on which module is selected.

D. Status indicators shall be provided for each of the input and output circuits and shall be illuminated when the circuit is energized.

E. Refer to PLC IO appendix.

2.05 SPECIFIC FUNCTION CHARACTERISTICS

A. Program timers shall be available in both on-delay and off-delay with a time base selection of 0.01 seconds, and timer range from 0.01 to 327.67 seconds. Additional time bases and longer timing intervals can also be supported.

B. Counters shall be available in both count up and count down with a range of -32,768 to 32,767.

C. Sequencers shall have a minimum capacity of 16 bits by 100 steps and be cascadable, time-driven or event-driven.

D. Shift registers shall be available with a minimum of 16 bit groups and be cascadable, time-driven or event-driven.

2.06 POWER SOURCE

A. The PLC's power supply shall accept AC power of 85-132 volts at 60 Hz. It shall be capable of withstanding a power loss for a minimum of 20 milliseconds while still remaining in operation.

B. Input power requirements for AC input power shall not exceed 180 VA.

C. On AC powered PLC system with DC inputs, 200 mA at 24 VDC should be available to the user to power external 24 volt drives.

2.07 PROGRAMMABLE LOGIC CONTROLLER (CPU) HARDWARE

A. The CPU shall be a self-contained unit, and will provide control program execution and support remote or local programming. This device will also supply I/O scanning and inter-processor and peripheral communication functions.

B. The user program and data shall be contained in battery backed memory. The operating system firmware shall be contained in non-volatile memory.

C. The operating system firmware can be updated via a separate update tool to allow for easy field updates. CompactLogix controllers that support CompactFlash shall allow the operating system to be updated using a suitably configured CompactFlash card.

D. The controller memory should be 1.5MB.

E. The CPU within the system shall perform internal diagnostic checking and give visual indication to the user by illuminating a “green” (OK) indicator when no fault is detected and a “red” (OK) indicator (Blinking or Solid) when a fault is detected.

F. The front panel on the Controller shall include color indicators showing the following status information:
   1. Program or Run mode of the controller.
   2. The fault status of the controller.

3. I/O Status.
4. RS-232 activity.
5. Battery Status.
6. Force LED.

G. The front panel of the Controller shall include a mounted keyswitch. The key shall select the following Controller modes: RUN - No control logic edits possible, program always executing; PROGRAM - Programming allowed, program execution disabled; and REMOTE - Programming terminal can make edits and change processor mode, including test mode, whereby the logic executes and inputs are monitored, but edits are not permanently active unless assembled

H. The Controller shall include a holder and a connector for a lithium battery. The battery shall provide power backup for user programs and data when the main power supply is not available.

I. The front panel of the Controller shall include at least one 9-pin D-shell serial RS232 port, which supports DF1, DH-485 (messaging only no programming) and ASCII protocols.

J. All system modules, local and remote chassis shall be designed to provide for free airflow convection cooling. No internal fans or other means of cooling, except heat sinks, shall be required.

K. The Controller shall include an integrated Real Time Clock (RTU). This clock value should be in a form of a predefined tag and should be accessible via logic or remotely.

2.08 POWER SUPPLIES

A. The Programmable Controller shall operate in compliance with an electrical service of 85 to 132 VAC or 120 to 220 VAC, single phase, in the frequency range from 47 to 63 Hz, or 16-32 VDC or 19.2 to 32 VDC.

B. The manufacturer shall be able to provide as standard equipment a system power supply capable of converting AC standard low voltage line power to the DC power required to operate the Programmable Controller system.

C. A single main power supply shall have the capability of supplying power to the CPU and local input/output modules. Other power supplies shall provide power to remotely located racks.

D. The power supply shall automatically shut down the Programmable Controller system whenever its output power is detected as exceeding 125% of its rated power.

E. The power supply shall monitor the incoming line voltage for proper levels. When the power supply is wired to utilize AC input, the system shall function properly within the range of 85 to 265 VAC. When the power supply is wired to utilize DC input, the system shall function properly within the range of 19.2 to 32 VDC. In addition, the power supply shall provide surge protection, isolation, and outage carry-over up to 2 cycles of the AC line.

F. Design features of the Programmable Controller power supply shall include a diagnostic indicator mounted in a position to be easily viewed by the user. This indicator shall provide the operator with the status of the DC power applied to the backplane. In addition, a means of disabling power to the CPU shall be possible from a power disconnect switch mounted in a position easily accessible by the operator.

G. At the time of power-up, the power supply shall inhibit operation of the processor and I/O modules until the DC voltages of the backplane are within specifications.

H. In addition to the electronic protection described above the power supply shall offer a failsafe fuse that is not accessible by the customer.

I. Provide one (1) spare power supply to District.

2.09 PROGRAM STORAGE

A. The program storage medium shall be of solid-state RAM (volatile) type.

B. Memory capacity shall be sized to allow for future programming expansion of 30% minimum.

C. Memory shall contain battery backup capable of retaining all stored program data through a continuous power outage of 12 months under worst case conditions. The capability shall exist to remove all batteries from the system without removing system power.

2.10 INPUT/OUTPUT - GENERAL

A. During normal operation, a malfunction in any remote input/output channel shall affect the operation of only that channel and not the operation of the CPU or any other channel.

B. Circuit components for both remote input and output shall be mounted on plug-in modules and keyed to prevent module insertion into the wrong slot.

C. Isolation shall be used between all internal logic and external power circuits. This isolation shall meet the minimum specification of 1500 vrms.

D. It shall be possible to replace any input or output module without disturbing field wiring.

E. Each I/O module shall contain a visual indicator to display ON/OFF status of individual input or output points.

F. Discrete output modules shall be provided with self-contained fuses for overload and short circuit protection of the module.

G. All field wiring to I/O modules shall be through a heavy duty terminal strip. Pressure-type screw terminals shall be used to provide fast, secure wire connections. All input/output modules shall be color coded and titled with a distinctive label.

2.11 INPUT/OUTPUT MODULES

A. The programmable controller shall utilize discrete input/output hardware consisting of the following as required of this project:
   1. Inputs (Isolated type):
      a. AC/DC input for devices which operate at 120 VAC, 50/60 Hz or 120 VDC, 220 VAC, 50/60 Hz or 220 VDC.
      b. Isolated AC input which provides isolation of 120 VAC or 120 VDC input signals.
   2. Outputs (Isolated type):
      a. AC output for devices which operate at 120 VAC, 50/60 Hz.
      b. Isolated AC output which provides six (6) isolated outputs capable of switching 120 VAC or 220 VAC power.
      c. Contact output which provides four (4) normally open and four (4) normally closed reed relay outputs.
   3. Provide one (1) 16 spare input and one (1) 16 spare output module spare including all racks for each PLC furnished as part of this project. Unused I/O points on other PLC modules do not count in spare I/O.

2.12 ANALOG INPUT/OUTPUT MODULES

A. Analog input which accepts analog signals and converts them to 3-digit BCD, 4-digit BCD or 14-bit binary values. Digital resolution shall be available in 1 part in 256, 1 part in 1,000 (BCD), or 1 part in 4,096 (binary). Analog inputs shall be available in single-ended and sourcing and differential and differential isolated versions. Analog inputs shall be available in the following ranges:
   1. Voltage range: +1 to +5 VDC.
   2. Current range: 4 to 20 mA.

B. Analog output converts a 3-digit BCD number, a 4-digit BCD number, or a 12-bit binary number into an equivalent single-ended analog output signal. Output isolation shall be available. Analog outputs shall be available in the following ranges:
   1. Voltage range: +1 to +5 VDC.
   2. Current range: 4 to 20 mA.

C. Provide one (1) 8 spare input and one (1) 8 spare output modules as spare including all racks for each PLC furnished as part of this project. Unused I/O points on other PLC modules do not count in spare I/O.

2.13 PLC SOFTWARE CHARACTERISTICS

A. The PLC's memory shall consist of data table and program logic areas. The PLC shall examine the status of its inputs prior to every program scan and store the status in the "Input" data table area of is memory. The PLC shall update the "Output" data table area of its memory during every program scan, and then set the real world outputs accordingly. The updating of inputs, program logic and outputs should be repeated continuously while the PLC is in the run mode. The user application program shall be stored in the program logic area of memory as a ladder diagram. The status of a group of inputs and/or outputs controlling an output or outputs shall be called a ladder diagram rung. The program shall consist entirely of ladder diagram rungs to carry out the control plan. The time that the PLC requires to scan 4,096 typical program instructions shall be less than or equal to 500 ms (milliseconds).

B. Provide registered copy of latest edition of programming software and final accepted source code to District for each CPU furnished as part of this project.

C. Inputs/Outputs: Refer to Appendix A - PLC inputs and outputs for required I/O.

2.14 PLC SURGE PROTECTION

A. PLC surge protection shall be provided for PLC circuits.

B. Manufacturer shall be MCG ELECTRONICS, INC., Model PLC-15A-60V.

C. Surge protection shall be for both AC power and 4-20 mA loop data lines.

D. Provide surge protection for each new PLC including remote I/O.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions on PLC.

B. Install all analog and digital spare I/O. Label as spare.

3.02 PROGRAMMING

A. The Contractor shall be responsible to develop, document, program and debug the control sequence and logic necessary to assure system operation as stipulated in the specifications and on the contract drawings. The ladder logic shall be directly programmed in the PLC's. This Contractor shall be responsible for complete programming and verification of performance to be consistent with the intended control operation.

3.03 MANUFACTURER'S FIELD SERVICE

A. Provide operating instruction manuals with adequate information pertaining to the following:
   1. Source Code.
   2. System specifications.
   3. Electrical power requirements.
   4. Application considerations.
   5. Assembly and installation procedures.
   6. Power up procedures.
   7. Troubleshooting procedures.
   8. Programming procedures.
   9. Explanation of internal fault diagnostics.
   10. Shutdown procedures.

B. Documentation: Provide two copies of all working programs on CD as well as a printed program listing. Program shall be fully annotated line-by-line.

C. Product Support Services: The Service Department of the Supplier shall have experienced representatives capable of providing telephone consultation, prompt on-site service and field replacement stock.

3.04 DEMONSTRATION

A. Provide complete system demonstration and performance verification services.

B. Demonstrate operation and programming of controllers. Provide as part of the start-up and demonstration service described in Section 265012, instruction for operating personnel, to be conducted at project site with manufacturer's representative.

C. Customer Training Programs: Provide a customer training program designed to teach the owner's personnel in the understanding and application of the programmable controller. The training program shall include training manuals and "hands-on" programming experience on a programmable controller of the type provided under this contract.

END OF SECTION 265011

Specification 265011 - Programmable Logic Controller
Appendix A - PLC Inputs/Outputs
Riverhead Water District
GST at East Winds Drive

Abbreviations	
DI:	Digital Input
DO:	Digital Output
AI:	Analog Input
AO:	Analog Output
MB:	Modbus
EN:	Ethernet

CP-1' I/O List

Signal Type	No.	Description	Quantity	Range	Units	Notes	Symbolic Address	Data Type	Alarm to Shutdown AOP System?
DI	1	Booster 'A' H-O-A Switch in Auto	1	N/A	N/A		N/A	N/A	N/A
DI	2	Booster 'A' H-O-A Switch in Hand	1	N/A	N/A		N/A	N/A	N/A
DI	3	Booster 'A' Pressure Safety Switch	1	N/A	N/A		N/A	N/A	N/A
DI	4	Booster 'A' Run (aux)	1	N/A	N/A		N/A	N/A	N/A
DI	5	Booster 'A' Fault	1	N/A	N/A		N/A	N/A	N/A
DI	6	Booster 'A' Reset	1	N/A	N/A		N/A	N/A	N/A
DI	7	Booster 'B' H-O-A Switch in Auto	1	N/A	N/A		N/A	N/A	N/A
DI	8	Booster 'B' H-O-A Switch in Hand	1	N/A	N/A		N/A	N/A	N/A
DI	9	Booster 'B' Pressure Safety Switch	1	N/A	N/A		N/A	N/A	N/A
DI	10	Booster 'B' Run (aux)	1	N/A	N/A		N/A	N/A	N/A
DI	11	Booster 'B' Fault	1	N/A	N/A		N/A	N/A	N/A
DI	12	Booster 'B' Reset	1	N/A	N/A		N/A	N/A	N/A
DI	13	Booster 'C' H-O-A Switch in Auto	1	N/A	N/A		N/A	N/A	N/A
DI	14	Booster 'C' H-O-A Switch in Hand	1	N/A	N/A		N/A	N/A	N/A
DI	15	Booster 'C' Pressure Safety Switch	1	N/A	N/A		N/A	N/A	N/A
DI	16	Booster 'C' Run (aux)	1	N/A	N/A		N/A	N/A	N/A
DI	17	Booster 'C' Fault	1	N/A	N/A		N/A	N/A	N/A
DI	18	Booster 'C' Reset	1	N/A	N/A		N/A	N/A	N/A
DI	19	Hi pH	1	N/A	N/A		N/A	N/A	N/A
DI	20	Low pH	1	N/A	N/A		N/A	N/A	N/A
DI	21	Hi Cl2	1	N/A	N/A		N/A	N/A	N/A
DI	22	Low Cl2	1	N/A	N/A		N/A	N/A	N/A
DI	23	Booster Pump Emergency Shut-off Panel Pressed	1	N/A	N/A		N/A	N/A	N/A
DI	24	Chlorine Pump Emergency Shut-off Panel Pressed	1	N/A	N/A		N/A	N/A	N/A
DI	25	Tank Influent Venturi 'VFM-1' Flow Switch	1	N/A	N/A		N/A	N/A	N/A
DI	26	Booster Discharge Venturi 'VFM-2' Flow Switch	1	N/A	N/A		N/A	N/A	N/A
DI	27	Tank Mixer No. 1 Running	1	N/A	N/A		N/A	N/A	N/A
DI	28	Tank Mixer No. 2 Running	1	N/A	N/A		N/A	N/A	N/A
DI	29	Booster Discharge Motorized Valve 'MOV-1' "Opened"	1	N/A	N/A		N/A	N/A	N/A
DI	30	Booster Discharge Motorized Valve 'MOV-1' "Closed"	1	N/A	N/A		N/A	N/A	N/A
DI	31	Booster Blow Off Motorized Valve 'MOV-2' "Opened"	1	N/A	N/A		N/A	N/A	N/A
DI	32	Booster Blow Off Motorized Valve 'MOV-2' "Closed"	1	N/A	N/A		N/A	N/A	N/A
DI	33	Tank Influent Control Valve Solenoid Status	1	N/A	N/A		N/A	N/A	N/A
DI	34	Tank Influent Control Valve Limit Switch	1	N/A	N/A		N/A	N/A	N/A
DI	35	UPS Alarm	1	N/A	N/A		N/A	N/A	N/A
DI	36	AC Power Loss Alarm	1	N/A	N/A		N/A	N/A	N/A
DI	37	Generator Running	1	N/A	N/A		N/A	N/A	N/A
DI	38	Generator Trouble Alarm	1	N/A	N/A		N/A	N/A	N/A
DI	39	ATS in Normal Position	1	N/A	N/A		N/A	N/A	N/A
DI	40	ATS in Emergency Postion	1	N/A	N/A		N/A	N/A	N/A
DI	41	Normal Power Available	1	N/A	N/A		N/A	N/A	N/A
DI	42	Emergency Power Available	1	N/A	N/A		N/A	N/A	N/A
DI	43	ATS in Auto	1	N/A	N/A		N/A	N/A	N/A
DI	44	Water Heater Flow Switch	1	N/A	N/A		N/A	N/A	N/A
DI	45	Chlorine Injection Leak Sensor	1	N/A	N/A		N/A	N/A	N/A
DI	46	Diesel Tank High Level Alarm	1	N/A	N/A		N/A	N/A	N/A
DI	47	Diesel Tank Low Level Alarm	1	N/A	N/A		N/A	N/A	N/A
DI	48	Diesel Tank Low Low Level Alarm	1	N/A	N/A		N/A	N/A	N/A
DI	49	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	50	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	51	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	52	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	53	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	54	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	55	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	56	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	57	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	58	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	59	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	60	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	61	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	62	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	63	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DI	64	SPARE INPUT	1	N/A	N/A		N/A	N/A	N/A
DO	1	Booster 'A' Start/Stop Command	1	N/A	N/A		N/A	N/A	N/A
DO	2	Booster 'B' Start/Stop Command	1	N/A	N/A		N/A	N/A	N/A
DO	3	Booster 'C' Start/Stop Command	1	N/A	N/A		N/A	N/A	N/A
DO	4	Booster Discharge Motorized Valve 'MOV-1' Actuator Open Actuator	1	N/A	N/A		N/A	N/A	N/A
DO	5	Booster Discharge Motorized Valve 'MOV-1' Actuator Close Actuator	1	N/A	N/A		N/A	N/A	N/A
DO	6	Booster Blow Off Motorized Valve 'MOV-2' Actuator Open Actuator	1	N/A	N/A		N/A	N/A	N/A
DO	7	Booster Blow Off Motorized Valve 'MOV-2' Actuator Close Actuator	1	N/A	N/A		N/A	N/A	N/A
DO	8	Chlorine Pump Start/Stop Command	1	N/A	N/A		N/A	N/A	N/A
DO	9	Tank Influent Control Valve Solenoid Open Command	1	N/A	N/A		N/A	N/A	N/A
DO	10	Tank Influent Control Valve Solenoid Close Command	1	N/A	N/A		N/A	N/A	N/A

Specification 265011 - Programmable Logic Controller
Appendix A - PLC Inputs/Outputs
Riverhead Water District
GST at East Winds Drive

Abbreviations	
DI:	Digital Input
DO:	Digital Output
AI:	Analog Input
AO:	Analog Output
MB:	Modbus
EN:	Ethernet

CP-1' I/O List

Signal Type	No.	Description	Quantity	Range	Units	Notes	Symbolic Address	Data Type	Alarm to Shutdown AOP System?
DO	11	BSCP Audible Alarm	1	N/A	N/A		N/A	N/A	N/A
DO	12	BSCP General Alarm	1	N/A	N/A		N/A	N/A	N/A
DO	13	Generator Exercise Command	1	N/A	N/A		N/A	N/A	N/A
DO	14	Tank Mixer No. 1 Start/Stop Command	1	N/A	N/A		N/A	N/A	N/A
DO	15	Tank Mixer No. 2 Start/Stop Command	1	N/A	N/A		N/A	N/A	N/A
DO	16	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	17	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	18	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	19	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	20	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	21	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	22	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	23	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	24	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	25	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	26	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	27	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	28	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	29	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	30	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	31	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
DO	32	SPARE OUTPUT	1	N/A	N/A		N/A	N/A	N/A
AI	1	Tank Level Ultrasonic Transmitter No. 1	1	TBD	%		N/A	N/A	N/A
AI	2	Booster Discharge Venturi 'VFM-2' High Flow Indicating Transmitter	1	TBD	4-20 mA		N/A	N/A	N/A
AI	3	Booster Discharge Pressure Indicating Transmitter	1	TBD	PSI		N/A	N/A	N/A
AI	4	Booster Pump 'A' Speed Feedback	1	TBD	%		N/A	N/A	N/A
AI	5	Booster Pump 'B' Speed Feedback	1	TBD	%		N/A	N/A	N/A
AI	6	Chlorine Pump Speed Feedback	1	0-100	%		N/A	N/A	N/A
AI	7	Chlorine Residual	1	0-100	4-20 mA		N/A	N/A	N/A
AI	8	pH Residual	1	TBD	4-20 mA		N/A	N/A	N/A
AI	9	Tank Influent Venturi 'VFM-1' Flow Indicating Transmitter	1	TBD	4-20 mA		N/A	N/A	N/A
AI	10	Booster Discharge Venturi 'VFM-2' Low Flow Indicating Transmitter	1	TBD	N/A		N/A	N/A	N/A
AI	11	Generator Diesel Fuel Tank Level	1	TBD	%		N/A	N/A	N/A
AI	12	SPARE INPUT	1	TBD	N/A		N/A	N/A	N/A
AI	13	SPARE INPUT	1	TBD	N/A		N/A	N/A	N/A
AI	14	SPARE INPUT	1	TBD	N/A		N/A	N/A	N/A
AI	15	SPARE INPUT	1	TBD	N/A		N/A	N/A	N/A
AI	16	SPARE INPUT	1	TBD	N/A		N/A	N/A	N/A
AO	1	Chlorine Pump Speed Command	1	0-100	%		N/A	N/A	N/A
AO	2	Booster 'A' Speed Command	1	0-100	%		N/A	N/A	N/A
AO	3	Booster 'B' Speed Command	1	TBD	TBD		N/A	N/A	N/A
AO	4	SPARE OUTPUT	1	0-100	%		N/A	N/A	N/A
AO	5	SPARE OUTPUT	1	TBD	TBD		N/A	N/A	N/A
AO	6	SPARE OUTPUT	1	TBD	TBD		N/A	N/A	N/A
AO	7	SPARE OUTPUT	1	TBD	TBD		N/A	N/A	N/A
AO	8	SPARE OUTPUT	1	TBD	TBD		N/A	N/A	N/A

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Programmable logic controller software development.

B. Instrumentation and Control System development.

1.02 SUBMITTALS

A. Submit PLC and Relay Logic Control drawings in accordance with Section 013300.

B. Provide registered copy of PLC programming including final accepted program to District for each PLC furnished as part of this project. Program shall be fully annotated line-by-line.

C. Provide submittal drawings for PLC/Communication cubicles for each plant.

PART 2 - PRODUCTS

2.01 CONTROL SYSTEM INTEGRATION

A. Instrumentation control system shall be integrated and manufactured by one of the following PLC integrators:
   1. Great Rock Automation
   2. Wire 2 Water
   3. Eagle Control Corporation

B. Instrumentation control system shall be provided by a single source supplier which includes manufacturing control panel, PLC programming, complete communication system, SCADA update and all operator terminals.

C. The contractor shall provide satisfactory evidence to the engineer that the instrumentation system supplier has demonstrable qualifications in performance of this kind of work with a minimum of ten (10) years related SCADA experience to substantiate:
   1. That the instrumentation system supplier has been regularly engaged in providing similar SCADA services and equipment for a minimum of ten (10) years.
   2. That the instrumentation system supplier has provided at least five (5) SCADA installations of comparable scope and complexity, with references.
   3. That the instrumentation system supplier has a service center within 50 miles of the project location.
   4. No shop drawing submittals shall be made, nor any equipment delivered or installed with respect to instrumentation or control prior to the contractor having obtained written approval of the instrumentation system supplier.
   5. That the instrumentation supplier has an office within 50 miles of the project site complete with the following:
      a. Spare parts including radio transmitters, antennas, antenna cabling, PLC’s, power supplies, I/O cards and processors.
      b. Office has a minimum of two (2) field technicians staffed full time at this office which provides 24-hour, 7 days a week service with a minimum response time of 2-hours.
      c. Office has a minimum of two (2) PLC programmers staffed full time at this location.
      d. Office has a minimum of two (2) electrical engineers staffed full time at this location experienced with SCADA systems, PLC’s and knowledge of water supply system operations.
      e. The Water District and District’s engineer shall have the right to inspect office, spare part supply and meet and interview service technicians, PLC programmers and engineers as part of determining qualification of system integrater.

D. The contractor shall bear full responsibility for the instrumentation and controls. The contractor shall have the instrumentation system supplier:
   1. Design the instrumentation system, communication system and monitoring system described in these specifications.
   2. Prepare shop drawings for submittal by the contractor to the engineer.
   3. Provide the necessary information or modifications to the shop drawings to obtain approval.
   4. Supervise the installation.
   5. Perform debugging, testing, maintenance and operation of all instrumentation and control systems.

E. The instrumentation system supplier shall prepare for submission by the contractor, detailed point-to-point wiring diagrams. Point-to-point wiring diagrams shall be provided for all existing electrical equipment to be interfaced with. Submittals not including this will be rejected. Engineering services shall be provided by the instrumentation system supplier during start-up and testing as required by other sections of the specification.

F. The contractor shall require the instrumentation system supplier to verify all connections and operational features of all equipment controlled, directly or indirectly, by equipment furnished under this contract prior to submission of shop drawings, schematics shall show all remote connections and respective terminal numbers of all such equipment.

G. The contractor shall have the instrumentation system supplier develop and provide details for installation of all field mounted control devices, communication equipment, transmitters, receivers, etc. per recommended practices of the equipment manufacturer and in a manner acceptable to the engineer. Such details shall include specific location, method of support and connection details, as a minimum.

H. Qualified personnel of the instrumentation system supplier shall be provided, as specified hereinafter, for the purpose of instructing the owner's personnel in the operation, maintenance and troubleshooting of all instrumentation systems and related equipment.

I. It is the intent of this specification that all devices, insofar as practical shall be purchased from a single manufacturer to simplify maintenance and operation.

2.02 CONTROL SYSTEM

A. Contractor will not be furnished any record drawings of existing conditions for execution of this project. Contractor shall provide all required field investigation by system integrator to develop existing conditions record drawings and verify existing controls are operational. Once Contractor begins installation, no claims shall be made for existing conditions not operational.

B. Control system integrator shall provide all relays, timers, pilot lights, selector switches and contactors required for operation of control system. IEC Contactors shall be required for all motorized butterfly valves/solenoid valves. Where contacts are required to interface with existing systems including caustic and oil level control panels, caustic tank leak/overfill alarm panels, pH, nitrate and chlorine analyzers, generator control panels, security panels, automatic transfer switches, existing blowoff valves, existing chemical treatment panels, variable frequency drives and starters; contractor shall provide new control boards, relays, wiring and controls as required to provide the required contacts for inputs/outputs as specified in the PLC I/O section and as required for system control.

C. Contractor shall provide all wiring required for operation of control system as specified.

D. Contractor shall provide all relays and controls for interfacing with new and existing I/O points. Provide IEC contactors for control of all valves and solenoids.

E. Drawings do not show all required wiring and conduits. Contractor shall refer to specifications Section 265010 for description of I/O for circuits required. Provide shielded twisted pairs for analog I/O and minimum 2c-#14AWG for each digital I/O.

F. Contractor shall provide minimum of two (2) 120 volt, 20 amps circuit from existing distribution system for all controls, at each location. Provide additional circuits for blowoff valves.

G. Digital I/O and 120 volt power shall be permitted in common conduit.

H. Analog signals shall be in dedicated conduit.

I. Ethernet cables shall be in dedicated conduit. Minimum size shall be 3/4”.

J. Contractor shall program new PLC’s such that on loss of communication (Tank Level) pumps shall be interlocked not to run after a time delay set through the graphic user interface (GUI) if communication (radio or backup modems) is not restored.

K. Contractor is responsible for coordinating control systems with equipment manufacturers for proper operation of all equipment. Any discrepancies shall be brought to the attention of the Engineer immediately for final coordination.

PART 3 - EXECUTION

3.01 BOOSTER PUMP CONTROL

A. Install a new PLC system including, I/O, GUI interface unit and communication equipment as described in Specification Section 264010, 265010 and 265013.

B. The I/O units will be connected to new instrumentation controls and/or termination boxes. Contractor to provide required relays, wires, conduits and connectors, schematics and wiring diagrams.

C. The PLC will be used to transmit status and information to the main SCADA Control system and to control all equipment and change settings. The PLC’s shall be programmed to communicate with the main SCADA system and the local plant GUI.

D. The locations of the PLC/communication panels at each location are indicated on contract drawings.

E. At each Plant the GUI plant and global overview and controls screens shall be the same as the screens for the plant in the SCADA system PC.

F. Control of Boosters shall be as follows:
   1. When the Booster H-O-A selector switch is in the "Auto" position, the pump shall start based on ground storage tank level setpoints (via the local OIT and/or SCADA).
   2. When the Booster H-O-A is in the "Off" position, the pump will not start.
   3. The Booster Pumps shall operate in the same sequence in the "hand" position as in the automatic position, except that "hand" does not need an on signal from the PLC to start the pump.
   4. The flow control valve shall modulate flow into the tank based on tank level to control flow into the tank, while still maintaining an operator selectable pressure within the system.

5. Contractor shall maintain all other control system features associated with control of pumps including but not limited to alarms, timers, blow-off, backpin, etc.
6. The pumps shall have a high and low pressure cutout safety circuitof PLC. If a high pressure still exists after a time delay set on SCADA time elapses, the pump shall shut down and must be manually reset. The low pressure cutout is for alarm notification only and shall not turn the pump off. A separate time delay relay shall be provided for high and low pressure cutout to allow for individual time delays. A second contact on each relay shall be input to the PLC for alarm condition.
7. Upon any alarm related to the specified pump and chemicals controls shall shut down and be manually reset locally on the SCP and alarm screen acknowledged through the GUI or SCADA system.

G. All status of I/O points listed in Specification Section 265010 shall be graphically represented on the main SCADA control screen and the Local GUI.

3.02 PROPORTIONAL INTEGRAL DERIVATIVE CONTROL (BOOSTER 'A' & 'B' CONTROL)

A. The proportional integral derivative controllers shall include an analog proportional controller to provide a continuous current output signal (0-20 or 4-20mA) to regulate the speed of the VFD. At minimum output (0 to 4 mA), the control output shall be programmable to be fully “on” or “off” depending on type of element used. At maximum output (20mA), control output shall be programmable to be fully modulated from its original position.

B. The controller shall provide an output to the variable frequency drive to regulate the pressure or tank level to a desired system setpoint set through the GUI. The controller shall combine adjustable proportional gain and integral functions to allow the process to attain the desired setpoint value within the shortest amount of time and with a minimum of overshoot by comparing the instantaneous difference between actual level and desired level (setpoint) as well as the recent history of difference between actual and desired pressures.

C. LOOP GAIN controls shall be provided to adjust the overall gain of the control loop. PROP GAIN control shall be provided to tune the controller to the process dynamics.

D. One PID loop control systems is required.

3.03 CHEMICAL ALARMS

A. On high pH and chlorine levels existing chemical treatment panels lock out the chemical pump. These contacts shall also be input into the PLC and monitored and provide alarms. An additional redundant high and low alarm shall be set through the GUI and SCADA system based upon the 4-20mA process signal. All alarms shall have an adjustable time delay set through the GUI and SCADA system. Alarms shall have enable/disable feature programmed in the SCADA system to send alarm (enable) or don’t send the alarm (disable) only when the pump is not running. When the pump is running to system the enable and disable feature will not work and a high/low chlorine/pH alarm will always be sent. An enable/disable relay shall be installed for the autodialer to not send alarm when the pump is not running.

B. On low chlorine and pH alarm the PLC shall generate an alarm only when the pump is running to system via an adjustable time delay set through the GUI or SCADA system and shut the pump off.

3.04 PRESSURE AND TANK LEVEL ALARMS

A. Where pressure switches are used for high pressure cutoff which shall turn off the boosters external of the PLC these contacts shall also be input to the PLC to monitor alarms. The low pressure cutoff shall be for alarm only and shall not turn the boosters off.

B. An additional redundant alarm for high and low pressure cutoff shall be provided based upon the 4-20mA process signal and set through the SCADA system.

C. Where pressure switches are used for high and low tank level and high and low pressure these switches shall feed the autodialer first and then also provide an additional contact to the PLC to monitor alarms. The high pressure cutout shall turn the boosters off. The low pressure cutout shall be for alarm only and shall not turn the boosters off.

D. An additional redundant high and low tank level alarm shall be provided based upon the 4-20mA process signal set through the GUI and SCADA system.

3.05 ALARMS

A. All alarms shall have independent time delay setpoints set through the GUI and SCADA system prior to being posted to the alarm summary screen. This will allow the District to choose which are immediate and which shall require longer delays.

3.06 AC POWER LOSS

A. The PLC shall monitor the input power to the UPS via a power monitor relay. If the relay senses no power the PLC shall sequence the pump to stop and de-energize the start signal contact.

B. Upon power restoration pumps shall restart if tank level or pressure is calling for a start.

3.07 LOSS OF COMMUNICATION

A. The SCADA system and GUI shall have a control selector switch to enable or disable a automatic switchover to pressure control after adjustable time delay set through the SCADA system or GUI after a communication loss. If the automatic switchover to pressure control is enabled the pump shall be prestarted even if the pump “on” pressure setting is not calling for a start. The pump shall stop on the pressure stop setpoint. Once stopped the pump shall not start until the on setpoint is reached. If the automatic switchover selector switch is in the disable mode the pump shall not switchover to pressure control and must wait for a communication restore to operate on tank level.

3.08 ALARM MONITORING

A. The PLC at each plant shall provide an alarm to the SCADA system and the local GUI, based on any alarm condition. The trigger alarm depends on the plant and can be caused by high pressure, low level, incomplete valve cycle, overload, communication loss, PLC failure, AC power loss, generator failure, etc. The detail of the alarm condition will be reported on the individual plant alarm page. After acknowledging the alarm, the alarm condition shall detail the reason for the alarm and what the operator needs to do to clear the alarm and assist diagnosing the problem.

B. Contractor shall program alarm setpoint screens for high/low pH and chlorine, high/low pressures at each plant, and high/low tank levels for each tank. All valves and time delays shall be set through GUI and SCADA system by operator.

C. The control room PLC at the Administration Building and Birch Drive upon receiving the information from the remote PLC will dial the number(s) set at the PC Dialing System. The PC will report the alarm message via pager with a pre-recorded text message for each individual alarm (i.e., Booster No. X overload) and request acknowledge of the person via telephone (dialing in) to the PLC receiving the call. The Superintendent or delegate shall have access to

the dialing system (password) to be able to edit the pager numbers and enable and disable pagers and the alarm messages.

D. The Superintendent or delegates will be able to investigate in more detail the alarm situation by calling and speaking to the SCADA computer or by connecting a laptop computer to the main SCADA system. At the PC the SCADA System will provide the alarms and overview screens and reports.

E. The PC Dialing System can be edited to select the alarms, time, message, and the person(s) to be called (see Section 265013 for more detail on the alarms messages and on the Editing Dialing Page).

3.09 DEMONSTRATION

A. Demonstrate operation of control system.

B. Demonstrate procedure for changing set points and timer settings.

3.10 STARTUP & DEMONSTRATION SERVICE

A. The Contractor shall engage the control system supplier/integrator to provide startup for the control system. A factory-trained engineer that is thoroughly familiar with the equipment supplied and its specific application on this project shall perform the startup service. The same factory trained engineer shall provide a minimum of ten (10) 8-hour days for demonstration of the new control system to the Owner's personnel. The demonstration shall include all the plant's PLC and GUI, system communication and the SCADA system. This service shall proceed once the system is completely debugged and up and running and written acceptance issued.

3.11 CONTROL MODIFICATIONS

A. The Contractor shall provide the services of the control system integrator to provide an additional ten (10) - eight (8) hour days of field programming changes as requested by the engineer based on start-up and field testing for the whole new system. Contractor shall make all requested control changes and incorporate into PLC programs and include changes as part of final closeout documentation. Control software changes shall include PLC, GUI or PC. Change notice will be provided by the engineer for each plant and/or system (PLC/GUI or SCADA).

END OF SECTION 265012

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Operator Terminals.

1.02 REFERENCES

A. NEMA ICS 1 - General Standards for Industrial Control and Systems.

B. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers and Assemblies.

C. NEMA ICS 3 - Industrial Systems.

D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Submit shop drawings indicating layout of completed assemblies, interconnecting cabling, dimensions, weights, and external power requirements.

C. Submit scaled drawings of graphic screen generations including systems overview, controls settings, reports and alarms for approval by Engineer prior to development.

D. Submit a written description of the alarms dialing scheduling/editing, reports editing and printing, access code and security, and communication from Administration Building control room and the East Winds Drive Booster Pump Station control room, for approval by Engineer prior to development.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. ALLEN BRADLEY Panelview Plus 7 Graphic Terminal to be installed within "BSCP'.

2.02 GRAPHIC USER INTERFACE (GUI)

A. Operator Terminal shall have the following features:
   1. 15-inch Color Active Matrix, TFT 1024x768, 18-bit color graphics.
   2. Full Analog resistive Touch screen
   3. Connect directly to specified ALLEN BRADLEY PLC
   4. 512MB of Battery Backed Application Memory
   5. Panel mount design to fit into motor control center.
   6. NEMA 4x enclosure.
   7. Luminance of at least 300cd/m2
   8. Audio visual feedback each time a touch cell is depressed.
   9. Built-in diagnostics, including “PLC communications lost” and “battery test fail”.
   10. Complete FactoryTalk and Windows CE Operating System to generate system graphics on the operator terminal. Provide one (1) copy of FactoryTalk software and Windows CE Operating System CD formats for each of the panelviews.
   11. Provide two (2) copies of Panelview screen development software to district.
   12. Provide cable to allow download/upload of panelview operator terminal to IBM PC computer.

13. Provide cable to connect the operator terminal to the PLC at each site complete with connectors.
14. Provide access code security to be assigned to any screen.
15. Install GUI unit SCADA Control Panel (SCP) location as shown on plans.
16. Provide LED type pilot lights with push-to-test capabilities. No incandescent pilot lights shall be permitted. No incandescent bases shall be permitted.

PART 3 - EXECUTION

3.01 GUI FUNCTION

A. The GUI terminal shall allow operator access to the operating system to view the system overview, view and acknowledge alarms, view and change the variable settings for the local plant only. Access code is required for changing setpoints, alarms acknowledge and resetting. The GUI shall provide an editing page to assign the password code to the superintendent and its delegates. Every employee shall be assigned his own access code.

B. Tank levels and pressure set points, time delays and alarm settings can be changed on the screen. It is required that an access password and any change shall be recorded and automatically included in the GUI and vice-versa when any change in setting takes place.

C. All setpoints changed will be recorded on the GUI including the date, time and the authorized person.

D. All tank levels, pump flows, and system pressures that are recorded via chart recorders shall also be recorded and trended on a dedicated GUI screen.

E. SCREENS
   1. The Plant overview shall represent the process at the plant including information on all pumps, valves, pH, and Chlorine levels, control schemes, and flow-pressure-level.
      a. Within the process control pages representing the tank levels and pressure settings for the alarms and start/stop of the equipment at each location, the variables can be changed as per the process requirements. A separate Matrix control page shall be generated listing the on/off settings for tank/pressure on/off setpoints and what each pump is selected for (tank/pressure). The contractor shall use the capability of the GUI Software to create the graphics and information. The software shall provide state of the art tools to edit the settings and controls and shall represent the status of the equipment, pipes and valves by changing colors, text indicators next to the device and providing on line variable data.
   2. Trend screens indicating the individual and total pressures, levels and flows, run times shall be continuously available.
   3. A General alarm indicating individual alarms and records shall be provided as a separate screen. Upon an alarm the Alarm Screen button will flash indicating that an alarm has occurred.
      a. Report pages and trend curves shall be provdied for reference. The reports and trend curves shall be selectable at any time interval and can be printed by the operator. The GUI System shall have an edit report page to select the elements to be included in each report and to select if the report is going to be printed automatically (daily, weekly, monthly or yearly) or on request. The data shall be stored on an acceptable database management system (DBMS) software (i.e., MS Access) for easy and rapid access. The software shall allow the data to be presented in a custom format for printing on specialized forms for District use. The District shall provide the contractor with sample forms for this purpose.
      b. Process Data:
         1) PLC Variables - The Operator Interface System (OIS) will read and write process variables in the PLC registers to control and monitor each plant.

2) Data Files - The following files will be maintained:
   (a) Alarm log, an ASCII file that records each configured alarm.
   (b) Alarm summary, a dBASE file that summarizes alarms.
   (c) Alarm acknowledgement, a dBase file that summarizes who acknowledged each alarm.
   (d) Report log, an RTF file that is written each time the report is run.

4. Graphic Pages:
   a. The OIS and all the processes it monitors and controls will be presented to operators through screens (called graphics pages). Operators will navigate through graphics pages via touchscreen.
   b. Menu Page - The menu page shall feature buttons to:
      1) Display the overview page for each plant representing the process and its variables.
      2) Matrix Page
      3) Display the control page for each plant with access to all control setpoints.
      4) Display the alarm pages.
      5) Display the network page.
      6) Display the reports page.
      7) Display the editing reports page.
      8) Graphic trends and summary.
   c. Graphics pages shall be linked together in a display sequence, so that operators can move easily between pages without needing to redisplay the menu page.
   d. Test Page - A test page shall be configured to test the communications and other processes during the configuration of the application.
   e. Utility Page - The utility page will contain some tools which will allow maintenance of the system security database as well as some tools to access some high level programming functions during the system's development.
   f. Alarm Pages - Equipment that often has fault conditions shall trigger alarms, for example, when tanks show low levels, and when the pump exceeds its operating pressure. Alarms shall be displayed on a separate alarm page and an alarm summary page will display a summary of all alarms. Operators will use commands on the alarm pages to handle alarms. Hardware alarms (faults within the Operator Interface System itself) will be reported on a hardware alarm page. All alarm pages will be displayed from buttons on the menu page.

3.02 REMOTE SCADA SYSTEM ACCESS

A. Establish communication between East Wind Drives Booster Pump Station VPN Device and Administration Building VPN Device to allow remote access.

B. All status of new booster station 'BSCP' PLC I/O points listed in Specification Section 265011 shall be graphically represented on the local GUI and SCADA.

C. Configure VPN router to accept remote connections. Configure firewall to protect VPN from unauthorized access.

D. Allow remote users to have control of the SCADA system based on their login and security level. All password protection to login and make changes to setpoints shall be required even when a users is using the remote login.

END OF SECTION 265013

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Main CB/current transformer/meter cabinet and meter pan.

B. Transformer to be mounted on a reinforced concrete pad/pull box.

C. Primary and secondary conduits, conductors, excavation, concrete and backfill.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

PART 2 - PRODUCTS

2.01 METERING EQUIPMENT

A. Meter pans, meter, current transformers and ground fault circuit protection shall be on PSEG's approved lists of manufacturers and models, and installed as per PSEG specifications.

2.02 COMBINATION TRANSFORMER PAD/PULL BOX

A. Combination transformer pad/pull box shall be as per Local Utility requirements.

B. Conduit penetrations shall be provided for both primary and secondary penetrations into transformer and into pull box so that minimum ground cover is maintained in accordance with NEC and Local Utility requirements. Enter primary and secondary conduits/conductors into transformer pullbox in accordance with Local Utility requirements.

2.03 PULL BOXES

A. Provide pull boxes including property line pull boxes as per Local Utility requirements for both primary and secondary services.

B. Provide Local Utility approved type TS for all primary services and secondary services above 400 amperes.

C. Provide Local Utility approved type B-3-6 for secondary services 400 amperes and less.

2.04 CABLE

A. Install new primary and secondary service conductors in conduit.

B. Primary service conductors shall be 15 KV, copper size 1/0, type TR-XLPE with 220 mils insulation thickness as per Local Utility requirements.

C. Secondary service conductors shall be copper type XHHW-2 as per Local Utility requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Coordinate primary and secondary service installation with PSEG prior to beginning work.

B. Provide secondary service to main circuit breaker via PSEG approved Trans S utility meter, coordinate service requirements with PSEG prior to commencing work.

C. All metering equipment and ground fault protection shall be factory installed in motor control center.

D. Contractor shall file application for new electrical service. Contractor shall coordinate with owner for all information related to the service application.

END OF SECTION 267173

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary electric service for construction.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate locations where temporary electric service will be located and routed.

1.04 REGULATORY REQUIREMENTS

A. Obtain required permits from authorities.

B. Notify affected utility companies before starting work and comply with their require-ments.

C. Do not close or obstruct egress width to exits.

D. Do not turn off electric equipment without authorization from Owner and Engineer. Provide 72 hours advance notification.

PART 2 - PRODUCTS

2.01 TEMPORARY ELECTRIC SERVICE

A. Temporary service shall be available during the entire contract period and during all phases of work, day and night.

B. Temporary service shall be installed and maintained per NEC, OSHA, N.Y. State Uniform Building Code and Local Utility requirements.

C. The temporary electrical service shall be sized correctly for all of the new and existing loads.

D. All existing equipment shall be protected against damage caused by the installation, operation and removal of the temporary service. Any equipment or items damaged shall be replace at no cost to the Owner.

E. Provide temporary lighting for new building. Minimum foot candle for temporary lighting: 30 F.C., measured at floor surface. The Contractor shall set up light to minimize glare.

F. Provide wiring, utility poles, metering equipment, distribution panel and other equipment for temporary light and power to new building. Contractor shall pay all fees required for temporary service and complete all required applications. Contractor shall pay all application and construction fees required for temporary service and complete all required applications. Contractor shall pay for all electrical consumption for temporary service.

G. Provide Owner with three (3) keys to all distribution panels for temporary power for distribution to General Contractor and District Personnel.

H. Wiring for temporary light, controls and power shall include a distribution panel for 4 wire, 120/240 volt, 200 AMP service. Feeders in building shall have branch circuits of #12

conductors minimum. Contractor shall pay all application and construction fees required for temporary service and complete all required applications. Owner shall be responsible for paying for the temporary electrical service monthly bills.

I. Provide 20 amp branch circuits with fused ground type receptacle outlet for single phase power.

J. Where distribution panels are provided for temporary power provide four (4) 20 amp circuits with #12 AWG SO cord pigtails with 20 amp plugs with strain relief. Provide one (1) 30 amp circuit with #10 AWG SO cord pigtail with 30 amp plug with strain relief.

K. Provide lamps and fuses, including replacements required.

L. Provide new materials for temporary light and power.

M. Provide ground fault protection (such as portable plug-in type ground fault circuit interrupters) on single phase 20 amp receptacle outlets.

N. Provide receptacle outlets, portable cord connectors and attachment plugs with standard NEMA configurations.

O. Install all temporary light and power materials in accordance with National Electrical Code.

P. Upon completion of the project, remove all temporary electric light and power work and restore all affected finishes, connections and sitework.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing system voltage characteristics and match to existing system voltage characteristics.

B. Verify that the temporary service is sized to accommodate all loads.

C. Determine locations and routings for temporary electric wires, cables and conduits with Engineer and Owner.

3.02 TEMPORARY POWER

A. Temporary wiring and power shall be installed so as not to be a hazard and shall be protected from damage. Separate circuits shall be provided for light and power. Over-current protective devices and switches shall be provided. All equipment, tools, metal cabinets and boxes shall be grounded.

B. Disable existing power only to make final connections or when new service is to be installed.

C. Remove and dispose of all temporary power and control feeds after receiving written approval from Engineer. Restore all finishes to original specified conditions.

END OF SECTION 267174

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Remove and dispose of surface debris as required.

B. Remove and dispose of paving, sidewalk, curbs, etc.

C. Clear site or designated areas of the site of plant life and grass as required, and dispose of as required.

D. Remove and dispose of trees and shrubs as required.

E. Remove and dispose of stumps and root system of trees and shrubs as required.

F. Removal and storage of topsoil.

1.02 RELATED SECTIONS

A. Section 312213 - Rough Grading.

B. Section 329119.13 - Topsoil Placement and Grading: Placement of stored topsoil.

1.03 REGULATORY REQUIREMENTS

A. Conform to applicable local code(s) for disposal of debris.

B. Burning of materials on site is prohibited.

C. Coordinate clearing work with utility companies.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify existing conditions.

B. Identify existing plant life designated to be removed. Verify with Owner and Engineer prior to removal.

C. Verify limits of clearing.

3.02 PROTECTION

A. Locate, identify and protect utilities that are to remain from damage.

B. Protect trees, plant growth and features designated to remain as final landscaping.

C. Protect benchmarks and existing structures from damage or displacement. Any damage to existing structures is to be promptly repaired at no additional cost to the Owner.

3.03 APPLICATION

A. Clear areas required for access to site and execution of work.

B. Remove paving, curbs, debris and sidewalks as required.

C. Remove trees and shrubs designated to be removed. Remove stumps, main root ball, surface rock and perishable debris.

D. Clear undergrowth and dead wood without disturbing subsoil.

E. Remove paving, debris, rock and extracted plant life from site and dispose of in accordance with State and local ordinances.

F. Excavate topsoil from areas to be further excavated, re-landscaped or regraded. Do not excavate wet topsoil.

G. Stockpile topsoil in area designated on site to a height not exceeding 8 feet. Protect from erosion. Remove excess topsoil not being reused from site. Do not remove any topsoil from the site prior to obtaining the approval of the Engineer.

END OF SECTION 311110

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of subsoil.

B. Rough grading and cutting, filing and rough contouring the site for placement of topsoil or pavement base for final grading.

C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 311000 - SITE CLEARING.

B. Section 312316 - EXCAVATION

C. Section 312323 - FILL: Filling and compaction.

D. Section 329219 - Seeding: Finish ground cover.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300

1.04 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of utilities remaining at the end of the project by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: See Section 312323 - FILL.

B. Other Fill Materials: See Section 312323 - FILL.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known underground, aboveground and aerial utilities. Stake and flag locations.

C. Coordinate the removal or relocation of utilities with the necessary utility companies.

D. Locate, identify, and protect from damage above- and below-grade utilities to remain.

E. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

F. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Section 312323 for filling procedures.

G. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 SOIL REMOVAL

A. Stockpile topsoil to be re-used on site; remove remainder from site.

B. Stockpile subsoil to be re-used on site; remove remainder from site.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet (2.5 m); protect from erosion.

3.05 FINISH GRADING

A. Before Finish Grading:

B. Verify subgrade has been contoured and compacted.

C. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size. Remove soil contaminated with petroleum products.

D. Where topsoil is to be placed, scarify surface to depth of 3 inches (75 mm).

E. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches (75 mm).

F. Place topsoil in areas where seeding are indicated.

G. Place topsoil where required to level finish grade.

H. Place topsoil to thickness as scheduled.

I. Place topsoil during dry weather.

J. Remove roots, weeds, rocks, and foreign material while spreading.

K. Near plants spread topsoil manually to prevent damage.

L. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

M. Lightly compact placed topsoil.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) (30 mm) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch) (13 mm).

3.07 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.

C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 CLEANING

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION 312200

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, slabs-on-grade, paving, site structures, utilities within the building, and retaining walls.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Section 312200 - Grading: Grading.

B. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

C. Section 312323 - Fill: Fill materials, filling, and compacting.

1.03 SUBMITTALS

A. See Section 013300 - SUBMITTALS, for submittal procedures.

B. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

1.04 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 312200 for additional requirements.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Protect plants, lawns, and trees to remain.

3.03 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Cut utility trenches wide enough to allow inspection of installed utilities.

F. Hand trim excavations. Remove loose matter.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd (0.25 cu m) measured by volume. See Section 312316.26 for removal of larger material.

H. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 312323.

I. Grade top perimeter of excavation to prevent surface water from draining into excavation.

J. Remove excavated material that is unsuitable for re-use from site.

K. Stockpile excavated material to be re-used in area designated on site .

L. Remove excess excavated material from site.

3.04 FIELD QUALITY CONTROL

A. See Section 014500 - FLOW METERS, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.05 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION 312316

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 312200 - Grading: Site grading.

C. Section 312316 - Excavation: Building and foundation excavating.

D. Section 312316.26 - Rock Removal: Removal of rock during excavating.

E. Section 312323 - Fill: Backfilling at building and foundations.

1.03 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2021, with Errata (2022).

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

F. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017a, with Editorial Revision (2021).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Fill Composition Test Reports: Results of laboratory tests on actual materials used.

C. Compaction Density Test Reports.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.
   1. Graded.
   2. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.

2.02 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Protect plants, lawns, rock outcroppings, and other features to remain.

E. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Engineer.

3.03 TRENCHING

A. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard (0.25 cu m) measured by volume.

G. Remove excavated material that is unsuitable for re-use from site.

H. Stockpile excavated material to be re-used in area designated in Section 312200.

I. Remove excess excavated material from site.

J. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

K. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot (305 mm) into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Engineer.

3.04 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.05 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches (150 mm) compacted depth.

F. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

G. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

H. Compaction Density Unless Otherwise Specified or Indicated:
   1. Compact to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.

I. Reshape and re-compact fills subjected to vehicular traffic.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

3.07 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1/4 inch (6 mm) from required elevations.

3.08 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: at the springline of the pipe and after each lift at 100 foot intervals along the pipe run.

3.09 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION 312316.13

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for: building footprint below grade, slabs-on-grade areas, pavement areas, and site structures.

B. Backfilling and compacting for utilities outside the building.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Section 015000 - TEMPORARY FACILITIES AND CONTROLS: Slope protection and erosion control.

B. Section 312316 - EXCAVATION: Removal and handling of soil to be re-used.

1.03 REFERENCE STANDARDS

A. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2015.

B. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)).

C. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

D. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

E. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.04 SUBMITTALS

A. See 013300 - SUBMITTALS for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

D. Compaction Density Test Reports.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.

2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.
   1. Graded.
   2. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.
   3. Conforming to ASTM D2487 Group Symbol CL.

B. Topsoil: .
   1. Graded.
   2. Free of roots, rocks larger than 1/2 inch (12 mm), subsoil, debris, large weeds and foreign matter.
   3. Acidity range (pH) of 5.5 to 7.5.
   4. Containing a minimum of 5 percent and a maximum of 25 percent inorganic matter.
   5. Conforming to ASTM D2487 Group Symbol OH.

C. Sieve Analysis:

Screen Size	Percent Passing
1" Square Mesh	100%
1/4 inch	more than 97%
#100 U.S.S.	35- 50 %
#200 U.S.S.	less than 20%

2.02 SOURCE QUALITY CONTROL

A. See 014500 - QUALITY CONTROL for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. See Section 312200 - Grading for additional requirements.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches (150 mm) to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches (200 mm) compacted depth.

G. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

H. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

I. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 92 percent of maximum dry density.

J. Reshape and re-compact fills subjected to vehicular traffic.

3.04 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch (25 mm) from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch (25 mm) from required elevations.

3.05 FIELD QUALITY CONTROL

A. See Section 014500 - QUALITY CONTROL, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor").

D. The Contractor shall submit representative samples of the topsoil, together with a certified report from an approved soil-testing laboratory stating the results of an analysis of the same material. Topsoil testing and analysis shall be performed for each 100 cubic yards of topsoil to be used on the project. The analysis shall include pH, organic content, nitrogen, potassium, phosphorus, soluble salt levels, and percentage of sand, silt and clay, and a comparison with

the material specifications. Cost of testing shall be the responsibility of the Contractor. Testing lab to be approved by the Engineer.

E. When the topsoil otherwise complies with the requirements of the specification, but shows a deficiency of not more than one (1) percent in organic matter content, humus, peat moss or other approved organic matter may be incorporated when and as permitted by the Architect.

F. If the topsoil does not have the ph value as specified above, it shall be amended and tested by the Contractor at his own expense to bring it within the specified limits.
   1. When the ph value is below the specified level, add ground limestone.
   2. When the ph value is above the specified level, add aluminum sulfate.

G. If the topsoil does not meet the requirements of this section, the Contractor shall make any and all additions or amendments to topsoil required to remedy any deficiencies shown in these tests to meet standards as specified. The test results shall include recommendations for bringing the topsoil to the requirements listed in this section.

H. Before delivery of off-site topsoil, the Contractor shall furnish the Engineer with a written statement giving location of properties from which topsoil is to be obtained, depth to be stripped, and crops grown during past 2 years.

I. Each batch delivered to the site shall be subject to the approval of the Engineer. The Engineer retains the right to reject all samples either prior to or after testing is complete. Contractor should submit samples for approval prior to testing.

J. If tests indicate work does not meet specified requirements, remove work, replace and retest.

K. Frequency of Tests: one test for every 5,000 square feet of subgrade immediately prior to placing subbase.

L. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.06 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION 312323

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wood and steel sheeting.

B. Sheeting box.

1.02 RELATED SECTIONS

A. Section 312323 - Fill

B. Section 312316.13 - Trenching

1.03 REFERENCES

A. Occupational Safety and Health Standards - Excavations; Final Rule (29 CFR Part 1926) - OSHA Standards.

1.04 QUALITY ASSURANCE

A. Perform all work of this section in accordance with OSHA Standards and approved shop drawings.

1.05 COORDINATION

A. Coordinate work under provisions of Section 013100.

B. Coordinate work with all other sections requiring temporary sheeting and bracing.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wood Sheeting: Hardwood species of size and dimensions capable of being driven to the required depths and capable of supporting excavation sides and soil pressures when braced; free from wormholes, wind shakes, loose knots, decayed or unsound portions or defects which would impair its strength or tightness; 2 inches (50 mm) thick minimum.

B. Steel Sheeting: Corrugated "Z" shape cross-section; of size and dimensions capable of being driven to the required depths and capable of supporting excavation sides and soil pressures when braced; structurally sound; special shapes for corner construction and transition points.

C. Sheeting Boxes: Steel, of size and dimensions capable of supporting excavation sides and soil pressures; structurally sound.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing substrate and site conditions.

B. Verify elevations and grades are as indicated on the plans.

C. Verify proposed locations of excavations are as indicated on the plans.

3.02 PREPARATION

A. Excavate to a depth no greater than 4 feet (1.2 m) from existing grade.

B. Assemble and drive the sheeting in accordance with approved shop drawings.

3.03 INSTALLATION - SHEETING

A. Drive sheeting in place to thoroughly support both sides of the excavation using a sheeting hammer. Use a steam or pneumatic hammer for steel sheeting.

B. Water jetting of sheeting will not be permitted. Do not loosen adjacent ground which might result in collapse.

C. Install walls and braces or shores tight and in accordance with approved shop drawings.

3.04 INSTALLATION - SHEETING BOX

A. Place box in trench utilizing a means which will not damage structural integrity of the box.

B. Excavate ahead of the sheeting box only enough to advance the sheeting box and only immediately prior to moving the sheeting box.

C. Backfill on both sides of the sheeting box as it is moved.

3.05 REMOVAL OF SHEETING

A. Remove sheeting only as backfilling progresses.

B. Carefully remove sheeting such that compacted backfill is not displaced. Add additional backfill to the areas vacated by the sheeting.

C. All sheeting is to be removed from the site once its use is no longer required.

3.06 CLEANING

A. Clean site of any debris from work of this section

END OF SECTION 315000

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Recycled concrete aggregate base course.

1.02 RELATED SECTIONS

A. Section 312000 - Earth Moving.

1.03 REFERENCES

A. ANSI/ASTM C88 - Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.

B. ANSI/ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

C. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18-inch Drop.

D. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Test Reports: Submit a sieve analysis for the aggregate base course used.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products to the site under provisions of Section 016500.

B. Do not handle aggregate in any manner which will cause segregation of large or fine particles.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregate Base Course: At least 95% by weight, of angular, crushed, recycled concrete; free of organic matter and deleterious material; graded in accordance with ANSI/ASTM C136 within the following limits:

	Sieve Size	Percent Passing
1.	2 inches	90-100
2.	1/4 inch	30-65
3.	No. 40	5-40
4.	No. 200	0-10

B. The material may contain up to 5% by weight of asphalt and/or brick.

C. Material retained on the 1/2 inch sieve is coarse aggregate.

D. Coarse aggregate shall not have more than 10 percent by weight of flat or elongated pieces. A flat or elongated piece is defined as being three times greater in the largest dimension as compared to its least dimension.

E. The portion of the aggregate base course which passes the No. 40 screen shall have a plasticity index of one as tested in accordance with ASTM D4318.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate.

B. Verify elevations of subgrade are as indicated on the plans.

C. Verify that subgrade is properly compacted and ready to receive work of this section.

D. Beginning work of this section means acceptance of existing conditions.

3.02 PREPARATION

A. Fine grade and compact subgrade to 95 percent maximum dry density in accordance with ANSI/ASTM D1557.

3.03 AGGREGATE PLACEMENT

A. Spread course aggregate over prepared subgrade to a total compacted thickness as indicated on the plans.

B. Place aggregate in 3 inch layers and compact by roller.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Compact placed aggregate materials to achieve 95% maximum dry density in accordance with ANSI/ASTM D1557. Maintain optimum moisture content to attain required density.

F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

G. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.

H. New pavement must be placed on the properly compacted aggregate base course within 24 hours of final compaction. If aggregate base course is left open for more than 24 hours, re-compact and retest in accordance with ANSI/ASTM D1557.

3.04 TOLERANCES

A. Maximum Variation From Flatness: 1/4 inch measured with 10 foot straight edge.

B. Maximum Variation From Scheduled Compacted Thickness: 1/4 inch.

C. Maximum Variation from True Elevation: 1/4 inch.

3.05 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014500.

B. Perform compaction testing in accordance with ANSI/ASTM D1557.

C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

D. Frequency of Tests: One test per 500 sq ft. immediately prior to paving.

END OF SECTION 321123.16

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Asphaltic concrete paving; wearing, binder or base course.

1.02 RELATED SECTIONS

A. Section 321123.16 - Recycled Concrete Aggregate Base Course.

1.03 REFERENCES

A. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.

B. AI MS-8 - Asphalt Paving Manual.

C. ASTM D242 - Mineral Filler for Bituminous Paving Mixtures.

D. ASTM D546 - Test Method for Sieve Analysis of Mineral Filler for Road and Paving Materials.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Supplier: Submit name of asphalt supplier to be used on the project prior to placement of any asphalt on the project.

C. Design Data: Submit asphalt mix design for each asphalt type to be used.

D. Testing Firm: Submit name of testing firm to be performing tests on asphalt pavement.

1.05 QUALITY ASSURANCE

A. Obtain materials from the same supplier throughout the duration of the project.

B. Do not alter from mix design requirements.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products to the site under provisions of Section 016500.

B. Deliver asphalt in sealed, metal containers covered with suitable material to protect the asphalt from the elements.

C. Lightly lubricate the inside surface of the container with a thin oil or soap solution before loading asphalt.

D. All containers must be cleaned of all foreign materials prior to loading.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when base surface temperature is less than 40 degrees F, or if surface is wet or frozen.

B. Do not place asphalt when precipitation is occurring.

PART 2 - PRODUCTS

2.01 2.01 - MATERIALS

A. Asphalt Cement: AC-20; homogeneous, and shall not foam when heated to 347 degrees F.

B. Fine Aggregate: Material passing the 1/8 inch sieve; natural sand of hard, strong, durable particles which are free from coatings or injurious amounts of clay, loam or other deleterious substances.

C. Coarse Aggregate: Material retained on the 1/8 inch sieve; crushed stone or gravel; clean, durable, sharp angled fragments of rock of uniform quality.

D. Mineral Filler: ASTM D242, finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter; 100 percent shall pass the No. 30 sieve; a minimum of 85 percent shall pass the No. 80 sieve; and a minimum of 65 percent shall pass the No. 200 sieve as measured in accordance with ASTM D546.

2.02 2.02 - EQUIPMENT

A. Rollers: Minimum weight of 10 tons; equipped with lubricating devices for the roller wheels.

B. Pavers: Equipped with a vibratory device.

2.03 2.03 - ACCESSORIES

A. Tack Coat: Homogeneous, medium curing, liquid asphalt.

B. Wheel Lubricant: Oil-water mixture containing maximum 10 percent lubricating oil.

2.04 2.04 - MIXES

A. Use dry material to avoid foaming. Mix uniformly.

B. Base Course: NYSDOT Type 1; 4.0 to 6.0 percent of asphalt cement by weight in mixture in accordance with the following gradation:

SIEVE SIZE	PERCENT PASSING
2 INCHES	100
1 ½ INCHES	90-100
1 INCH	78-95
½ INCH	57-84
¼ INCH	40-72
1/8 INCH	26-57
NO. 20	12-36
NO. 40	8-25
NO. 80	4-16
NO. 200	2-8

A. Binder Course: NYSDOT Type 3; 4.5 to 6.5 percent of asphalt cement by weight in mixture in accordance with the following gradation:

Sieve Size	Percent Passing
1-1/2 inches	100
1 inch	95-100
1/2 inch	70-90
1/4 inch	48-74
1/8 inch	32-62
No. 20	15-39
No. 40	8-27
No. 80	4-16
No. 200	2-8

B. Wearing Course: NYSDOT Type 6; 5.8 to 7.0 percent of asphalt cement by weight in mixture in accordance with the following gradation:

Sieve Size	Percent Passing
1 inch	100
1/2 inch	95-100
1/4 inch	65-85
1/8 inch	36-65
No. 20	15-39
No. 40	8-27
No. 80	4-16
No. 200	3-6

2.05 SOURCE QUALITY CONTROL

A. Obtain asphalt materials from same source throughout the project.

B. Provide asphalt in accordance with the approved mix design for each type of asphalt.

C. Test samples in accordance with AI MS-2.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate.

B. Verify that compacted subbase is dry and ready to receive work of this section.

C. Verify gradients and elevations of base are correct.

D. Verify that all castings are properly installed and are at the correct elevations.

E. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

A. Apply tack coat at uniform rate of 0.03 to 0.07 gal/sq. yd. to contact surfaces of castings, curbs, gutters and any asphalt or concrete material.

B. Do not apply tack coat to wet or frozen surfaces.

C. Coat top surfaces of castings with oil to prevent bond with asphalt pavement.

3.03 INSTALLATION

A. Install work in accordance with AI MS-8.

B. Maintain asphalt temperature between 250 and 325 degrees F during placement.

C. Place asphalt within 24 hours of applying tack coat.

D. Place asphalt to compacted thicknesses as identified on plans. If a multiple course pavement is to be used, place top course within 24 hours of placing bottom course. If more than 24 hours elapse, a tack coat will be required to be placed over the entire surface of the bottom course prior to any additional paving.

E. Utilize the vibratory device on the paver at all times.

F. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

G. Compact pavement to a minimum of 94% maximum density.

H. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

I. Seal all joints between new pavement and existing pavement with asphalt cement.

3.04 TOLERANCES

A. Maximum Variation From Flatness: 1/8 inch measured with 10 foot straight edge.

B. Maximum Variation From Scheduled Compacted Thickness: 1/8 inch.

C. Maximum Variation from True Elevation: 1/4 inch.

3.05 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014500.

B. Take samples and perform tests in accordance with AI MS-2.

C. Test are to include percent compaction, gradation and asphalt content.

D. Provide an asphalt thermometer for determining the asphalt temperature during paving operations.

E. Frequency of Tests: One test for every 1,000 square feet of each pavement course.

3.06 PROTECTION

A. Protect finished work under provisions of Section 015000.

B. Immediately after placement, protect pavement from mechanical injury until project is accepted by the Owner.

END OF SECTION 321216

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Concrete parking areas and roads.

B. Formwork.

1.02 RELATED SECTIONS

A. Section 312000 - Earth Moving.

B. Section 321123.16 – Recycled Concrete Aggregate Base Course.

1.03 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

C. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

D. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

E. ASTM C33 - Concrete Aggregates.

F. ASTM C94 - Ready Mix Concrete.

G. ASTM C150 - Portland Cement

H. ASTM C260 - Air-Entraining Admixtures for Concrete.

I. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

J. ASTM C494 - Chemical Admixtures for Concrete.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide data on joint filler, admixtures and curing compounds.

C. Supplier: Submit name of concrete supplier prior to the placement of any concrete on the project.

D. Design Data: Provide a design mix for each type of concrete used on the project.

E. Certificates: Submit receipts of all concrete deliveries indicating source, date, contractor, amount of concrete, concrete strength, truck number and time load was batched.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017839.

B. Accurately record locations of each day's concrete pour.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain concrete only from approved suppliers and maintain same source throughout duration of the project.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products to the site under provisions of Section 016500.

B. Deliver concrete in accordance with ASTM C94, Alternative No. 2.

C. Place all concrete within 90 minutes of time load was batched.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F, or if surface is wet or frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: ASTM C150 Air Entraining - Type IA Portland type, gray color.

B. Aggregates: ASTM C33.

C. Water: Potable, not detrimental to concrete.

D. Reinforcing Bars: ASTM A615; 60 ksi yield grade; deformed billet steel bars; uncoated finish.

E. Dowels: ASTM A615; 60 ksi yield grade, plain steel, uncoated finish.

F. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; uncoated finish.

2.02 ACCESSORIES

A. Steel Forms: Minimum 16 gauge thick, stiffened to support weight of concrete with a minimum deflection.

B. Plywood Forms: Douglas Fir species; solid one side grade; sound, undamaged sheets.

C. Joint Filler: ANSI/ASTM D1751; 1/2 inch thick.

D. Air Entrainment Admixture: ASTM C260.

E. Chemical Admixture: ASTM C494, type as required.

F. Curing Compound: ASTM C309, Type 2, Class A.

G. Form Release Agent: Colorless material which will not stain concrete or absorb moisture.

H. Joint Sealant: ASTM C920, Type M, Grade P; SL-2 by Sonneborn or equal.

2.03 MIXES

A. Concrete shall be mixed and prepared in accordance with the approved mix design and ASTM C94, Alternative No. 2.

B. The mix design shall be such that the concrete shall attain the following characteristics:
   1. Compressive Strength (28 days): 4,000 psi.
   2. Slump: 2-1/2 to 3-1/2 inches.
   3. Air Entrainment: 6%±1%.

C. Use chemical admixtures only when approved by Engineer. Use of admixtures will not relax placement requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate.

B. Verify compacted granular subbase has been properly placed and is ready to receive work of this section.

C. Verify gradients and elevations of base are correct.

D. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

A. Moisten base to a minimum depth of 1/2 inch to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.

C. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

D. Place and secure forms to correct location, dimension, and profile.

E. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

3.03 INSTALLATION

A. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

B. Place dowels to achieve pavement and curb alignment as detailed on the plans.

C. Place reinforcement as indicated on the plans. Interrupt reinforcement at expansion joints.

D. Provide doweled joints with one end of dowel greased or set in capped sleeve to allow longitudinal movement.

E. Place concrete in accordance with ACI 301.

F. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.

G. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

H. Vibrate concrete adjacent to forms.

I. Place concrete to pattern indicated on the plans.

J. Place expansion and contraction joints as indicated on the plans.

K. Place joint filler between paving components and building or other appurtenances.

L. Provide keyed joints as indicated.

M. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing at the locations shown on the plans. Cut 1/3 into depth of slab.

N. Apply a light broom finish perpendicular to vehicular traffic.

O. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014500.

B. Take six concrete test cylinders for every 50 cu. yds. or fraction thereof of each class of concrete placed each day.

C. Cure test cylinders on site under same conditions as concrete they represent.

D. Take one slump test for each set of test cylinders taken. Concrete not meeting slump requirements will be rejected.

E. Concrete represented by cylinders that do not meet required strength will be removed and replaced at no additional cost to the Owner.

3.05 PROTECTION

A. Protect finished work under provisions of Section 015000.

B. Immediately after placement, protect pavement from premature drying, excessive temperatures and mechanical injury.

C. Protect pavement from damage until project is accepted by the Owner.

END OF SECTION 321313.26

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Reinforced concrete curb.

B. Formwork.

1.02 RELATED SECTIONS

A. Section 312000 - Earth Moving.

1.03 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

C. ASTM A615 - Deformed and Plain Billet Steel for Concrete Reinforcement.

D. ASTM C33 - Concrete Aggregates.

E. ASTM C94 - Ready Mix Concrete.

F. ASTM C150 - Portland Cement

G. ASTM C260 - Air-Entraining Admixtures for Concrete.

H. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

I. ASTM C494 - Chemical Admixtures for Concrete.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide data on joint filler, admixtures and curing compounds.

C. Supplier: Submit name of concrete supplier prior to the placement of any concrete on the project.

D. Design Data: Provide a design mix for concrete to be used on the project.

E. Certificates: Submit receipts of all concrete deliveries, indicating source, date, contractor, amount of concrete, concrete strength, truck number and time truck load was batched.

F. Testing Firm: Submit name of testing firm to be performing tests on concrete.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record locations of each day's concrete pours.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain concrete only from approved suppliers and maintain the same source throughout the project.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver concrete in accordance with ASTM C94, Alternative No. 2.

B. Place all concrete within 90 minutes of time load was batched.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees, or if surface is wet or frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: ASTM C150, Type 1 Portland, gray color.

B. Aggregates: ASTM C33.

C. Water: Potable and not detrimental to concrete.

D. Reinforcement: ANSI A615 steel; 60 ksi yield grade; deformed billet steel bars; uncoated finish.

E. Dowels: ASTM A615 steel; 60 ksi yield grade; plain steel, uncoated finish.

2.02 ACCESSORIES

A. Steel Forms: Minimum 16 gauge thick, stiffened to support weight of concrete with a minimum deflection.

B. Wood Forms: Douglas Fir species; solid, sound, undamaged sheets; minimum 2 inches (50 mm) thick.

C. Joint Filler: ANSI/ASTM D1751; 1/2 inch thick.

D. Air Entraining Admixture: ASTM C260.

E. Chemical Admixture: ASTM C494, type as required.

F. Curing Compound: ASTM C309, Type 1, Class A.

G. Form Release Agent: Colorless material which will not stain concrete or absorb moisture.

H. Joint Sealant: ASTM C920, Type S, Grade NS; NP-1 by Sonneborn or equal.

2.03 MIXES

A. Concrete shall be mixed and prepared in accordance with the approved mix design and ASTM C94, Alternative No. 2.

B. The mix shall be such that the concrete shall attain the following characteristics:
   1. Compressive Strength (28 days): 4,000 psi.
   2. Slump: 2½ to 3½ inches.

3. Air Entrainment: 6% ±1%.

C. Use chemical admixtures only when approved by the Engineer. Use of admixtures will not relax placement requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate.

B. Verify datum and all elevations are as indicated on the plans.

C. Verify compacted granular subbase has been properly prepared and is ready to receive work of this section.

D. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

A. Excavate to the required depth and compact surface.

B. Place and secure forms to correct location, dimension and profile.

C. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

D. Moisten base to a minimum depth of 1/2 inch to minimize absorption of water from fresh concrete.

E. Coat forms with form release agent.

3.03 INSTALLATION

A. Place joint filler vertical in position and at equal spaces not exceeding 20 feet. Secure to formwork during concrete placement.

B. Place dowels through joint filler as indicated on the plans. One end of dowel is to be greased or set in a capped sleeve to allow longitudinal movement.

C. Place reinforcement as indicated on the plans. Interrupt at expansion joints.

D. Place concrete in accordance with ACI 301.

E. Ensure reinforcement, dowels, joint filler or forms are not disturbed during concrete placement.

F. Place concrete continuously between construction joints. Do not break or interrupt successive pours such that cold joints occur.

G. Vibrate concrete adjacent to forms.

H. After concrete sets, but prior to curing, remove front forms without damaging concrete and apply a light broom finish to the top and face of the curb.

I. Place curing compound on exposed surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed under provisions of Section 014500.

B. Take six concrete test cylinders for every 50 cu. yds. or fraction thereof of concrete placed each day.

C. Cure test cylinders on site under same conditions as curb.

D. Take one slump test for each set of cylinders taken.

E. Concrete not meeting slump requirements will be rejected.

F. Concrete represented by cylinders which do not meet required strength will be removed and replaced at no additional cost to the Owner.

3.05 PROTECTION

A. Protect finished work under provisions of Section 015000.

B. Immediately after placement, protect curb from premature drying, excessive temperatures, rain and mechanical injury.

C. Protect curb from damage until project is accepted by the Owner.

END OF SECTION 321613

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Bollards.

B. Footings and foundations.

1.02 REFERENCES

A. ASTM A36 - Structural Steel.

B. ASTM C33 - Concrete Aggregates.

C. ASTM C150 - Portland Cement.

D. ASTM C260 - Air-Entraining Admixtures for Concrete.

E. ASTM C330 - Lightweight Aggregates for Structural Concrete.

1.03 SUBMITTALS FOR REVIEW

A. Section 013300 - Submittals

PART 2 - PRODUCTS

2.01 MATERIALS

A. ASTM A36 structural steel tubing.

2.02 BOLLARDS

A. Formed Steel Tubes: 1/4" thick, 6" diameter galvanized steel, concrete filled.

B. PVC Bollard Cover: Manufactured by ULINE, Model H-3719Y. Color: Yellow or as selected by Owner.

C. Quantity: As indicated on plans.

D. See Section 033000 - CAST-IN-PLACE CONCRETE for concrete requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install units in accordance with manufacturer's instructions, without damage. Replace or repair damaged units.

B. Install units in alignment with adjacent work.

C. Install bollards in footings. Bollards shall be installed in locations as per PSEGLI requirements or in locations as directed by Engineer.

D. Install bollard cover. Drill and tap steel bollard to accept two (2) galvanized screws to attach bollard cover at 4" AFG.

END OF SECTION 323000

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. PVC coated fence framework, fabric and accessories.

B. Excavation for post bases; concrete foundation for posts and center drop for gates.

C. Manual swing gates and related hardware.

1.02 RELATED SECTIONS

A. Section 312316 - Excavation: Excavation for fence posts.

1.03 REFERENCES

A. ANSI/ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ANSI/ASTM F567 - Installation of Chain Link Fence.

C. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire.

D. ASTM A392 - Zinc-Coated Steel Chain Link Fence Fabric.

E. ASTM C150 - Portland Cement.

F. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric.

G. ASTM F900 - Industrial and Commercial Swing Gates.

H. ASTM F1043 - Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.

1.04 SYSTEM DESCRIPTION

A. Fence Height: As indicated on plans.

B. Line Post Spacing: As indicated on plans. If not indicated, intervals shall not exceed 10 feet.

1.05 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

C. Manufacturer's Installation Instructions: Indicate installation requirements and post foundation anchor bolt templates.

1.06 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017839.

B. Accurately record actual locations of property perimeter posts relative to property lines and easements.

1.07 QUALITY ASSURANCE

A. Perform work in accordance with ANSI/ASTM F567.

B. Maintain one copy of document on site.

1.08 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 3 years documented experience.

1.09 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on the plans.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. ANCHOR FENCE, INC.

B. AMERICAN FENCE CORPORATION.

C. Substitutions shall be permitted only after receiving written approval from the Engineer.

2.02 MATERIALS

A. Fence Framing: ASTM F1043; SS40 steel pipe, standard weight, one piece without joints.

B. Fabric Wire: ASTM A392; Zinc-coated No. 9 steel core wire fabric with 2 inch squares, top and bottom selvage knuckle end closed.

C. Gate Framing: ASTM F900; SS40 steel pipe, standard weight, one piece without joints.

D. Barbed Wire: ASTM A121; Galvanized steel, 12 gage thick wire, 3 strands, 4 points at 5 inches on center.

E. Concrete: ASTM C150, Type 1; minimum 4,000 psi strength at 28 days; 3 inch slump; 5 to 7 percent air entrainment.

F. Tension Wire: 7 gauge thick steel, single strand.

G. Tie Wire: Aluminum alloy steel wire.

2.03 ACCESSORIES

A. Caps: Cast steel galvanized or malleable iron galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; galvanized steel.

C. Extension Arms: Cast steel galvanized to accommodate 3 strands of barbed wire, single arm, sloped to 45 degrees.

D. Gate Hardware: Fork latch with gravity drop; center gate stop and drop rod; two 180 degree gate hinges per leaf and hardware for padlock.

E. Diagonal Truss Rod with Turnbuckle: ASTM A153 galvanized steel.

F. Grounding Rod: ANSI/ASTM A123 steel rod.

G. Privacy Slats: High density polyethylene with ultraviolet inhibitors and locking slats.

2.04 FINISHES

A. Framework: Galvanized to ANSI/ASTM A123; 1.8 oz/sq ft coating with a 10-15 mil supplemental PVC powder coating in accordance with ASTM F1043.

B. Fabric and Tension Wire: Galvanized to ANSI/ASTM A123; 0.3 oz/sq ft coating with a 7-12 mil supplemental PVC coating in accordance with ASTM F668.

C. Fittings and Accessories: Galvanized to 1.2 oz/sq ft coating with a 10-15 mil supplemental PVC powder coating in accordance with ASTM F1043.

D. Color: Selected by Owner.

PART 3 - PART 3 - EXECUTION

3.01 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ANSI/ASTM F567 and manufacturer's instructions.

B. Set all posts plumb in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

C. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts.

D. Install diagonal truss rod from the center of the gate or corner post to the bottom of the adjacent line post.

E. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

F. Install brace rail on corner gate leaves.

G. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

H. Position bottom of fabric 2 inches above finished grade.

I. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

J. Attach fabric to end, corner and gate posts with tension bars and tension bar clips.

K. Install bottom tension wire stretched taut between terminal posts.

L. Do not swing gate from building wall; provide gate posts.

M. Install gate with fabric and barbed wire overhang to match fence. Install 3 hinges per leaf, latch, catches and drop bolt.

N. Install concrete center drop to footing depth and drop rod retainers at center of double gate openings.

O. Install 8 foot grounding rod to fence post.

3.02 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

C. Components shall not infringe adjacent property lines.

END OF SECTION 323113.13

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Finish grade subsoil.

B. Place, level and compact topsoil.

1.02 RELATED SECTIONS

A. Section 329219 - Seeding

1.03 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products to the site under provisions of Section 016500.

B. Deliver topsoil to the site in uncontaminated containers.

C. Do not stockpile topsoil over a height of 8 feet.

D. Cover stockpiled topsoil to protect from precipitation, erosion and contamination.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Do not place wet or frozen topsoil.

B. Do not place topsoil on wet or frozen ground or when precipitation is occurring.

1.05 COORDINATION

A. Coordinate work under provisions of Section 013100.

B. Coordinate with all adjacent work and work within areas to receive topsoil.

C. Coordinate the storage of topsoil under provisions of Section 311100 with the placement of topsoil in this section.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; friable loam; free of subsoil, clay or impurities, plants, weeds, roots, grass, stone and foreign matter; acidity range (pH) of 5.8 to 6.5; containing a minimum of 2.75 percent and a maximum of 25 percent organic matter. Topsoil may be reused from on-site if it meets these requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing substrate and conditions.

B. Verify site conditions and note irregularities affecting work of this section.

C. Beginning work of this section means acceptance of existing conditions.

3.02 PREPARATION

A. Prepare subsoil in accordance with Section 312000.

B. Eliminate uneven areas and low spots. Remove and dispose of debris, roots, branches and stones in excess of 1/2 inch in size. Remove and dispose of subsoil contaminated with petroleum products.

C. Scarify subsoil to depth of 3 inches where topsoil is scheduled to be placed. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.03 INSTALLATION

A. Place topsoil in areas where seeding, sodding or planting is scheduled or where shown on the plans.

B. Place topsoil to the depths as indicated on the plans.

C. Use topsoil in relatively dry state. Place during dry weather.

D. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles and contours of subgrade.

E. Remove and dispose stone, roots, grass, weeds, debris and foreign material while spreading.

F. Manually spread topsoil around trees, plants and building to prevent damage.

G. Lightly roll placed topsoil.

H. Remove surplus subsoil and topsoil from site. Do not remove surplus topsoil from the site prior to obtaining approval of the Engineer.

I. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.04 TOLERANCES

A. Maximum Variation from Proposed Elevation: 1/2 inch.

3.05 PROTECTION

A. Protect finished work under provisions of Section 016500.

B. Protect landscaping and other features remaining as final work.

C. Protect existing structures, fences, roads, sidewalks, paving and curbs. Any damage caused by the Contractor to any of these items shall be repaired promptly by the Contractor at no additional cost to the Owner.

END OF SECTION 329119.13

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Seeding.

B. Mulch, fertilizer and other accessories.

C. Maintenance.

1.02 REFERENCES

A. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.03 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel and Brome Grass.

1.04 SUBMITTALS

A. Product Data: Provide data on seed mixtures, fertilizer and lime.

B. Certificates: Provide certificates indicating that all fertilizer, pesticides and herbicides comply with all applicable regulatory agency requirements.

1.05 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.06 QUALITY ASSURANCE

A. Seed: Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.07 REGULATORY REQUIREMENTS

A. Comply with applicable regulatory agencies for fertilizer, pesticide and herbicide composition.

B. All fertilizer, pesticides and herbicides to be used shall comply with all applicable regulatory agency requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016500.

B. Deliver grass seed mixture in original sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis and name of manufacturer.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not sow immediately following rain, during windy periods or if ground is frozen.

B. Do not sow when the ambient temperature is expected to drop below 40 degrees F or rise above 90 degrees F during the time in which the seed will establish itself.

C. Planting Season: April 1st through May 15th or September 1st through October 15th.

1.10 COORDINATION

A. Coordinate with grading and placement of topsoil.

B. Coordinate with installation of underground sprinkler system piping and watering heads.

1.11 WARRANTY

A. Include coverage for one continuous growing season; reseed areas of dead or unhealthy grass at no additional cost to the Owner.

1.12 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition, as determined by at least two cuttings, or until the job is accepted by the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Seed: Dry, fresh, re-cleaned seed of the latest crops and of the mixtures as specified and shown on the drawings.

B. No-Mow Fescue Mixture #12 by the Long Island Cauliflower Association (LICA).

2.02 ACCESSORIES

A. Mulching Material: Hemlock species wood cellulose fiber, dust form, free of growth or germination inhibiting ingredients.

B. Fertilizer: FS O-F-241, Type I, Grade A; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions: Nitrogen 10 percent, phosphoric acid 6 percent, soluble potash 4 percent.

C. Limestone: Ground dolomitic limestone containing a minimum of 90 percent calcium and magnesium carbonates. One hundred percent (100%) shall pass a No. 10 mesh screen and a minimum of 50 percent shall pass a No. 100 mesh screen.

D. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 90 percent organic material measured by oven dry weight; pH range of 4 to 5 percent; moisture content of 30 percent; with moisture absorptive capacity of 450 to 500 percent.

E. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

F. Stakes: Softwood lumber, chisel pointed.

G. String: Inorganic fiber.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing substrate and site conditions.

B. Verify that prepared soil base is ready to receive the work of this section.

C. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

A. Rake topsoil smooth.

3.03 APPLICATION

A. Apply fertilizer at a rate of 21 lbs per 1,000 square feet.

B. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

C. Mix thoroughly into upper 2 inches of topsoil and water lightly to aid the dissipation of fertilizer.

D. Apply seed at a rate of 4 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.

E. Do not seed areas in excess of that which can be mulched on same day.

F. Roll seeded area with roller not exceeding 100 lbs per foot of width.

G. Immediately following seeding and compacting, apply mulch at a rate of 92 lbs per 1,000 square feet. Maintain clear of shrubs and trees.

H. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil. Discontinue watering if washing begins to occur.

I. Identify seeded areas with stakes and string around area periphery. Set string height to 24 inches. Space stakes at 8 feet on center.

J. Cover seeded slopes where grade is 30 percent or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

K. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

L. Secure outside edges and overlaps at 36 inch intervals with stakes.

M. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

N. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 12 inches.

3.04 MAINTENANCE

A. Maintain grass until the grass exhibits a vigorous growing condition, as determined by at least 2 cuttings.

B. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

C. Neatly trim edges and hand clip where necessary.

D. Immediately remove clippings after mowing and trimming.

E. Water to prevent grass and soil from drying out.

F. Immediately reseed areas which show bare spots.

3.05 FINAL ACCEPTANCE

A. Final acceptance of grass area will be granted when a uniform stand of acceptable grass is obtained, with a minimum of 95 percent coverage. Portions of the grass areas may be accepted at various times at the discretion of the Owner's representative.

B. Unacceptable grass area: reseed as specified and fertilize at one-half the specified rate.

C. At the physical completion of the Work, the Owner will assume maintenance responsibilities of the grass areas.

3.06 PROTECTION

A. Protect seeded areas with warning signs during maintenance period.

END OF SECTION 329219

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Water quality sampling of potable water:
   1. Distribution systems
   2. Storage tanks

1.02 RELATED SECTIONS

A. Section 331140 - Disinfection of Water Facilities

B. Section 331160 - Disinfection of Water Storage Facilities

C. Section 331300 - Disinfection of Water Utility Distribution

D. Section 332121 - Disinfection of Water Treatmant Plants

1.03 SUBMITTALS

A. Test Reports: Indicate results comparative to specified requirements.

B. Certificate: Certify that cleanliness of potable water equipment meets or exceeds specified requirements.

1.04 PROJECT RECORD DOCUMENTS

A. Prepare and submit complete water analysis results with the following information:
   1. Date issued, project name and testing laboratory name, address and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24-hour disinfectant residuals in ppm.
   6. Coliform bacteria and chemical test results.
   7. Certification that water conforms or fails to conform to New York State Drinking Water Standards.
   8. Laboratory Director's signature and authority.

1.05 QUALIFICATIONS

A. Testing Firm: Laboratory specializing in testing potable water systems, approved by the New York State Department of Health. Owner approved laboratory, Pace Analytical Services, Inc.

1.06 REGULATORY REQUIREMENTS

A. The Suffolk County Department of Health Services will be notified of the date of water quality testing to allow sampling by the Health Department. Provide Engineer three (3) days advanced notification of proposed sampling date.

PART 2 - MATERIALS

NOT USED.

PART 3 - EXECUTION

3.01 EXECUTION

A. For health department approval of completed works, sampling is required after completion of installation. See latest available Suffolk County Department of Health Water Quality Monitoring Requirements (provided as an appendix to these specifications). It is the responsibility of the Contractor to perform sampling in accordance with the most recently released health department monitoring requirements.

B. Microbiological samples shall not be collected if chlorine residual is greater than 0.1 mg/L, or greater than distribution system residual, if chlorinated system water is used for testing.

C. Microbiological testing shall continue until two (2) consecutive sets, 24 hours apart, show negative results. Collect samples 24-hours after flushing disinfectant and refilling with potable water.

D. If water quality in system does not meet the bacteriological requirements of the Suffolk County Department of Health Services for potable water, the Contractor, at no additional cost to the owner, shall re-chlorinate or take other steps necessary to provide acceptable water quality. Samples shall be collected and analyzed after each attempt. All costs associated with subsequent sampling shall be borne directly by the Contractor.

E. The services of the testing laboratory will be paid for out of the cash allowance included by the Contractor in the price as bid in accordance with the requirements contained in Section 012100 - Allowances.

3.02 QUALITY CONTROL

A. Provide analysis and testing of potable water at locations indicated within this specification or as directed by the Engineer.

B. Test samples in accordance with ANSI/AWWA C652, C653, C654, and Suffolk County Department of Helath Services.

END OF SECTION 331120

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Disinfection of potable water piping, valves,and pumping units.

1.02 REFERENCES

A. ANSI/AWWA B300 - Standard for Hypochlorites

B. ANSI/AWWA B301 - Standard for Liquid Chlorine

C. ANSI/AWWA C651 - Standard for Disinfection of Water Mains

D. ANSI/AWWA C652 - Standard for Disinfection of Water Storage Facilities

E. ANSI/AWWA C653 - Standard for Disinfection of Water Treatment Plants

1.03 SUBMITTALS

A. Submit proposed method for introducing disinfectant into the treatment unit. If media must be disinfected, obtain method for disinfecting from supplier.

B. Test Reports: Indicate results comparative to specified requirements.

C. Certificate: Certify that cleanliness meets or exceeds specified requirements.

1.04 PROJECT RECORD DOCUMENTS

A. Prepare and submit a disinfection report containing the following:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test and injection locations.
   4. Initial and 24-hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   5. Date and time of flushing start and completion.
   6. Disinfectant residual after flushing in ppm for each outlet tested.

B. Prepare and submit complete water analysis results with the following information:
   1. Date issued, project name and testing laboratory name, address and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24-hour disinfectant residuals in ppm.
   6. Coliform bacteria and chemical test results.
   7. Certification that water conforms or fails to conform to New York State Drinking Water Standards.
   8. Laboratory Director's signature and authority.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with ANSI/AWWA C651, ANSI/AWWA C652 and ANSI/AWWA C653.

1.06 QUALIFICATIONS

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three (3) years experience.

B. Testing Firm: Riverhead Water District approved laoratory, Pace Analytical Labs

C. Testing Firm: Laboratory specializing in testing potable water systems, approved by the New York State Department of Health.

1.07 REGULATORY REQUIREMENTS

A. Conform to Recommended Standards for Water Works and applicable codes or regulations for performing the work of this Section.

B. Water quality to conform to New York State Drinking Water Standards after completion of disinfection.

C. The Suffolk County Department of Health Services will be notified of the date of water quality testing to allow sampling by the Health Department. Provide Engineer three (3) days advanced notification of proposed sampling date.

PART 2 - MATERIALS

2.01 DISINFECTION CHEMICALS

A. ANSI/AWWA B300, Hypochlorite

B. ANSI/AWWA B301, Liquid Chlorine

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that all piping systems and treatment units have been cleaned, inspected and pressure tested.

3.02 EXECUTION

A. Provide required equipment to perform the work of this Section. The Owner will provide the water required for the initial disinfection and filling of the piping, and valves, etc. The Contractor shall pay for the water required for any subsequent filling of these systems based on the Owner's retail water rate.

B. Disinfect system in accordance with Section 4.1 or Section 4.3 of AWWA C651.

C. Collect samples 48 hours after flushing disinfectant and refilling with potable water. Samples shall not be collected if chlorine residual is greater than 0.1 mg/L, or greater than distribution system residual, if chlorinated system water is used for testing.

D. Collect sample from tank sampling point at 30 minutes and have analyzed for Inorganic Chemicals (IOCs), physical characteristics, and Principal Organic Contaminants (POCs) as listed in Tables 9A and 9D of Part 5, Subpart 5-1 Public Water Systems of the New York State Department of Health Water Quality Monitoring

E. Chemical tests shall include bacteriological, inorganic chemicals, volatile halogenated organics, non-volatile organics, heavy metals and any other tests required by the Suffolk County Department of Health Services.

F. If water quality in system does not meet the bacteriological requirements of the Suffolk County Department of Health Services for potable water, the Contractor, at no additional cost to the owner, shall re-chlorinate or take other steps necessary to provide acceptable water quality. Samples shall be collected and analyzed after each attempt. All costs associated with subsequent sampling shall be borne directly by the Contractor.

G. Neutralize residual chlorine to less than 1 mg/l with a suitable quantity of sodium bisulfite, sodium sulfide or sodium thiosulfate prior to disposal.

H. For this project, a minimum of four (4) sets of bacteriological samples for plant/site distribution water main will be required. Take samples at the appropriate time intervals as required by the Suffolk County Department of Health Services. Verify sampling location with the Engineer.

3.03 QUALITY CONTROL

A. Provide analysis and testing of treated water.

B. Test samples in accordance with ANSI/AWWA C652 and C653 and the Suffolk County Department of Health Services.

END OF SECTION 331140

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Disinfection of water piping and valves.

1.02 REFERENCES

A. ANSI/AWWA B300 - Standard for Hypochlorites.

B. ANSI/AWWA B301 - Standard for Liquid Chlorine.

C. ANSI/AWWA C651 - Disinfecting Water Mains.

D. ANSI/AWWA C655 - Field Dechlorination.

1.03 SUBMITTALS

A. Submit proposed method for introducing disinfectant into water piping.

B. Test Reports: Indicate results comparative to specified requirements.

1.04 PROJECT RECORD DOCUMENTS

A. Disinfection Report: Record:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test and injection locations.
   4. Initial and 24-hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   5. Date and time of flushing start and completion.
   6. Disinfectant residual after flushing in ppm for each outlet tested.

B. Bacteriological, Chemical and Organic Chemical Report: Record:
   1. Date issued, project name and testing laboratory name, address and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. 24-hour and 48-hour disinfectant residuals in ppm.
   6. Coliform bacteria and chemical test results.
   7. Certification that water conforms or fails to conform to New York State drinking water standards.
   8. Laboratory Director's signature and authority.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with ANSI/AWWA C651, latest edition.

1.06 QUALIFICATIONS

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three (3) years experience.

B. Testing Firm: Laboratory specializing in testing potable water systems, approved by the New York State Department of Health.

1.07 REGULATORY REQUIREMENTS

A. Conform to Recommended Standards for Water Works and applicable codes or regulations for performing the work of this Section.

B. Water quality to conform to New York State drinking water standards after completion of disinfection.

PART 2 - MATERIALS

2.01 DISINFECTION CHEMICALS

A. ANSI/AWWA B300, Hypochlorites.

B. ANSI/AWWA B301, Liquid Chlorine.

PART 3 - DISINFECTION & TESTING

3.01 EXAMINATION

A. Verify that all piping systems have been cleaned, inspected and pressure tested.

3.02 EXECUTION

A. Provide required equipment to perform the work of this Section. The Owner will provide the water required for the initial disinfection and filling of the piping, and valves, etc. The Contractor shall pay for the water required for any subsequent filling of these systems based on the Owner's retail water rate.

B. The preferred method of chlorinating the new water mains is the continuous feed method using calcium hypochlorite granules in accordance with Section 4.4.3 of AWWA C651, latest edition. Granules shall be placed at a minimum in accordance with Table 1 of the applicable Section. The slug method of chlorination is also acceptable and shall be performed in accordance with Section 4.5 of AWWA C651, latest edition. The use of tablets for disinfection is prohibited.

C. The use of calcium hypochlorite granules specifically intended for swimming pool use is prohibited. The contractor shall utilize only those chemicals which are NSF 60/AWWA approved for disinfection.

D. The newly laid main shall be properly chlorinated to at least 200 ppm (mg/l) for a minimum of 24 hours, to ensure the chlorine residual at the pipe extremities and at other representative points after the retention period, is at least 200 ppm (mg/l). Treated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria.

E. After completion of retention period, new mains shall be flushed in order to neutralize residual chlorine with a suitable quantity of one of the following neutralizing agents: sodium bisulfite, sodium sulfide or sodium thiosulfate, prior to disposal to prevent damage to the environment, in accordance with ANSI/AWWA C655. Bacteria samples may not be collected until a chlorine residual representative of the existing distribution system is achieved. New mains shall be flushed at a velocity of no less than 3.0 ft/sec.

F. Collect samples 24 & 48-hours after flushing disinfectant and refilling with potable water. Samples shall not be collected if a chlorine residual inconsistent with that of the existing distribution system is present. Any portion of the sample set which tests positive for total coliform and/or e-coli bacteria constitutes failure of the entire set with no exceptions.

G. Field chlorine residual checks shall be performed for each sample and shall be recorded on the laboratory sampling form for inclusion in the sampling results report.

H. Two (2) consecutive sets of bacteriological samples, taken 24 hours apart, must be collected from every 1,000 ft of new main, the end of the line and from each branch. Samples should be collected after final flushing and when the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the distribution system (ANSI/AWWA C651 Standard, latest edition).

I. Sample tap locations shall be as directed by the Engineer. Taps shall be installed to sample at a frequency as described above.

J. If water quality in system does not meet the requirements of the Department of Health for potable water, the Contractor shall re-chlorinate or take other steps necessary to provide acceptable water quality. Samples shall be collected and analyzed after each attempt.

K. Where cut-in connections or valve installations are being installed on existing main, all pipe, valves and fittings shall be disinfected via 200 ppm chlorine solution. The contractor shall apply the solution via spraying or swabbing the appurtenances to allow for a minimum contact time of 2 hours prior to activation.

3.03 QUALITY CONTROL

A. Test samples in accordance with the latest edition of ANSI/AWWA C651 and Department of Health requirements.

END OF SECTION 331300

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Water Utility Pipe

B. Special Castings; Mechanical Joint Fittings

C. Buried Valves & Valve Boxes

D. Tapping Sleeves

1.02 RELATED SECTIONS

A. Section 312333 - Trenching

B. Section 312323 - Backfilling

C. Section 331300 - Disinfection of Water Utility Distribution

1.03 REFERENCES

A. ANSI/AWWA C104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.

B. ANSI/AWWA C105 - Polyethylene Encasement for Ductile Iron Pipe Systems

C. ANSI/AWWA C110 - Ductile Iron and Grey Iron Fittings.

D. ANSI/AWWA C111- Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.

E. ANSI/AWWA C150 - Thickness Design of Ductile Iron Pipes

F. ANSI/AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast for Water Service.

G. ANSI/AWWA C153 - Ductile-Iron Compact Fittings for Water Service.

H. ANSI/AWWA C504 - Rubber Seated Butterfly Valves.

I. ANSI/AWWA C509 - Resilient Seated Gate Valves for Water Supply Service.

J. ANSI/AWWA C515 - Reduced-Wall Resilient-Seated Gate Valves for Water Supply Service.

K. ANSI/AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of water mains, valves, fittings, connections, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with the local water utility company requirements.

B. The tone-out, mark-out, locating and verification of existing utilities on private property and within public Right-of-Ways are the responsibility of the contractor. All known utilities and facilities shall be verified by test holes or other means prior to commencing water main installation. No compensation will be paid to the contractor for lost time due to improper or inadequate utility investigation.

C. The contractor shall conform to the standard traffic requirements of the New York State Manual of Uniform Traffic Control Devices for work in Public Roadways.

D. Valves: Manufacturer's name and pressure rating marked on valve body.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to ensure they are kept free from damage.

B. Store piping and valves to ensure that their interiors are kept free of debris, organics or animals.

C. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.01 WATER UTILITY PIPING

A. Cement-Lined Ductile Iron Pipe
   1. Approved Manufacturers:
      a. US PIPE
      b. McWANE DUCTILE
      c. AMERICAN PIPE
   2. Cement-Lined Ductile Iron Pipe meeting AWWA C150/C151 :
      a. Special Class 52 for all pipe 14 inches and smaller.
      b. Special Class 51 for all pipe 16 inches and larger.
   3. Interior lining shall be double-thick cement with a minimum thickness of 1/8" (125 mils) in accordance with AWWA C104.
   4. Exterior of pipe shall have an exterior bituminous coating measuring 1 mil in thickness and be marked with the manufacturer name, date of casting and pressure class.

B. Polyvinyl Chloride Pressure Pipe
   1. Approved Manufacturers:
      a. JM Eagle
      b. National Pipe & Plastics
      c. North American Pipe Corporation
      d. Approved Equal
   2. Polyvinyl Chloride Pressure Pipe meeting AWWA C900:
   3. Pressure Class 235 psi (DR-18)
   4. Gasket for PVC pipe shall be in conformance with ASTM F477.
   5. Exterior of pipe shall be marked with identification markings in conformance with AWWA Standard C900.

6. Restraint harnesses shall be used on all push-on joints. Restraint harnesses will be epoxy coated ductile iron with a pressure rating of 235 psi. EBAA 1900 Split Serrated Restraint Harness or approved equal shall be used.

C. Pipe Accessories:
   1. Joints: ANSI/AWWA C111, vulcanized rubber gaskets for push-on pipe; mechanical joint with rods and wedge-type restraining glands for fittings.
   2. Field lock gaskets by US Pipe Model 350 or approved equal shall be utilized on the last push-on joint of all dead-end mains, where a bell falls within 10 feet of a mechanical joint connection or as indicated on the plans or as directed by the Engineer.
   3. Gaskets shall be free from porous areas, foreign materials and visible defects. No reclaimed rubber shall be used
   4. Lubricant for Joints: Nontoxic, NSF-61 certified, shall not support the growth of bacteria, and shall have no deteriorating effects on the gasket or pipe material.
   5. Wedges: Bronze, installed at each push-on joint. (CLDIP only)
   6. Electro-Magnetic Marking Tape: (PVC only)

2.02 SPECIAL CASTINGS

A. Manufacturers:
   1. US PIPE
   2. SIGMA CORP.
   3. TYLER UNION
   4. APPROVED EQUAL

B. Material:
   1. Fittings shall be in accordance with ANSI/AWWA C153 (compact).
   2. Fittings shall be ductile iron.
   3. Ductile iron fittings shall have a pressure rating of 350 psi.
   4. Fittings shall be cement lined.

C. Mechanical Joint fittings shall be used with "push-on" joint pipe with the joint conforming to AWWA Specifications.

D. Rubber gaskets shall be used at each pipe connection. Rubber gaskets shall be vulcanized rubber that is free of porous areas, foreign materials and visible defects. No reclaimed rubber shall be used. The size, mold number, gasket manufacturer's mark, the letters "MJ" and the year of manufacture shall be molded in the rubber.

E. Wedge type restraining glands shall be required at all mechanical joints.
   1. Manufacturer:
      a. EBAA IRON WORKS
      b. FORD METER BOX CO.
      c. SIGMA CORPORATION
      d. TYLER UNION
      e. US PIPE
      f. Approved equal
   2. Wedge type restraining glands shall be secured to fittings using alloy steel T-head bolts and hex-head nuts.

2.03 BURIED VALVES

A. Resilient Wedge Gate Valves (up to 12”)
   1. Acceptable Manufacturers:
      a. MUELLER COMPANY; A-2361/2362 (M.J. x M.J. Connections)

b. CLOW VALVE COMPANY; Model 2639
c. KENNEDY VALVE CO.; Model KS-FW(8571)/KS-RW(7571)

2. All vertical gate valves up to and including 12-inch diameter shall conform to latest revision of AWWA Specification C509 or C515, and shall be specified as follows:
   a. Material: Ductile Iron body, bronze mounted.
   b. Pressure: 250 psi minimum working pressure.
   c. Wedge: Cast iron wedge with urethane rubber coating (encapsulated). The rubber/metal bond shall be tested to meet ASTM D429.
   d. Stem: Forged bronze, non-rising stem with two "O" ring seals.
   e. Wrench Nut: Two-inch square (at base) wrench nut opening to the left or counterclockwise.
   f. Mechanical Joint Ends: Mechanical joint ends complete with all joint accessories including rubber gaskets.
   g. Painting: The body and bonnet shall be coated with a fusion coating both interior and exterior to meet AWWA Standard C550.
   h. Markings: Markings shall be cast on the bonnet or body of each valve, and shall show the manufacturer's name or mark, the year the valve casting was made, the size of the valve, and the designation of working water pressure for 4 to 12-inch valves.
   i. Affidavit of Compliance: The Contractor shall have the manufacturer provide an affidavit directly to the Engineer that all valves supplied on this project comply with all applicable provisions of AWWA Specification C509, and that each valve was subjected to and passed the 500 psi hydrostatic test without leakage. No final payment for valves will be made until this Affidavit of Compliance is received by the Engineer.

B. Butterfly Valves (14” and larger):
   1. Acceptable Manufacturers:
      a. CLOW VALVE COMPANY; Model 4500
      b. MUELLER COMPANY Lineseal XP II
      c. Approved equal
   2. All butterfly valves shall conform to AWWA Specification C504-06 or latest revision, and shall be specified as follows:
      a. Select from below as required:
      b. Material: Ductile Iron body, bronze mounted.
      c. Pressure: 200 psi minimum working pressure.
      d. Shaft: The valve shaft shall be a one-piece unit extending through the valve bearings into the valve disc. The shaft shall be 18-8 stainless steel, Type 302, 303, 304, 316, or if carbon steel, with 18-8 stainless steel journals.
      e. The disc movement shall be 90 degrees open to shut. Discs shall be of cast iron conforming to ASTM A48, Class 40, or if alloy cast iron, conforming to ASTM A436, Type 1 or 2. Disc edge shall have Type 316 stainless steel seating surface.
      f. Valve seats shall provide tight shutoff 200 psi upstream, zero psi downstream pressure differential. Rubber seats mounted on the disc and shall be retained without metal hardware. Rubber seats mounted on valve bodies shall be cemented and clamped, bonded or vulcanized into the valve body. Rubber seats shall be of new natural or synthetic rubber.
      g. Valves shall be fitted with sleeve type bearings contained in the hubs of the valve body. A bearing shall be provided on the shaft outboard of the shaft seal or in the operator housing to protect the shaft seal from thrust forces developed in the operating mechanisms. Each valve shall be equipped with either one or two thrust bearings set to hold the valve disc securely in the center of the valve seat. Sleeve and other bearings fitted into the valve body proper shall be of self-lubricating materials and shall have a coefficient of friction not higher than 0.25.
      h. Where shafts project through the valve body for operator connection, a shaft seal shall be provided. Seals shall be split "V" type or "O" ring type. "O" ring type shall be

contained in a removable, corrosion-resistant recess. Seals shall be of a design allowing replacement without removing the valve shaft.

i. Manual operation shall be provided with totally enclosed gearing, with stop-limiting devices for the open and closed positions. Actuators shall be totally enclosed and shall produce full output torque requirements throughout the entire travel with an input torque no greater than 150 foot pounds.

C. Valve Boxes
1. Manufacturer:
   a. BINGHAM & TAYLOR
   b. SIGMA CORPORATION
   c. TYLER UNION
2. Valve boxes shall be two piece, sliding type with 8" x 5-1/4" cast iron flanged bottom section, 9" x 6-1/8" ductile iron top section and 7" ductile iron drop lid with "WATER" cast on cover.

2.04 TAPPING SLEEVES

A. Manufacturers:
1. MUELLER COMPANY; Model H-304MJ
2. POWERSEAL PIPELINE PRODUCTS; Model 3490MJ
3. ROMAC; SST-MJ
4. Sleeves shall be constructed with integral mechanical joint outlet.
5. Material:
   a. Shell Material: 304 Stainless Steel
   b. Neck Material: Heavy Gage 304 Stainless Steel
   c. Shell Hardware: 304 Stainless Steel
   d. Mechanical Joint Hardware: High Strength Lowe Alloy Steel T-Bolts with hex nut and plastic or neoprene washer.
   e. Gasket: Virgin SBR Reinforced Rubber.
6. Sleeves shall be rated with a maximum working pressure of 250 psi.

PART 3 - EXECUTION

3.01 INSTALLATION - PIPE

A. Remove scale and dirt, on inside and outside, before assembly.

B. Bevel plain ends of cut pipe at push-on joints.

C. Excavate pipe trench in accordance with Section 312333 for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated.

D. Place bedding material at trench bottom; level fill materials in one continuous layer not less than 6 inches compacted depth; compact to 95 percent maximum dry density.

E. Maintain optimum moisture content of bedding material to attain required compaction density.

F. The Contractor shall be responsible for verifying the location of the existing water mains and other utilities along the entire route of the project.

G. The Contractor must have experienced personnel in his employ to perform the cut-ins and connections to the existing water mains and have available equipment necessary for cutting ductile iron, cast iron, asbestos cement and miscellaneous piping in the existing distribution system.

H. Suitable facilities shall be available for proper dewatering, drainage and disposal of water removed from dewatered lines and excavations, without damage to adjacent properties. Exposed ends of the water main shall never be submerged either partially or fully.

I. Maintain a 10 foot horizontal and 18 inch vertical separation of water main from all storm and sanitary sewer facilities. The Contractor shall install the water main with the minimum cover indicated in the Contract Documents. The Contractor shall verify the depth of any existing service laterals to the structures prior to crossing of same.

J. Pipe trenches shall be of minimum width and allow six (6) inches on each side of the bell with sufficient width to allow straight alignment of pipe and provide sufficient room for jointing as required and to allow the backfill to be placed as specified.

K. Only new full-lengths of pipe shall be delivered to and utilized on this project. Field cut pieces with bell ends shall be a minimum of 5 feet in length. Smaller pieces shall not be permitted for use and shall be removed from site.

L. Pipe shall be laid with the bell end facing in the direction of laying. Where pipe is laid on a grade of 10% or greater, the laying shall start at the bottom and shall proceed upward with the bell ends of the pipe up gradient.

M. Install pipe to indicated elevation to within tolerance of 1/2 inch.

N. Clean bell end of pipe prior to placing gasket. Apply lubricant to both gasket and plain end of pipe.

O. Do not field cut pipe within 24 inches of bell or 8 inches of spigot end. Verify the pipe diameter of cut end.

P. Route pipe in straight line where possible. Joint deflections are permitted as outlined in ANSI/AWWA C600.

Q. Install and test ductile iron piping and fittings to ANSI/AWWA C600.

R. For installation of CLDIP, at each joint, two serrated silicon bronze wedges shall be driven into the rubber gasket after the pipe is pushed into place. The wedges shall be installed on opposite sides of the joint on a horizontal plane. Both wedges shall be started in together and driven with a hammer with blows on alternate sides so as not to displace the spigot end to one side of the pipe.

S. For installation of PVC main, install markings facing up. Install magnetic marking tape 12-18" above top of pipe.

T. Establish elevations of buried piping to ensure not less than 4 feet of cover unless otherwise indicated on plans or specifically approved by Engineer or Owner in field.

U. Trench widths shall not exceed the following authorized widths prior to cut-back:
   1. Less than 12-inches diameter mains: 30 inches
   2. 12-inch & 16-inch diameter mains: 36 inches

V. Pavement removal shall be kept to a minimum and not exceed the preceding authorized widths. Sawing, drilling or chipping shall be used to ensure the breakage of pavement along straight lines. Final restoration limits shall include a 12-inch cut-back on all sides of the trench.

W. Backfill trench in accordance with Section 312323. Backfill around sides and to top of pipe with fill, tamped in place and compacted to 95 percent maximum dry density.

X. The contractor shall restore, replace and/or reposition all decorative lawn ornaments, and miscellaneous items disturbed during water main installation including but not limited to the following: stones, brick driveway pavers, fences, signs, sprinklers, shrubs and trees.

3.02 DISINFECTION AND BACTERIA SAMPLING OF WATER UTILITIES

A. Flush and disinfect system in accordance with Section 331300.

B. Where cut-in connections or valve installations are being installed on existing main, all pipe, valves and fittings shall be disinfected via 200 ppm chlorine solution. The contractor shall apply the solution via spraying or swabbing the appurtenances to allow for a minimum contact time of 2 hours prior to activation.

3.03 PRESSURE TESTING

A. Perform hydrostatic pressure testing after disinfection, but prior to bacteria sampling.

B. Expel all air from piping system, including pipe, valves and appurtenances. All new water mains shall be pressure tested to a minimum of 150 psi or 1.5 times line pressure, whichever is greater. The pressure test shall be held for a minimum of two hours with no leakage.

C. Remove and replace any defective pipe, fittings, valves, and appurtenances. Repeat pressure test until satisfactory to Engineer.

D. Where cut-in connections or valve installations are being installed on existing main and hydrostatic pressure testing is not feasible, the joints shall be visually inspected for leaks following depressurization of the main and prior to backfilling.

3.04 INSTALLATION - SPECIAL CASTINGS

A. Tighten glands in accordance with manufacturers direction.

B. Ensure that fittings are free of dirt and debris prior to installation.

C. Support fitting with solid blocking in areas of over excavation. Wood wedges, blocking and supports are prohibited.

D. The contractor shall install a minimum of two ¾-inch steel tie rods on mechanical joint fittings. Additional tie-rods may be requested on vertical pipe or by Engineer in areas of high pressure.

E. Steel tie rods shall be secured to fittings using 3/4" steel eye-bolts, washers and nuts. The use of ductile iron "Duc-Lugs" is prohibited. Steel tie rods shall be secured to pipe using half-moon pipe clamps, restraints, washers and nuts.

F. Bell ends of pipe shall not be installed within 5 feet of a mechanical joint assembly without being further restrained by locking gaskets or tie rods.

G. Concrete blocking shall be applied on all pipe lines 4-inch in diameter and larger at all hydrants, tees, plugs, caps, and at bends deflecting 22-1/2 degrees or more. Blocking shall be placed between solid ground and the fitting to be anchored. The blocking shall be so placed that the pipe and fitting joints will be accessible for repair. Size of blocking and minimum bearing area shall be in accordance with the Bearing Area Table within this specification section.

H. Form and place concrete for thrust blocks at each elbow or change of direction of pipe.

BEARING AREA TABLE				
Pipe Size	Dead End of Tee	90 Degree Bend	45 Degree Bend	22½ Degree Bend
4 in	1 ft2	1 ft2	3/4 ft2	½ ft2
6 in	2 ft2	3 ft2	2 ft2	1 ft2
8 in	4 ft2	5½ ft2	3 ft2	1½ ft2
10 in	6 ft2	8½ ft2	4½ ft2	2½ ft2
12 in	9 ft2	12 ft2	6½ ft2	3½ ft2
16 in	12 ft2	15½ ft2	8½ ft2	4½ ft2
20 in	15 ft2	18½ ft2	10½ ft2	5½ ft2
24 in	28 ft2	28	15	8

I. Concrete for Thrust Blocks: Portland Cement Concrete; 2,000 psi minimum strength at 28 days. Solid precast concrete blocking meeting the compressive strength requirement shall also be acceptable for use. When solid blocking is utilized, the contractor shall fill all annular spaces with cement or mortar. The use of wood wedges or blocking is not permitted.

3.05 INSTALLATION - VALVES

A. Set valves on solid bearing.

B. Contractor is responsible for ensuring that all valve boxes are plumb and centered over the operating nut until after final asphalt restoration is complete.

C. Contractor shall adjust boxes prior to final restoration. The use of "Rite-Hite" type adapters is not permitted on new construction.

3.06 INSTALLATION - TAPPING SLEEVES

A. Clean existing pipe thoroughly to remove dirt and scale prior to installation of gasket.

B. Ensure gasket is free from tears and debris.

C. Tighten hardware in accordance with manufacturer's recommendations.

D. Tapping valve shall be installed level to grade to ensure access with valve box. Support valve during tapping operations and afterwards with solid concrete blocking.

3.07 NOTIFICATIONS

A. The Engineer and local water utility shall be notified at least 24 hours in advance and immediately prior to any of the following:
   1. Commencing work or starting again after more than a 72-hour shutdown.
   2. Admitting water to a new section.
   3. Flushing or blowing off water mains.
   4. Chlorination of water mains.
   5. Shutting down water mains or service to consumers. Consumers should also be informed at least 24 hours in advance and immediately prior to shutting down service.
   6. Disinfection and reconnection of house services.
   7. The permanent shutting down of existing water mains or house services.

3.08 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with Owner requirements.

B. Leakage testing shall be in accordance with ANSI/AWWA C600.

C. Compaction testing shall be in accordance with ANSI/ASTM D1557.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

END OF SECTION 331411

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Section 312333 - Trenching.

B. Section 331411 - Water Utility Distribution Piping.

C. Section 331300 - Disinfection of Water Utility Distribution.

1.02 REFERENCES

A. ASTM B88 - Seamless Copper Tube.

B. AWWA C800 - Underground Service Line Valves and Fittings.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300

B. Product Data: Provide data on pipe materials, pipe fitting and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of piping mains, valves, connections, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with the local water utility company requirements.

PART 2 - PRODUCTS

2.01 COPPER PIPING AND ACCESSORIES

A. All underground copper piping, for potable water shall be soft annealed Type "K" with fittings per ANSI/AWWA C800.

B. Copper Tubing: ASTM B88, Type "K" annealed and AWWA C800, with the following accessories:
   1. Fittings: ANSI/ASME B62, cast bronze
   2. Joints: AWWA, Compression Gasket

C. Couplings for 1" shall be copper to copper (compression-type) by MUELLER COMPANY, No. H-15403, Flare fittings shall not be utilized.

2.02 CORPORATION STOP

A. Corporation stops to be FORD METER BOX COMPANY, Model No. F1000-4-G QNL, or MUELLER COMPANY, Model No. P-15008N for 1-inch, or specifically approved equal.

B. Water service bronze body with AWWA standard thread inlet and copper AWWA outlet, complete with straight coupling nuts. Ball valve type corporation stops may also be utilized.

C. A service saddle shall be utilized on all taps greater than 1-inch. Service saddles shall be by MUELLER COMPANY, Model DR2A or specifically approved equal.

2.03 CURB STOPS

A. All curb stops shall be by FORD METER BOX COMPANY, Model No. B44-444 QNL, or MUELLER COMPANY, Model No. P-25209N, or specifically approved.

B. All metal parts shall be constructed of water service bronze. The curb stop shall have a combined tee and cap and an inverted tapered key with 1/4-inch hole drilled in cap for attaching a stationary rod. The valve shall open to the left (counterclockwise).

2.04 EXTENSION SERVICE BOXES

A. Extension service boxes shall be constructed of extra grade gray iron cover and base, steel ex-tension pipe; with a small arch pattern base for 1/2-inch through 1-1/2-inch curb stops; adjustment between 4 and 5 feet; complete with stationary inside stop rod; one-piece lid with two holes for removal with spanner wrench.

B. Curb valve shall be located within a No. 6 round, three-piece cast iron, 5-1/4 inch shaft, sliding type valve box with "WATER" cast on the cover.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Before tapping, the pipe to be tapped shall be thoroughly cleaned by removing all dirt and scale. The main shall be tapped on the side facing the house. All copper service pipes shall be installed at 4'-6" minimum cover with slack left at the corporation stop.

B. The Contractor shall furnish and install all materials and incidentals as outlined herein including the copper tubing, complete from the new corporation stop to within 5 feet of the existing building face and as indicated on the plans. The new installation shall include all costs to furnish and install the corporation stop, saddle, 'K'-copper, and union.

C. In making cuts in copper service pipe, the most modern equip-ment shall be used to produce a square cut. The tubing, after cutting, shall be cut square, burrs removed and reamed. Fittings, sockets and tube ends shall be thoroughly cleaned to a bright finish. All solder joints shall be fluxed using either 95/5 tin/antimony or silver solder. NO LEAD SOLDER WILL BE PERMITTED.

D. On completion of the service connection, the corporation stop shall be left on.

E. All new copper service piping crossing existing drainage piping, etc. shall be installed at a 4'-6” minimum cover wherever possible. In areas where 4'-6” cover cannot be maintained, the Contractor will be allowed to cross the drainage piping with an absolute minimum cover of 3'-6”, otherwise the new service shall be installed under the drainage piping, etc. All new services installed with cover between 3'-6” and 4'-6” due to drain interference, etc., shall be wrapped with felt wrapping and tar paper or other approved frost wrap protection. A minimum of ten-foot horizontal separation shall be maintained between the new water service and any sanitary sewer facilities including; pipes, tanks and pools.

F. The Contractor shall take all necessary precautions to minimize damage to any underground utility. Damage to any utility shall be immediately repaired and the cost of such repair shall be the responsibility of the Contractor. No water service shall be accepted which has been installed through any storm drain, etc.

3.02 FIELD QUALITY CONTROL

A. Flush new service line prior to installing meter, backflow device and connecting to existing service.

B. Before piping is concealed, recheck it for leaks.

END OF SECTION 331417

PART 1 - GENERAL

1.01 ECTION INCLUDES

A. Corrugated polyethylene pipe.

B. Fittings and accessories.

1.02 RELATED SECTIONS

A. Section 312333 - Trenching.

1.03 REFERENCES

A. ASTM D2321 - Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

B. ASTM F405 - Corrugated Polyethylene (PE) Tubing and Fittings.

C. ASTM F667 - Large Diameter Corrugated Polyethylene Tubing and Fittings.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide data on pipe, fittings and accessories.

C. Manufacturer's Instructions: Indicate special procedures and conditions required to install products specified.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of pipe runs, connections and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable codes for materials and installation of the work of this section.

B. Install pipe in accordance with ASTM D2321.

1.07 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on the plans and as required by the manufacturer.

1.08 COORDINATION

A. Coordinate pipe installation with the trenching.

PART 2 - PRODUCTS

2.01 COMPONENTS

A. Corrugated Polyethylene Pipe: ASTM F405 or ASTM F667 corrugated polyethylene; N-12 manufactured by ADVANCED DRAINAGE SYSTEMS, INC. or specifically approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate.

B. Verify that trench cut is ready to receive work and excavations, dimensions and elevations are as indicated on the plans.

3.02 PREPARATION

A. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

B. Excavate under provisions of Section 312316.

3.03 INSTALLATION

A. Install pipe and accessories in accordance with manufacturer's instructions and approved shop drawings.

B. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.

C. Shore pipe to required position; retain in place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.

D. Lay pipe to slope gradients noted on the plans, with maximum variation from true slope of 1/8 inch in 10 feet.

E. Backfill under provisions of Section 312323.13.

3.04 TOLERANCES

A. Maximum Variation from Intended Invert Elevation: 1/2 inch.

B. Maximum Offset of Pipe from True Alignment: 1 inch.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 014500.

B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.06 PROTECTION

A. Protect pipe from damage or displacement until backfilling operation is in progress.

END OF SECTION 334116

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. PVC pipe for drainage.

B. Fittings and accessories.

1.02 RELATED SECTIONS

A. Section 312333 - Trenching

B. Section 312323.13 - Backfilling

1.03 REFERENCES

A. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity Flow Applications.

B. ASTM D2729 - Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

C. ASTM D2855 - Recommended Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.

D. ASTM D3034 - Standard Specification for Type PDM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

E. ASTM D3212 - Standard Specifications for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide data on pipe, fittings, accessories and marking tape.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017839.

B. Accurately record actual locations of pipe runs, connections and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable codes for materials and installation of the work of this section.

1.07 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on the plans and as required by the manufacturer.

1.08 COORDINATION

A. Coordinate pipe installation with trenching and installation of drainage structures.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. PVC Pipe: CERTAINTEED, JM, CARLON.

B. Joint Lubricant: Manufacturer's standard.

2.02 MATERIALS

A. PVC - ANSI/ASTM D3034, Type PSM, Polyvinyl Chloride (PVC) material; inside nominal diameter as indicated, integral bell and spigot end joints, class DR 18 or SDR 35 as indicated on plans. Joints meet or exceed ASTM D3212.

2.03 ACCESSORIES

A. Marking Tape - Solid plastic tape with a minimum total thickness of 4.5 mil. Tape resilient to alkalis, acids, and other destructive elements; of sufficient strength that layers cannot be separated by hand or by exposure to boiling water for a period of three hours. Green in color, minimum 3" wide with the words "Caution - Sanitary Sewer" repeated every 16-36 inches, conforming to AWPA uniform color code.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate.

B. Verify that trench cut is ready to receive work and excavations, dimensions and elevations are as indicated on the plans.

C. Inspect all pipe and fittings before installation. Remove defective pipe from site.

3.02 PREPARATION

A. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

B. Excavate under provisions of Section 312316. Excavate sufficient clearance at each bell or coupling to allow uniform bearing along the pipe barrel.

3.03 INSTALLATION

A. Install pipe and accessories in accordance with ASTM D2321.

B. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.

C. Shore pipe to required position; retain in place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.

D. Lay pipe to slope gradients noted on the plans, with maximum variation from true slope of 1/8 inch in 10 feet.

E. Repair surface damage to any pipe protective coating in accordance with manufacturer's recommendations.

F. Backfill under provisions of Section 312323.13.

G. After partially backfilling, install marking tape 18 to 24 inches above crown of pipe.

H. Construct cleanouts at locations shown and as detailed on the drawings. Use PVC wyes, bends and pipe as appropriate. Extend cleanout pipe to grade and terminate with plug.

3.04 TOLERANCES

A. Maximum Variation from Intended Invert Elevation: 1/2 inch.

B. Maximum Offset of Pipe from True Alignment: 1 inch.

3.05 FIELD QUALITY CONTROL

A. Perform field inspection under provisions of Section 014500.

B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.06 PROTECTION

A. Protect finished work under provisions of Section 015000.

B. Protect pipe from damage or displacement until backfilling operation is in progress.

END OF SECTION 334123

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Precast concrete catch basins and field inlets.

B. Castings.

1.02 RELATED SECTIONS

A. Section 312000 - Earth Moving.

B. Section 334116 -Corrugated Polyethylene Pipe.

1.03 REFERENCES

A. ASTM A48 - Gray Iron Castings.

B. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

C. ASTM C55 - Concrete Building Brick.

D. ASTM C150 - Portland Cement.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate dimensions and details of catch basins and castings.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products to the site under provisions of Section 016500.

B. Store products on firm and level ground.

C. Handle products in such a manner which will not induce unnecessary stresses, cause cracks to occur or damage the product in any way.

D. Any cracked or otherwise defective materials will be rejected.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not mix or place mortar if ambient temperature is below 40 degrees F.

1.07 COORDINATION

A. Coordinate work under provisions of Section 013100.

B. Coordinate with excavation, backfilling, installation of piping and all other work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. OLD CASTLE PRECAST, INC.

B. SUFFOLK COUNTY PRECAST CORP.

C. COASTAL PIPELINE PRODUCTS CORP.

D. Substitutions shall be permitted only after receiving written approval from the Engineer.

2.02 MATERIALS

A. Catch Basin and Field Inlet Sections: Reinforced precast concrete, lipped male/female joint, of the following materials:
   1. Concrete: ASTM C150 normal Portland cement, Type 1; minimum 4,000 psi strength at 28 days.
   2. Reinforcement: ASTM A615 reinforcing bars.
   3. Castings: ASTM A48, Class 30B, cast iron construction, machined flat bearing surface, non-rocking; removable grate, capable of supporting the AASHTO HS-20-44 highway loading; free from blowholes, shrinkage, distortion, cracks or other defects; smooth and of uniform quality; size and pattern as indicated on the plans, manufactured by CAMPBELL FOUNDRY COMPANY or specifically approved equal.

2.03 ACCESSORIES

A. Brick: ASTM C55, Grade N, Type I - Moisture Controlled; normal weight; nominal modular size as required.

B. Mortar: A 1:1:5 ratio of Portland cement, masonry cement and sand, respectively. Add water as required to create a workable consistency.

C. Catch Basin Steps: Cast iron rungs; pattern number 2589 as manufactured by CAMPBELL FOUNDRY COMPANY; pattern number R-1980-C as manufactured by NEENAH FOUNDRY COMPANY, or specifically approved equal.

D. Concrete for Formed Invert: ASTM C150 Portland cement type I, cast in place; 3,000 psi minimum strength at 28 days; dimensions as indicated on the plans.

2.04 FABRICATION

A. Fabricate and reinforce catch basin to the dimensions as indicated on the plans.

B. Pipe Entry: Provide openings as required.

C. Steps: Set or drilled and grouted in the catch basin wall at 18 inches on center vertically.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing grades are as indicated on the plans.

B. Verify items provided by other sections of work are properly sized and located.

C. Verify that rough openings for piping are as required.

3.02 INSTALLATION

A. Form bottom of excavation clean and smooth to correct elevation. Compact bottom of the excavation to a minimum of 95 percent of maximum dry density.

B. Place catch basin, secure and level, to the proper elevation. Utilize a placement method which will not damage or crack the catch basin.

C. Place catch basin sections plumb and level, trim to correct elevations.

D. Cut and fit for pipe. Seal openings in wall around pipe with brick and mortar. Establish elevations and pipe inverts for inlets and outlets as indicated on the plans. Trowel surfaces smooth.

E. When indicated on the plans, place concrete in base of catch basin as required to form invert to the dimensions indicated on the plans. Trowel smooth.

F. Set slab top on catch basin in a 1 inch mortar bed.

G. Mount casting in a 1 inch mortar bed over access opening. Install firm, level and to the required elevation.

H. If required to achieve proper elevation of casting, adjust with brick and mortar. A maximum height of 5 inches is permitted between the catch basin and the base of the casting. Maintain a maximum of 1 inch thickness of mortar between all bricks.

3.03 TOLERANCES

A. Maximum Variation from Proposed Rim Elevation: 1/4 inch.

B. Maximum Variation from Proposed Location: 1/2 inch.

3.04 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 014500.

B. Request inspection prior to backfilling around structure and prior to surface restoration.

3.05 PROTECTION

A. Protect finished work under provisions of Section 015000.

B. Protect catch basin from damage or displacement until project is accepted by the Owner.

END OF SECTION 334413.13

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Reduced pressure zone device (RPZ)

1.02 RELATED SECTIONS

A. Section 221113 - Facility Piping

1.03 REFERENCES

A. ANSI/ASSE 1013 - Reduced Pressure Principle Backflow Preventers

B. ANSI/AWWA C511 - Reduced-Pressure Principle Backflow Prevention Assembly

1.04 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Within thirty (30) days of installation, the contractor shall employ a New York State certified backflow prevention tester to test each backflow device and submit results on New York State Department of Health Form DOH 1013.

1.05 QUALITY ASSURANCE

A. All backflow prevention devices shall be approved by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research, Sixth Edition (or latest revision).

B. All valves and fittings installed on a potable water supply line shall be made of "low-lead" materials and have a maximum lead content of 0.25 percent by weight. All low lead fittings shall be stamped or embossed with a mark indicating that the product is manufactured from low-lead alloys.

C. All RPZ devices shall meet the requirements of ASSE Standard 1013 and AWWA Standard C511.

PART 2 - PRODUCTS

2.01 RPZ

A. Manufacturer:
   1. FEBCO Model LF860, 1/2" through 2"
   2. or other USC Foundation for Cross-Connection Control and Hydraulic Research approved device

B. The reduced pressure zone assembly shall consist of two independently operating, spring loaded check valves, one hydraulically dependent differential relief valve, two ball valves, four test cocks, and a strainer.

C. The check valve and relief valve components shall be constructed so they may be serviced without removing the valve body from the line.

D. The device shall include full ported, ball valve type, threaded inlet and outlet shut-off valves and test cocks by the same manufacturer as the RPZ device.

E. The assembly shall be rated to 175 psi working pressure and water temperature range from 32 degrees F to 140 degrees F.

F. RPZ Materials:
   1. Valve Body, Ball Valves, Test Cocks: Lead Free Cast Copper Silicon Alloy
   2. Elastomers: Silicone
   3. Springs: Stainless Steel

G. Each backflow prevention device shall have a strainer with the following specifications. Body and cover shall be of ASTM B-63 bronze, screen shall consist of ASTM A478, Type 304 stainless steel. Strainer includes body, cap, gasket and plug. Working pressure shall be 150 psi. Strainers shall have self-cleaning blow-off plug with NPT threads. Stainless steel screens shall be standard 20 mesh. Strainers shall be by the same manufacturer as the RPZ device.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Contractor shall furnish and install each backflow prevention device in the location indicated on the contract drawings. The installation shall conform to all clearances as required by the County Department of Health.

B. The Contractor shall install a drain funnel and drain line as indicated on the contract drawings. Installation shall conform to latest County Department of Health requirements.

C. All piping and branches not protected by the backflow prevention device shall be stenciled or otherwise marked with "DO NOT TAP TO THIS LINE". Piping shall be marked with wrap around pipe markers at five foot intervals

END OF SECTION 400567

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Large interior piping systems.

1.02 RELATED SECTIONS

A. Section 331140 - Disinfection of Water Facilities

1.03 REFERENCES

A. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings

B. ANSI/AWWA C104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings

C. ANSI/AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids

D. ANSI/AWWA - C115/A21.15 - American National Standard for Flanged Ductile Iron Pipe with Threaded Flanges

E. ANSI/AWWA C150/A21.50 - American National Standard for Thickness Design of Ductile Iron Pipe

F. ANSI/AWWA C600 - Installation of Ductile Iron Water Mains and Appurtenances

G. ANSI B18.2.1 - Square and Hex Bolts and Screws Inch Series Including Hex Cap Screws and Lag Screws

H. ANSI B18.2.2 - Square and Hex Nuts (Inch Series)

I. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

1.04 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Product Data: Provide data on pipe material, pipe fittings, and accessories. Provide manufacturer's catalog information.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

A. ANSI/AWWA C151/A21.51; double thickness cement lining minimum 3/16" in accordance with ANSI/AWWA C104/A21.04, bituminous coating inside; and epoxy primer outside; flanged joint for exposed pipe, thickness Class 52 minimum for all pipe diameters.
   1. Fittings: ANSI/AWWA C110, Ductile iron, standard thickness.
   2. Flanged Joints: ANSI B16.1, Class 125 with full face, 1/8" thick rubber gaskets.
   3. Bolts: ANSI B18.2.1 and ASTM A307 Grade B.
   4. Nuts: ANSI B18.2.2 and ASTM A307 Grade B.
   5. Lubricant for Joints: Nontoxic; shall not support growth of bacteria; shall have no deteriorating effects on gasket or pipe material.
   6. Manufacturer: TYLER UNION, SIGMA, U.S. PIPE & FOUNDRY CO., GRIFFIN PIPE PRODUCTS or specifically approved equal.

B. Flanged Adapters: Dresser Industries, Inc., Style 127 for plain end steel or cast iron pipe with all bolts, rings, gaskets and accessories.

C. Restrained Flange Adapters: EBAA Iron Inc., Style 2100 Megaflange.

D. Couplings: Dresser Industries, Inc., Style 38 for plain end steel or cast iron pipe with all bolts, rings, gaskets and accessories.

E. Piping extending outside buildings shall be mechanical joint.

2.02 PIPE ACCESSORIES

A. Joint Restrainers: Joint restrainers shall be Style 442 with tiebolts for flanged piping as manufactured by STAR NATIONAL PRODUCTS.

B. Pipe Supports: Pipe supports shall be manufactured by MATERIAL RESOURCES:
   1. Pipe Saddle Support: Standon Model S92. Minimum Quantity: Two (2)/10'
   2. Pipe Flange Support: Standon Model S89. Minimum Quantity: Two (2)/10'

PART 3 - EXECUTION

3.01 INSTALLATION

A. Clean inside of pipe before installation. Keep installed piping clean and protect ends from foreign matter by capping or plugging.

B. Install pipe so that it does not interfere with opening of doors or apparatus, access to equipment or any portion of electrical equipment. Group piping whenever practical at common elevations.

C. Run pipes in straight lines and square with building. Install rise plumb. Make offsets only where indicated and where necessary.

D. Install pipes so that expansion and contraction will not cause undue stress or strain to pipes or equipment. Provide loops, offsets and expansion joints as shown on drawings. If, in contractor's opinion, inadequate loops or offsets are shown, contact Engineer for instructions.

E. Provide flanges and unions throughout the pipe systems to make installation and removal of piping and equipment convenient. Make provisions for servicing and removal of equipment without dismantling piping.

F. Label piping after testing.

G. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

H. Install valves with stems upright or horizontal, not inverted.

I. Core drill through existing walls and floors to provide clearance around pipe to be installed and install link seals.

J. Install ductile iron piping and fittings to ANSI/AWWA C600.

K. Install flanged adapters and couplings in accordance with manufacturer's installation instructions. Drawings show minimum required adapters and couplings. Contractor shall install additional coupling and adapters as required for installation and disassembly of the piping systems.

L. Install pipe saddle supports and pipe flange supports to brace piping systems in locations shown on contract plan or as directed by Engineer. Installation shall be in accordance with manufacturer's installation instructions.

3.02 PIPE JOINTING

A. Preparing pipe ends: Cut pipe ends square with pipe cutters only. Do not use hacksaws or torch. Ream pipe ends, after cutting, to full diameter. Where pipe is to be threaded, die-cut right hand, pipe stand, clean cut full depth, taper threads. Make threaded joints so that they will be leak proof without caulking. Apply a thin coat of approved pipe lubricant to make threads only.

B. Bracing joints: Provide braces and bridle rods as required to reinforce joints. Where large pipes underground are subject to shock because of sudden changes in liquid flow rate, provide concrete "kicker" blocks at joints, fittings and changes of pipe direction.

C. Flanged ductile iron pipe joints: Clean face of flange of all sand, grease, grit or other foreign matter. Center gasket before assembling joints. After alignment has been completed insert bolts and hand tighten nuts. Keep gap between flanges approximately uniform while tightening. Tighten bolts to required torque in several steps, alternating from one side to the other.

3.03 RECHECKING AND REPAIRING

A. Before piping is concealed, recheck it for leaks.

B. Rework or replace defective and leaking joints, and joints which are otherwise unsatisfactory. Peening, caulking and doping are not permitted.

END OF SECTION 402323

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Butterfly Valves & Actuators

B. Gate Valves

C. Check Valves

D. Hydraulic Control Valves

1.02 RELATED SECTIONS

A. Section 099744 - Mechanical Piping Coating Systems

B. Section 332121 - Disinfection of Water Treatment Plants

C. Section 402323 - Potable Water Process Piping

1.03 REFERENCES

A. ASME/ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings

B. ASME/ANSI B16.34 - 2004 Valves Flanged, Threaded and Welding End

C. ASTM A126 - Grey Iron Castings for Valves, Flanges and Pipe Fittings

D. ASTM A536 - Ductile Iron Castings

E. AWWA C504 - Standard for Rubber Seated Butterfly Valves

F. AWWA C508 - Swing Check Valves for Waterworks Service, 2 inches (50 mm) through 24 inches (600 mm) NPS

G. AWWA C509 - Resilient Seated Gate Valves for Water Supply Service

H. AWWA C540 - Power Actuating Devices for Valves and Slide Gates

I. AWWA C542 - Electric Motor Actuators for Valves and Slide Gates

J. AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants

K. AWWA C800 - Swing - Check Valves for Waterworks Service, 2 inches (50 mm) through 24 inches (600 mm) NPS

L. ANSI/NSF Standard 61, Drinking Water System Components

M. AWWA C530 - Pilot Operated Control Valves

1.04 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Submit the following:

1. Technical descriptive data for the valves showing model number, size, capacity, weight, materials, accessories and other similar information. Catalog cuts are acceptable if they contain the necessary information.
2. Storage, handling and installation instructions for the valves.
3. Warranty Certificate prepared in accordance with paragraph 1.03 herein.

D. Operations and Maintenance Manuals prepared in accordance with the requirements contained in Section 017823 - Operating and Maintenance Data shall be provided.

1.05 PROJECT RECORD DOCUMENTS

A. Submit product data under provisions of Section 017839.

B. Accurately record actual locations of valves, connections, and invert elevations.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with the local water utility company requirements.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. All brass valves and fittings installed on a potable water supply line shall be made of "low-lead" materials and have a maximum lead content of 0.25 percent by weight. All low lead brass fittings shall be stamped or embossed with a mark indicating that the product is manufactured from low-lead alloys.

D. Consideration will only be given to suppliers who can demonstrate that their valve complies with these specifications having had successful and documented experience of the size, quality, performance and reliability to that specified, and who can successfully demonstrate this criteria to the Engineer.

E. Each manufacturer shall have at least ten (10) years of experience in the design and manufacture of the specified valve.

1.07 WARRANTY

A. Provide a Warranty Certificate typed on company letterhead and signed by an authorized officer of the manufacturer.

B. The instrument manufacturer shall guarantee all components to be furnished under this section to be free from defects in design, materials and workmanship for a period of twenty-four (24) months commencing on the date the instrument was placed in permanent and consistent operation.

C. During the guarantee period, if any part or equipment component is defective or fails to perform when operating at design conditions and if the equipment has been installed and is being operated and maintained in accordance with the written instructions provided by the manufacturer; the manufacturer shall repair or exchange at the discretion of the Owner such defective part(s) free of any and all charges. The cost of labor and all other expenses resulting from the repair or replacement of the defective part(s) and from installation of part(s) furnished by this Warranty shall be borne solely by the manufacturer.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Sections 016100 and 016500.

B. Deliver and store valves in shipping containers with labeling in place.

1.09 FIELD SERVICES

A. Supply and credit to the Owner field services as specified in Section 014500 - Quality Control.

B. Provide the following field services:
   1. One (1) day totaling eight (8) hours for the pressure relief - pressure sustaining valve manufacturer. During these visits, the representative shall check the installation, make all necessary adjustments, and otherwise place the specified valve into permanent operation as specified in Section 017500 - Starting and Adjusting. As part of startup activities, the representative shall check the terminal connections and the specific work of the Contractor. Before substantial completion, provide operation and maintenance instruction to the Owner. A complete review of the Operations and Maintenance Manual for the pressure relief - pressure sustaining valve shall be presented at this time.

1.10 SERVICE CONDITIONS

A. All components of the control instruments shall be designed for continuous duty.

B. Provisions shall be made for adjustments or replacements of all parts.

PART 2 - PRODUCTS

2.01 BUTTERFLY VALVES (FLANGED TYPE)

A. Manufacturers:
   1. PRATT, Model 2FII
   2. Mueller, Lineseal III
   3. GA Industries, Series 800
   4. Approved equal.

B. Flanged end butterfly valves shall be of the rubber-seated, tight closing type, with cast body and disc. Valves shall conform to the requirements specified in the governing Standard for Rubber-Seated Butterfly Valves, AWWA C504.

C. Valve body shall be cast iron per ASTM A-126, Class B, with integrally cast hubs for shaft bearing housing, and 125 class flanged ends faced and drilled in accordance with ANSI B16.1, Standard for Cast Iron Flanges. Rated for 150 psig working pressure.

D. Valve disc shall be symmetrical about the shaft axis with no external ribs, cast of alloy cast iron per Military Specification MIL 6-858a, Class I. Valve shaft shall be of a solid one-piece design of centerless ground 18-8 stainless steel or high strength steel (70,000 psi) completely isolated from line fluid.

E. Taper pins, lock washers and nuts shall be 18-8 stainless steel. Valve seat shall be of molded natural rubber, recess mounted, bonded and mechanically secured to the valve body or disc. Sleeve type bearings of self-lubricating material shall be installed in the hubs of the valve body, designed for maximum load of 2,500 psi or one-fifth the compressive strength of the material, whichever is highest.

F. A shaft seal shall be provided in the valve body hub where the shaft extends through same. The one-piece cast gland follower studs and nuts shall be bronze. Packing shall be self-adjusting split "V" type, or triple "O" ring.

G. Manual Valve Operators
   1. Manual operators shall be of the worm and gear type and shall be self-locking. The gear operators shall be permanently lubricated, totally enclosed, with adjustable stops for the open and closed position, and valve disc position indicator. The operator shall be designed so that a pull of not more than 80 pounds will produce an output torque sufficient to operate the valve under actual line pressures and velocities.
   2. Valves shall be equipped with hand wheels and position indicators.
   3. Provide manual valve operator wheel.

H. Electric Valve Actuators
   1. Manufacturers: AUMA motor operator, Model SQXX.1 Auma Matic for 3” valves and larger.
   2. Electric Valve Actuator operator shall conform to AWWA C504 and AWWA C540. Valve shall be electric motor actuated. The electric motor operator shall be designed to move the valve from fully open position to fully closed when electrical power is applied, and hold the valve in any intermediate position between full open and fully closed without creeping or fluttering. Valve, reducer, electric motor operator and accessories shall be furnished complete, ready for installation, from a single manufacturer. Electric motor enclosure shall meet NEMA 4 construction.
   3. Electrical control housing shall be heavy cast aluminum and fully gasketed to meet NEMA 4, watertight construction.
   4. Heavy duty motor shall operate from 120 VAC (nominal) single phase input source. Thermal cut-out switches shall be provided in case of motor overload. Internal heaters shall be provided to prevent damage from condensation within housing.
   5. Gears and gear shafts shall be alloy steel and heat treated for hardness. All shafts shall mount in friction reducing bearings. Gear box housing shall be grease filled and sealed. No lubrication shall be required for the life of the unit.
   6. Two (2) internal limit switches shall be preset at the factory and furnished for each extremity of valve disc travel. Adjustment of each limit switch within one-half degree of disc travel shall be possible. Two (2) additional external limit switches shall be furnished for signal or auxiliary control for both open and closed valve positions. Manual operation shall be available and shall be accomplished by means of a shaft, equipped with a flat wrench that extends through a sealed opening in the housing. A hand wheel for manual operation shall be supplied.
   7. For each motorized butterfly valve, provide automatic and local valve controls which will include an open-close-automatic remote selector switch and timer that will open the valve and then close the valve as directed. Two (2) indicator lights shall be provided to indicate the OPEN (green) and CLOSED (red) positions.
   8. Provide position indication by means of an indicator dial in full step at all items with valve travel during both powered and manual operation.
   9. Provide manual valve operator wheel.

2.02 CHECK VALVES

A. Horizontal Swing Arm with limit switch
   1. Manufacturers:
      a. GOLDEN ANDERSON, Figure 350
      b. CLOW, Model 206
   2. Quiet closing, outside lever and weight with adjustable air cushion chamber, ASTM A126 C1.B cast iron body and valve disc, stainless steel shaft, bronze seal and gate rings, watertight on closing, horizontal, resilient seat ring. AWWA C508, full flow area not less than the area of a circle with a diameter equal to the nominal pipe size, flanged ends, Class 125, working pressure of 250 psi.
   3. Valve shall be provided with a mounted plunger actuated limit switch.
   4. SCADA compatible, Nema-4 heavy duty limit switch with DPDT contacts shall be provided.

2.03 HYDRAULIC CONTROL VALVES

A. Flow Control Valves
   1. The flow control valve shall be the 58-01 Series - reduced internal port, as Manufactured by CLA-VAL. Model 58-01: Combination Back Pressure & Solenoid Shut-Off Valve.
   2. The valve shall have the following attributes and accessories:
      a. Operating system pressure as follows: 60 - 80 psi
      b. Outlet pressure range = 5 - 12.5 psi
   3. Require Flow Rate:
      a. Minimum Flow = 0 MGD
      b. Maximum Flow = 2.16 MGD (1,500 GPM)
   4. Required Valve Size = 12” reduced port
   5. Each valve shall have the following attributes and accessories:
      a. Valve body and cover: epoxy-coated ductile iron, flanged ends, 250 PSI.
      b. Disc retainer and diaphragm washer: cast iron.
      c. Disc guide, seat and cover bearing: bronze
      d. Disc: Buna-N Rubber
      e. Diaphragm: Nylon reinforced Buna-N Rubber
      f. Stem, nut and spring: Stainless steel
      g. Anti-Cavitation Trim
      h. Additional features: flow clean strainer, pilot isolation valves, flow control (closing), check valve with isolation valve, atmospheric drain, CV flow control (opening), X105LCW Limit Switch, Shutoff Isolation Valve, X141 Pressure Gauge.
      i. Provide four (4) solenoid valves on the valve pilot system to be controlled by the electronic controller.
      j. Electronic controller: 131VC Series

PART 3 - EXECUTION

3.01 GENERAL

A. Install control valves and components in accordance with the written and/or verbal instructions provided by the manufacturer.

B. All components shall be fully tested and verified for service by the manufacturer. Each manufacturer shall provide a MSR as specified in Section 017500 - Starting and Adjusting.

3.02 INSTALLATION

A. All valves, valve accessories and static mixers shall be installed by workers thoroughly experienced in such work and all valve work shall be properly supported and aligned and present a neat and workmanlike appearance. All other required temporary or permanent supports for the valves shall be included in this contract to the approval of the Engineer.

B. Secure all floor stands to support members using stainless steel hardware. Field touchup floor stands after installation.

C. Plug valves shall be installed with the pressure side correctly placed.

D. Set valves in a plumb or level position, as applicable.

E. Install check valves for proper direction of flow. Adjust cushion chamber check valve to prevent water hammer at service conditions.

F. Assemble flanged joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

G. All flanged valves shall be furnished and installed with a Style 128 flange adapter by Dresser Industries, Inc. or equal.

H. Paint all installed valves and piping in accordance with Section 099744.

I. Before each valve is installed, pipe lines should be flushed of all chips, scale, and foreign matter.

J. Properly use dielectric fittings and gaskets with dissimilar metals to insure that galvanic and/or electrolytic action does not take place.

K. Coordinate with Electrical Contractor for wiring of solenoid valves and transmitters.

L. Limit switch shall be wired by Contract E.

3.03 INSPECTION, HANDLING AND STORAGE

A. Inspection - All valves and accessories are subject to inspection by the Engineer at the point of delivery for manu-facturer, direction of opening, freedom of operation, tightness of pressure-containing bolt, cleanliness of valve ports and especially seating surfaces, handling damage, cracks and any other damage.

B. Valves found to be either defective or damaged shall be rejected and immediately removed from the job site.

C. Handling - All valves shall be loaded and unloaded by lifting with hoists or skidding under control with ropes in order to avoid shock or damage. Under no circumstances shall valves and boxes be dropped.

D. Storage - Valves, joint accessories and other appurtenances, if stored, shall be kept safe from damage. The interior of the valve and the joint accessories shall be kept free from dirt or foreign matter at all times.

E. Perform operating tests on valves as per the manufacturers recommendations as required to determine they are in satisfactory operating condition and do not leak. All valves upon completion of the work shall be checked to determine they are in an open position, unless otherwise indicated.
   1. Electronic controller shall be installed and wired by Contractor E. Contract G shall provide manufacturer's representative to provide field start-up services for programming and calibrating the electronic control which shall receive a remote 4-20mA set point (desired flow) as an input to the electronic controller.

END OF SECTION 402324

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe penetration seals.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Thunderline Corp

B. PSI Products

C. Approved equal

2.02 MATERIALS

A. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut.

B. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and wall opening under 40 feet of head. Seal shall be suitable for a temperature range of -40°F to 250°F and submergence in groundwater.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Determine the required inside diameter of each individual wall opening or sleeve. The inside diameter of each wall opening shall be sized as recommended by the manufacturer to fit the pipe and pipe penetration seal to assure a watertight joint. Sizing for correct pipe penetration seal model and number of links per seal may be obtained through manufacturer's catalog. If pipe outer diameter is nonstandard due to coating or insulation, consult manufacturer for engineering assistance and recommendation before proceeding with wall opening detail.

3.02 INSTALLATION

A. Install and tighten seal to provide a watertight pipe penetration in accordance with manufacturer's instructions.

B. Process piping sleeves shall be supplied by Contract P and installed by Contract G.

END OF SECTION 402325

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pressure Switches

B. Differential Pressure (Flow) Switch

C. Check Valve Limit Switches

D. Flow Transmitters

E. Pressure Transmitter

F. Ground Storage Tank Level Transmitter

G. Ground Storage Tank Level Probe

1.02 REFERENCES

A. NFPA 70 - National Electric Code.

1.03 SYSTEM DESCRIPTION

A. Flow monitoring, water level monitoring and system control devices for potable water.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Provide catalog cuts indicating materials, ratings and descriptive data and accessories.

C. Provide installation instructions and calibration data.

1.05 OWNERS INSTRUCTIONS

A. Provide the services of a manufacturers trained representative on operation and maintenance of equipment

PART 2 - PRODUCTS

2.01 PRESSURE SWITCHES

A. Manufacturers:
   1. Mercoid DA Series

B. Bourdon Tube Material: Brass

C. Stem Mounted

D. Snubbers

E. Adjustable Operating Range:
   1. 5-150 PSIG - Booster A
   2. 5-150 PSIG - Booster B
   3. 5-150 PSIG - Booster C

F. Snap-action Switch - SPDT, 15A, 120V; one normally closed and one normally open.

G. Set points shall be adjustable without removing switch cover or shutting down process.

H. Switch shall have visible on/off indication

I. Switch shall have calibrated dial and two pointers indicating set and reset points.

2.02 CHECK VALVE LIMIT SWITCHES

A. Manufacturers:
   1. Square D, Type C, Class 9007, Model C52KC.
   2. Type: Wobble stick coil spring extension, compact box, plug in.
   3. Contacts: 1 N.O., 1 N.C.
   4. Verify mounting with Owner and Engineer.

2.03 DIFFERENTIAL PRESSURE (FLOW) SWITCH

A. Manufacturers:
   1. Meriam Instruments Series 1220.

B. Bellows Material: Beryllium Copper.

C. Rated Pressure: 500 psig.

D. Electrical Switch: SPDT, 5A, 120V.

E. Minimum Dead Band: 10% of full differential.

F. Set Points: Visible and externally adjustable.

G. Mounting: H mounting bracket for pipe saddle or wall mounting.

H. Indicating Dial Size: 6 inches.

I. Full Scale Displacement: 0 to 30 inches through 0 to 130 inches w.c. range.

2.04 ELECTRONIC FLOW TRANSMITTER

A. Manufacturers:
   1. Foxboro, Model No. IDP10 Intelligent d/p cell transmitter for flow.

B. Transmitter Housing: NEMA 4X.

C. Pressure Cell Module: Type 316 stainless steel.

D. Silicone Sensor Fill Fluid.

E. Universal Wall/Pipe Mounting Bracket.

F. Local Indicator: LCD display, integrally mounted.

G. Lightning and Surge Protection.

H. Accessories: 3 valve manifold, Type 316 Stainless Steel.

I. Transmitter for use with venturi tube.

J. Span Limits: 3.5 and 200 inches of water column.

2.05 PRESSURE TRANSMITTER

A. Manufacturers:
   1. Foxboro, Model No. IGP20 Gauge Pressure Transmitter.

B. Transmitter Housing: NEMA 4X.

C. Pressure Cell Module: Type 316 Stainless Steel.

D. Silicone Sensor Fill Fluid.

E. Universal wall/pipe mounting bracket.

F. Digital Indicator: LCD display, integrally mounted.

G. Accuracy: ±0.10% of full span.

H. Lightning and surge protection.

I. Span Limits: 10 and 300 inches of water column.

2.06 GROUND STORAGE TANK LEVEL TRANSMITTER - CONTINUOUS

A. Manufacturers: Endress+Hauser

B. Type: Ultrasonic Level Transmitter.

C. Model: FMU43

D. Housing: IP 68, NEMA 6P

E. Output Signal: 4-20mA HART

F. Max Range: 15m

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer’s installation instructions.

B. Calibrate flow, level and pressure transmitters based on flow, level and pressure levels.

C. Provide all taps, pressure sensing lines, valves and miscellaneous equipment as indicated on drawings.

D. Mount pressure switches and transmitters in vertical position.

E. Install copper Type K piping from pressure taps to switches and transmitters.

F. Provide vent and drain valves in accordance with meter manufacturer's installation instructions.

G. Calibrate booster flow for low and high flow using two (2) wide range transmitters.

H. Contractor shall provide a portable clamp on flow meter and differential pressure gauge to calibrate new and existing flow transmitters.

3.02 FIELD QUALITY CONTROL

A. Verify tubing installation is leak free.

B. Demonstrate performance and operation of installed equipment.

C. Calibrate all transmitters and pressure switches.

END OF SECTION 409000

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Venturi flow meter

1.02 RELATED SECTIONS

A. Section 221113 - Facility Piping

B. Section 260519 - Low Voltage Electrical Power Conduit and Cables.

C. Section 402323 - Potable Water Process Piping.

D. Section 409000 - Instrumentation and Control for Process Systems

1.03 REFERENCES

A. NFPA 70 - National Electric Code

1.04 SYSTEM DESCRIPTION

A. Flow monitoring devices for potable water.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Provide catalog cuts indicating materials, ratings and descriptive data and accessories.

C. Provide installation instructions and calibration data.

1.06 MANUFACTURER'S FIELD SERVICE

A. Provide the services of a manufacturers trained representative on operation and maintenance of equipment.

B. Schedule demonstration with the Engineer and Owner.

1.07 WARRANTY

A. Provide manufacturer's standard 2-year warranty.

PART 2 - PRODUCTS

2.01 VENTURI FLOW METER

A. Manufacturer:
   1. Primary Flow Signal, Inc.: Model HVT-CI Halmi Cast Iron Meter

B. Material: ASTM A126 Class B cast iron body. Throat liner fabricated from 304 stainless steel. Pressure tap bushings lined with stainless steel.

C. Mounting: ANSI Class 150 flange.

D. Maximum Service Pressure: 250 psig.

E. Pressure Tap Connections: 3/4-inch diameter NPT.

F. Provide integral metal tag which indicates manufacturer's name, address, model, size, and serial number.

G. Schedules:
   1. Storage Tank Influent Meter: 12-inch line size, 6-inch throat size, with 51.705 inches of differential pressure at 1,500 GPM. Flange end configuration.
   2. Booster Effluent Meter: 16-inch line size, 8.4-inch throat size, with 3.31 inches of differential pressure at 750 GPM, and 53.06 inches at 3,000 GPM. Flange end configuration.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's installation instructions.

B. Provide all taps, pressure sensing lines, valves and miscellaneous equipment as indicated on drawings. Including vent and drain valves in accordance with meter manufacturer's installation instructions. Install pressure sensing piping from pressure taps to switches and transmitters.

C. Mount pressure switches and transmitters in vertical position.

D. Calibrate flow and pressure transmitters based on flow and pressure levels.

E. Calibrate the "Booster Effluent Meter" flow for low and high flow using two (2) wide range transmitters.

F. Contractor shall provide a portable clamp on flow meter and differential pressure gauge to calibrate new flow transmitters and to verify calibrations.

3.02 WORK INCLUDED UNDER OTHER CONTRACTS

A. The furnishment and installation of equipment in this section shall be included under Contract G.

B. Contract G shall provide information to Contract E on make and model of venturi flow meter to be utilized.

C. Contract E shall furnish and install switches, transmitters, and wiring. Contract G shall furnish and install pressure sensing piping from pressure taps to switches and transmitters.

3.03 FIELD QUALITY CONTROL

A. Verify installation is leak free.

B. Demonstrate performance and operation of installed equipment.

C. Calibrate all sensors, transmitters, and control equipment.

END OF SECTION 409123

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Combination gauging, overfill and leak detection system for caustic storage tank.

B. All equipment specified in this section shall be provided and mounted by Contract P. This equipment shall be wired by Contract E.

1.02 SUBMITTALS

A. Shop drawings and product data for configuration of alarm system and each component, with physical dimensions and proposed mounting locations of components and conduit runs.

B. Elementary wiring diagrams and manufacturer's literature for alarm panels, cables, probes and fittings.

C. Written proposal for any modifications must be approved by the Engineer in writing prior to installation.

D. Operation & maintenance manuals.

PART 2 - PRODUCTS

2.01 LEAK DETECTION ALARM PROBES

A. The leak detection probes shall be capable of sensing the presence of leaking product. They shall be capable of transmitting an electric signal to the control panel during a leakage situation. The leak detection probe shall be located in the sleeve in the sump as shown on contract drawings. The probes shall be able to automatically reset when no longer sensing the presence of product. The probe shall be compatible with the material being stored (calcium hypochlorite).

B. Interstitial space probe shall be as manufactured by OMNTEC.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All parts and components of the alarm system shall be provided and mounted by Contract P. All parts and components of the alarm system must be clean and free of dirt and water prior to installation.

B. All power and sensor wiring for all components of the alarm system shall be installed by Contract E in accordance with manufacturer's installation instructions and Division 26 of the specifications. Contract E shall provide all control and power wiring in rigid conduit.

C. Installation shall be neat and workmanlike and to the complete satisfaction of the Engineer.

D. Install all system components in accordance with the manufacturer's installation instructions. Provide all equipment, connections and incidentals as required for a complete system installation.

E. Demonstrate operation of system components to Owner.

F. Provide type and quantities of wiring as per manufacturers recommendations.

G. Installation shall comply with Suffolk County Health Department and New York State Department of Environmental Conservation Chemical Bulk Storage Requirements.

END OF SECTION 409123.36

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Chlorine residual monitoring components.

B. pH monitoring components.

C. Control relays to activate chemical feed equipment.

1.02 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Provide catalog information, parts list and wiring diagram, and operation and maintenance instructions.

1.03 OWNERS INSTRUCTIONS

A. Provide the services of a manufacturers trained engineer for one day to check each system installation, calibrate equipment and to instruct Owner on operation and maintenance.

1.04 EXTRA MATERIALS

A. Manufacturer's recommended spare parts kits.

PART 2 - PRODUCTS

2.01 PH AND CHLORINE RESIDUAL MONITORING COMPONENTS

A. Transmitter:
   1. Manufacturer:
      a. Rosemount by Emerson Model FCL with Dual Channel Analyzer Transmitter model 56-03-24-32-HT. Free chlorine measuring system with continuous pH correction.
      b. Approved equal.
   2. Transmitter Type:
      a. Dual Channel
   3. Power:
      a. 85-265 VAC Switching, 50/60 Hz with four Alarm Relays
   4. Liquid Analytical Measurement
      a. Channel No. 1: Chlorine
      b. Channel No. 2: pH
   5. Communication
      a. HART Digital Communication
   6. Accessories:
      a. Cable Gland Kit
      b. 2 in. Stainless Steel Pipe Mounting kit
      c. Stainless Steel Tag (Owner Specified Marking)
   7. Enclosure:
      a. Material: Polycarbonate
      b. Rating: Type 4X and IP65
      c. Dimensions: 6.2 in. L x 6.2 in. W x 5.2 in. H
      d. Conduit Opening: 1/2 in.
   8. Display:
      a. Features: Customizable, full color LCD, back-lit display

b. Resolution: 480 x 272 color TFT
c. Dimensions: 4.3 in. Diagonal

9. Ambient Conditions:
   a. Temperature: 14 to 131F
   b. Temperature for Turbidity: 14 to 122F
   c. Relative Humidity: 5 to 95% (non-condensing)
10. Alarm Relays:
   a. Four Form C SPDT configurable alarm relays for process measurement as alarms or faults with interval timer settings.
11. Outputs:
   a. Current Outputs: four actively powered (4-20mA or 0-20mA, scalable)
   b. Max Load: 550 Ohms

B. pH Sensor:
1. Manufacturer:
   a. Rosemount Model 3900VP-02-10 pH/ORP Sensor.
   b. Approved equal.
2. Sensor Type: pH/ORP
3. Measurement Range:
   a. pH: 0 to 14
   b. ORP: -1500 to +1500 mV
4. Maximum Pressure: 100 psig at 212F
5. Operating Temperature: 14 to 212F, automatic temperature compensation
6. Process Connection:
   a. Front Facing: 3/4-in. and 1-in. MNPT
   b. Rear Facing: 1-in. MNPT
7. Transmitter Compatibility:
   a. Rosemount 56
8. Cable:
   a. Rosemount Model 24281-05 interconnecting cable, VP8 Variopol for 3900VP sensor, 4 ft.
9. Measuring Code: General purpose low reistivity (GPLR) pH glass (0-14 pH)
10. Calibration Certificates:
   a. Loop Calibration Certificate (sensor and transmitter calibrated together, with test data).
11. Materials of Construction:
   a. Sensor Body: Ryton
   b. O-ring: EPDM
   c. pH Electrode: Glass
   d. ORP Electrode: Glass, Platinum
   e. Solution Ground: Stainless Steel
   f. Reference Junction: PFTE (Teflon)

C. Chlorine Sensor:
1. Manufacturer
   a. Rosemount Model 499ACL-01-54-VP Free Chlorine Sensor.
   b. Approved equal.
2. Sensor Type: Free Chlorine
3. Measurement Range: 0 to 10 ppm (mg/L)
4. Pressure: 0 to 65 psig
5. Temperature: 32 to 122 F
6. Process Connection: 1-in. MNPT
7. Transmitter Compatibility:
   a. Rosemount 56

b. Rosemount 1056
c. Rosemount 1066-DO
d. Rosemount 5081-A

8. Cable:
   a. Rosemount Model 23747-04 interconnecting cable, Variopol for 499ACL sensor, 4 ft.
9. Calibration and Conformance Certificate:
   a. Loop Calibration Certificate (sensor and transmitter calibrated together, with test data).

2.02 MOUNTING

A. The Chlorine analyzers shall be mounted on gray Formica mounting board, which shall be mounted to a stainless steel channel rack (refer to drawings for additional detail). Mounting board to be sized to allow ease of maintenance to all mounted equipment.

2.03 CHEMICAL TREATMENT SAFETY CONTROL

A. Power Relays to energize treatment receptacle control contacts for each treatment pump, rated 1 H.P., 120/240 volts single phase with weld resistant contacts. Refer to drawings for required quantity.

B. Each treatment pump receptacle shall be powered via a dedicated IEC Contactor Rated 1 HP, which will be energized via the treatment receptacle control contacts.

C. Chemical Safeties for treatment shall be as shown on drawings.

D. All components shall be installed in the MCC where shown on drawings.

E. All press-to-test pilot lights shall be LED. Lights and switches shall be flush mounted on door with press-to-test lights.

F. Monitor shall be factory wired to numbered terminal strips and tested prior to shipment.

G. Labels to identify each indicator light and switches.

H. The chemical safety panel shall have a four-position selector switch to permit “off”, “normal”, “weld” and “device” operation. When positioned “off”, chemical feeders shall be prevented from operating. In the “normal” position, the closure of all safety/flow detection devices will allow chemical feeders to operate. When a safety/flow detection device activates, a pilot light shall indicate its operation. Similarly, when the chemical feed pump is energized, a pilot light shall indicate its operation. If a chemical feed pump becomes powered in the “normal” mode and any one or all of the safety devices are not closed, an alarm bell shall sound for an adjustable time period, all power to chemical feed pumps shall be interrupted, a pilot light shall indicate a failure, and an auxiliary relay contact shall close. Chemical safety panel shall require operator to manually depress a reset button to re-power chemical feeders and to reset alarms.
   1. The “weld” position shall allow testing of the power contactor’s contacts for weld. During this test, individual push-buttons for each safety device are depressed. Should a power contactor contain a welded contact, pilot lights shall pinpoint the specific location. The procedure for electrically testing all pilot lights shall be performed by the weld test.
   2. The “device” position shall permit the operator to test the safety devices. By manually operating each device, the panel alarm bell shall double function as an audible continuity tester to indicate closed and open states. Visual verification shall be provided through panel pilot lights. All instructions for performing the above test procedures shall be silk screened on the panel face.

I. All wiring shall be numbered, tagged, and terminated at 30 AMP heavy duty labeled terminal strips.

J. All associated logic control and monitoring circuitry shall be configured utilizing control relays and timers of the octal base (or 11 pin base) plug in type. Each relay and timer shall be equipped with an LED or neon status indicator (visible with enclosure door open), and manual operators to facilitate testing and troubleshooting by Owner. Contact ratings shall be minimum 10 AMP, 24 volt.

K. Install new controls to interface with well motor control circuits. Install relays and an adjustable 0 to 60 second time delay relay to provide a set of contacts that interface with the chemical treatment pump receptacles. The controls shall provide contacts that open/close based on the well pump to stop. This circuit shall de-energize the treatment safeties while the well pump is returning to blowoff before final shutdown. The adjustable time delay relay shall be mounted inside the enclosure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install analyzers in location(s) indicated on drawings.

B. Install all analyzer equipment as shown on drawings.

C. Install all analyzer equipment on the mounting board as shown on drawings.

D. Run power supply and interconnect cable in separate conduit.

E. Run interconnect cable without splices from sensor junction box to analyzer.

F. Install isolated 4-20 mA DC pH and chlorine residual process variable instrument circuits in dedicated conduits.

3.02 ADJUSTING

A. Calibrate analyzer with installed probe using two point buffer method.

B. Set low and high alarm set points as requested by Engineer.

3.03 DEMONSTRATION

A. Demonstrate performance of system to operate monitoring systems and to operate chemical feed pump when alarm relay is energized.

B. Demonstrate operation and maintenance of system to Owner.

END OF SECTION 409513

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Safety equipment and supplies associated with use of calcium hypochlorite and diesel fuel.

1.02 REFERENCES

A. ANSI Z87.1.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. NEW PIG CORP., TIPTON, PA.

B. Or approved equal.

2.02 MATERIALS

A. HAZ-MAT Spill Kit:
   1. Polyethylene Bucket
   2. Polypropylene Socks
   3. Polypropylene Mats
   4. Order No. 64CRSC
   5. Quantity: Two (2)

B. Face Shield:
   1. Ratchet Adjustment System
   2. Polycarbonate Face Shield
   3. Compliance with ANSI Z87.1
   4. Order Nos. GLS204 , GLS204-0002
   5. Quantity: Two (2)

C. Splash Goggles:
   1. Polycarbonate Lense
   2. Indirect Vent
   3. Fog Free
   4. Compliance with ANSI Z87.1
   5. Order No. GLS310
   6. Quantity: Two (2)

D. Nitrile Apron:
   1. Heavy-duty
   2. Nitrile - Cotton Blend
   3. Adjustable Neckstrap & Waist Ties
   4. Size: 35" x 45"
   5. Color: White
   6. Order No. WPL795
   7. Quantity: Two (2)

E. Chem. Resistant Gloves:
   1. Multi-layer Construction w/ Knit Liner
   2. PVA & Neoprene Material Construction
   3. Puncture, Tear, Abrasion Resistant
   4. Length: 14.5”-inches
   5. Size: Large
   6. Order No. GLV950
   7. Quantity: Two (2) pair

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install one set of complete equipment as indicated in 2.02 A-E to Owner at location indicated by the Engineer.

END OF SECTION 416719

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. New water lubricated, canned lineshaft multi-stage short set vertical turbine pumping units and accessories for potable water, including a bowl assembly, column assembly, suction can, discharge head and driver.

B. Testing, adjusting, and balancing.

C. Demonstration.

1.02 RELATED SECTIONS

A. Section 099744 - Mechanical Piping Coating Systems

B. Section 432268.01 - Vertical Hollow Shaft Electric Motor

1.03 REFERENCES

A. ANSI B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

B. AWWA E101 Vertical Turbine Pumps - Line Shaft and Submersible Types.

C. ANSI/NSF Standard 61 - Drinking Water System Components.

D. ASTM A48 - Gray Iron Castings.

E. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless.

F. ASTM A108 - Steel Bars, Carbon, Cold Finished, Standard Quality.

G. ASTM A283 - Low and Intermediate Tensile Strength Carbon Steel Plates.

H. ASTM B42 - Seamless Copper Pipe, Standard Sizes.

I. ASTM B584 - Copper Alloy Sand Castings for General Applications.

J. AWWA E103 - Horizontal and Vertical Line-Shaft Pumps.

K. AWWA C205 - Cement-Mortar protective lining and coating for steel water pipe.

L. NEMA - National Electrical Manufacturers Association.

1.04 PERFORMANCE REQUIREMENTS

A. The installed pumps shall be premium efficiency, multi-stage, water lubricated, vertical turbine pumps for potable water with the following characteristics:

REQUIREMENT	**CANNED BOOSTER PUMPS (A&B)**
Capacity (GPM)	1500
Total Dynamic Head (ft)	223
Minimum Pump Efficiency	80 percent
Full Load Speed (RPM)	1800

Stages	2

REQUIREMENT	**CANNED BOOSTER PUMP (C)**
Capacity (GPM)	750
Total Dynamic Head (ft)	225
Minimum Pump Efficiency	82 percent
Full Load Speed (RPM)	1800
Stages	4

B. The pumping unit shall be designed and furnished in accordance with the latest Hydraulic Institute and AWWA standards for canned lineshaft turbine pumps.

C. Pump curves must not be excessively shallow at any point throughout the range of operating pressures. The pump must meet a HI14.6-1U acceptance grade at the design point. If not, the pump will need to be reworked and retested at the manufacturer's expense.

D. Manufacturer shall submit certified pump curves stamped by a registered Professional Engineer before shipping unit.

E. All pump equipment shall be supplied by a single manufacturer. A certified bill of materials shall be provided.

F. All pump components and accessories in contact with water shall be in compliance with the “Lead in Drinking Water Act” effective January 4, 2014.

1.05 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Indicate technical information and dimensions for the pumps and electric motors, including non-witnessed certified performance test pump curves and upthrust and downthrust ratings.

C. Shop Drawings: Indicate mounting details, dimensions, configuration, construction details and parts list.

D. Certified Pump Curves: Indicate operating characteristics at design points as well as throughout the operating range of the pump.

E. Manufacturer's Instructions: Indicate procedures and conditions required for proper installation.

F. Written report on results of initial and final pump tests.

G. Operation and maintenance data.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017820.

B. Operation Data: Indicate procedures and methods required for proper operation of all equipment.

C. Maintenance Data: Indicate maintenance schedule, type and frequency of lubrication, spare parts manual and local parts supplier.

1.07 WARRANTY

A. The manufacturer shall provide a warranty certificate typed on company letterhead and signed by an officer of the manufacturer. The certificate shall be witnessed by a notary public in the state in which the company headquarters is located.

B. The manufacturer shall guarantee all components of the equipment specified to be furnished under this Section to be free from defects in design, materials and workmanship for a period of one (1) year commencing on the date the contractor posts the maintenance bond.

C. During the guarantee period, if any part or equipment component is defective or fails to perform when operating at design conditions and if the equipment has been installed and is being operated and maintained in accordance with the written instructions provided by the manufacturer, the manufacturer shall repair or exchange at the discretion of the Owner such defective part(s) free of any and all charges. The cost of labor and all other expenses resulting from the repair or replacement of the defective part(s) and from installation of part(s) furnished by this Warranty shall be borne solely by the manufacturer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. GOULDS PUMPS INC.

B. LAYNE CHRISTENSEN, CO.

C. AMERICAN MARSH

D. Or approved equal.

2.02 MATERIALS

A. Pumping Unit (Canned Lineshaft Vertical Turbine Pump): AWWA E101, high efficiency, multi-stage water lubricated, turbine pump; discharge diameter pump column; of the following materials and components:
   1. Bowl Assembly: ASTM A48, Class 30 (250 PSI), flanged, cast iron, high tensile strength; free from blowholes, sand holes and other faults; porcelain enamel coated water passages; fitted with diffuser vanes; replaceable bronze wear rings; rubber or bronze sand collar; bronze alloy C89835 sleeve bearings; bowl shaft and collets. Bowl exterior to be uncoated. Bowl assembly stages fastened with ASTM A276 type 316 stainless steel hardware.
   2. Impeller: ASTM A743, , Type 304 stainless steel, fastened to the bowl shaft with ASTM A582 type 416 stainless steel taper collets; enclosed type with solid plates; statically and dynamically balanced; adjustable. Impellers shall be balanced to grade G6.3 of ISO 1940 as minimum. Impeller trim shall be typical of each individual impeller.
   3. Suction: The suction bowl shall be provided with a non-soluble grease packed bronze bearing. A bronze sand collar shall be provided to protect bearing from abrasives in water and shall have sufficient opening at bottom for easy removal of bearing. Suction bowl shall have a bell bottom.
   4. Impeller Shaft: ASTM A582 type 416 stainless steel, polished to better than 40 RMS surface finish, minimum 12% chromium content; diameter equal to that of line shaft;

connected to line shaft with solid type 416 stainless steel coupling; supported by bearings above and below each impeller.

B. Column Assembly - Water Lubricated: AWWA E101, discharge diameter pump column of the following materials and components:
   1. Line Shaft: ASTM A582 type 416 stainless steel; polished to better than 40 RMS surface finish, balanced; faced both ends, left hand threaded with a tendency to tighten during normal operation; maximum 10 foot lengths; ASTM A582 type 416 heavy duty stainless steel couplings, rubber line shaft bearings in bronze bearing retainers; water lubricated during pump's operation; secured at each coupling or flange. Line shaft shall be rated for minimum of 150% of maximum rated torque/HP requirement. The lineshaft shall be provided with ASTM A743 type 304 stainless steel sleeve to act as a journal at each bearing location. The sleeve shall be placed on a full size shaft without undercutting and secured in position by a suitable adhesive.
   2. Discharge Column Assembly: ASTM A53, Schedule 40, Grade B, steel pipe, threaded; maximum 5 foot lengths; screw coupled with 8 threads per inch with 3/16” taper per foot thread and faced parallel to butt against centering spider to form accurate shaft alignment. Uncoated.
   3. Bearing: Bearing shall be fluted rubber retained in the centering spider by a shoulder on each end of the bearing.
   4. Centering Spiders: 416 stainless steel.

C. Discharge Head Assembly - Water Lubricated:
   1. ASTM A48, Class 30 cast iron, high profile type to allow shaft coupled above stuffing box and provided for mounting the motor and support the column and bowl assemblies. Vertical suction to horizontal discharge, 125 ANSI drilling discharge flange.
   2. Stuffing Box: Provide ASTM A48, Class 30 cast iron stuffing box with a minimum of five (5) packing rings. The packing gland shall be a 316 stainless steel split type secured in place with 316 stainless steel hardware and with a rubber slinger installed on the shaft. The bearing shall be C89835 bronze.
   3. Headshaft: ASTM 582 type 416 stainless steel, polished to better than 40 RMS surface finish, minimum 12% chromium content; diameter equal to that of line shaft; connected to line shaft with solid type 416 stainless steel coupling;
   4. Discharge head shall be provided with
      a. NPT fittings for rim drain connection
   5. Provide removable discharge head opening guards to protect from inadvertent contact with rotating shaft.
   6. Baseplate: Provide ASTM A283 steel or ASTM A48, Class 30 cast iron base plate to mount discharge head. Baseplate shall be bolted to the pump casing as shown on the drawings.

D. Can Assembly
   1. The can diameter shall be sized such that the velocity in the can does not exceed the standards recommended by the Hydraulic Institute. The suction can shall be supplied by the manufacturer.

2.03 ACCESSORIES

A. Protective Coating: See Section 099744 (Head only).

B. Bolts and Hardware: Stainless Steel; ASTM A582, Type 316.

2.04 PUMP BASE SEALANT

A. Manufacturer: Pecora Corp, Synthacalk GC2+, or approved equal.

B. NSF 61 approved polysulfide rubber sealant.

C. Conforms to ASTM C920 (color change) and ASTM C1247 (continuous immersion in liquids). Tested in conformance with ASTM D70, ASTM C1250, ASTM C661, ASTM C679, and ASTM D412.

D. UV, ozone, aging, shrinkage, rain, and snow resistant; non-sag sealant.

E. Apply Synthacalk P53+ primer (and allow to dry) prior to GC2+.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing site conditions and work required to install pump.

B. Verify that the piping and substrate are ready to receive vertical turbine pumps of this section.

3.02 INSTALLATION

A. Prior to the installation of any equipment, the equipment shall be thoroughly cleaned and disinfected.

B. Contractor shall utilize a minimum of 2,000 psi pressure washer to thoroughly clean the interior and exterior of all pump equipment. Prevent any dirt, debris or other foreign matter from contaminating the washed equipment.

C. Disinfect all pump equipment by applying a minimum of 1 percent hypochlorite solution to all exterior and interior surfaces. Rinse solution off of materials which are not compatible with hypochlorite to prevent corrosion.

D. Install new pumping unit and discharge head in accordance with manufacturer's instructions and approved shop drawings.

E. Install pumps plumb and level. Securely mount pumping unit to concrete base.

F. Position suction pipe, column assemblies and bowl assemblies in center of clearwell penetration. Pump setting is to be as noted on plans.

G. Securely mount pumping unit. Form Health Department approved sanitary seal. Material used to form Sanitary Seal shall be NSF-61 approved.

H. Install new electric motors, shafts and couplings in alignment with existing and or new equipment.

I. Following manufacturer recommendation and instruction for application of sealant.

3.03 FINAL TESTS

A. Conduct: After a minimum 12 hours of operation, conduct final test on new pump for five different points along the pump curve for each pump, including the design point, and shutoff head. Record and submit the following data for EACH point:

B. Tank water level

C. Flow in gpm

D. Discharge pressure

E. Voltage and amperage.

F. Power factor.

G. Bowl Efficiency.

H. Total Dynamic head

I. RPM

J. Motor vibrations.

K. Provide all valves, gauges and, piping, hoses, flow measuring devices and instruments required to conduct all tests. Owner's equipment shall not be used.

3.04 PROTECTION

A. Protect pump and accessories from damage and contamination during removal and installation and until project is accepted by the Owner.

B. Protect finished work under provisions of Section 016500.

C. Protect all nearby equipment from damage during installation.

D. Protect pumps and accessories from damage and contamination during installation, and until project is accepted by the Owner.

3.05 ADJUSTING

A. Adjust under provisions of Section 017500.

B. Adjust operation of pump to ensure proper installation and operation consistent with the submitted pump curves.

3.06 DEMONSTRATION

A. Demonstrate under provisions of Section 017900.

B. Demonstrate operation and maintenance of pump to Owner's personnel.

3.07 PAINTING

A. Includes new motor, discharge head, fittings, base plate and other exterior pump surfaces.

B. Apply paint as per specification Section 099744.

C. Submit paint color and type to Engineer for review and approval.

D. Clean up all paint splatter, spills, chips, etc., to the satisfaction of the Engineer.

END OF SECTION 432150

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Premium efficiency vertical electric motors.

B. Testing.

1.02 RELATED SECTIONS

A. Section 432155.01 - Water Lubricated Vertical Turbine Well Pump

1.03 REFERENCES

A. All equipment shall be fabricated, assembled and tested in accordance with the most current applicable standards as defined by the following institutions:
   1. Institute of Electrical and Electronic Engineers (IEEE).
   2. National Electrical Manufacturers' Association (NEMA).
   3. Anti-Friction Bearing Manufacturers' Association (AFBMA).
   4. American National Standards Institute (ANSI).
   5. National Electrical Code (NEC).
   6. Underwriter's Laboratories (UL).

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.
   1. Preliminary Dimension Print and Frame Size.
   2. Approximate Motor Weight.
   3. Complete Motor Nameplate Information.
   4. Motor Performance Data, including the following:
      a. Efficiencies at 100%, 75% and 50% of full load
      b. Power factor at 100%, 75% and 50% of full load
      c. Locked Rotor Current
      d. Full Load Current
      e. Starting Torque
      f. Full Load Torque
      g. Breakdown Torque
   5. Complete Description of Testing Facilities.
   6. Job site Storage Requirements.
   7. Certified Dimension Prints.
   8. Recommended Spare Parts List with current pricing.
   9. Required with motor upon shipment:
      a. Operation and Maintenance Manuals
      b. Connection Diagrams
      c. Test Reports as Specified

1.05 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017823.

B. Operation Data: Indicate procedures and methods required for proper operation of all equipment.

C. Maintenance Data: Indicate maintenance schedule, type and frequency of lubrication, spare parts manual and local parts supplier.

1.06 COORDINATION

A. Coordinate work under provisions of Section 013100.

B. Coordinate work of this section with installation of new well pump, including all adjacent mechanical and electrical work.

1.07 WARRANTY

A. Provide under provisions of Section 017800.

B. Provide minimum 3 year warranty on all parts, labor and equipment, effective the date of final acceptance of the project.

C. Provide 3 year guarantee that motor will meet or exceed specified requirements.

PART 2 - MATERIALS

2.01 VERTICAL HOLLOW SHAFT ELECTRIC MOTOR

A. Conditions of Service
1. Motor shall be suitable for operation under the following conditions of service unless otherwise specified:

BOOSTER PUMP	HORSE POWER	SPEED (RPM)
A - VFD	125	1,785
B - VFD	125	1,785
C - Continuous	75	1,785

2. Continuous operation on a three-phase 60 hertz system rated 460 volts.
3. Motors shall have a service factor of 1.15.
4. Motors shall be designed to operate at rated load in a maximum ambient temperature of 40° C at a maximum altitude of 300 feet.
5. The location of the installation will be indoor unless otherwise specified.

B. Design Requirements
1. Motors shall be capable of withstanding all normal forces which may be imposed upon them during the course of normal operation, including starting and normal stops.
2. Motors shall be suitable for across the line starting and shall be able to start and accelerate the connected load speed with 90% of rated voltage at the motor terminals.
3. Motors shall be capable of continuous operation at full load and rated frequency with a voltage variation of +10%.
4. Motors shall be capable of continuous operation at full load and rated voltage with a frequency variation of +5%.
5. Motors shall be capable of continuous operation with a combined voltage and frequency variation of no greater than 10% with the frequency variation no greater than 5%.
6. Motor installation locations will be subject to dust, moisture and/or corrosive atmospheric conditions and shall have all parts given protective treatment such as Emerson’s “CORRO-DUTY®” or equal.
7. Inverter Duty Rated Motors must exceed NEMA MG-1, Section IV Part 31 standard.

a. Motor equivalent circuit data must be supplied for submission to the VFD supplier to approve an excessive power quality condition will not exist when base speed of motor is less than 1200 RPM
b. Motors must be suitable for up to 10:1 speed range on variable torque loads.

C. Enclosure
1. Motors shall be furnished with a Weather Protected, Type I (WPI) guarded enclosure.
2. Openings on enclosures shall be covered with metal guard screens having a mesh size no larger than 5/8” square.
3. Enclosure shall be of cast iron construction in accordance with the manufacturer
4. S standard design. Canopy caps shall be of plastic, aluminum, cast iron or sheet metal and shall be easily removable for maintenance purposes.

D. Stator Construction
1. Stator laminations shall be of fully processed steel. Each lamination surface shall be given necessary treatment so as to have core plate type C-5 insulation.
2. Insulation system shall be Class F or better.
3. When specified, motors to be rated for variable frequency drive applications shall meet NEMA MG-1, Section IV, Part 31 dated 2006 and shall be U.S. Motor’ Inverter Grade® insulation system or equal. The insulation system shall be warranted for a minimum of 3 years operation on VFD power.

E. Rotor Construction
1. Rotors shall be of cast or fabricated aluminum in accordance with manufacturer’s standard design practices.

F. Bearings
1. Bearing supplied shall be of type and size sufficient to satisfy thrust loading requirements for each motor in accordance with the manufacturer’s standard design.
2. Bearings shall be rated for an in-service L-10 life of 32,500 hours.

G. Thrust bearings
1. Thrust bearings shall be deep-groove ball, angular contact ball or spherical roller type. Bearings mounted back-to-back or in tandem are acceptable and may be furnished when required according to manufacturer’s standard design.
2. Motors shall be of high thrust design and shall be supplied with angular contact ball bearings whenever possible and in accordance with manufacturer’s standard design.
3. Where thrust requirements restrict the use of angular contact bearings, spherical roller bearings shall be furnished. Spherical roller bearings shall be spring loaded to keep the lower bearing race in contact and prevent bearing damage during starting and momentary upthrust conditions.

H. Guide Bearings
1. Guide bearings shall be deep-grove ball type.
2. Guide bearings may be stacked when necessary according to manufacturer’s standard design to accommodate specific upthrust conditions.
3. Guide bearings or bearing assemblies shall be provided with sufficient means for preventing the leakage of lubricant or entrance of foreign matter along the shaft.

I. Lubrication
1. Grease lubricated bearings shall be furnished with provisions for in-service positive lubrication. A drain shall be provided to guard against over lubrication.

J. Noise Level

1. Sound pressure levels shall be measured according to NEMA MG1 / ANSI 12.51-2002 and shall not exceed 90 decibels as measured on the A-Weighted Scale at a distance of five (5) feet from any motor surface under no load, free field conditions.

K. Nameplates
   1. Motor nameplates shall be of stainless steel and shall be securely fastened to the motor frame with pins of like material.
   2. The following information shall be contained on the motor nameplate as a minimum:
      a. Rated Horsepower
      b. Full Load Speed
      c. Frequency
      d. NEMA KVA Code and Design (when applicable)
      e. Rated Voltage
      f. Manufacturer's Serial Number
      g. Service Factor
      h. Insulation Class
      i. Maximum Ambient
      j. Full Load Current at Nameplate Voltage
      k. Frame Size Designation

L. Terminal Boxes
   1. Terminal boxes shall be of aluminum, stamped steel, fabricated steel or cast iron construction to be compatible with the motor enclosure specified and when possible, shall be diagonally split and capable of rotation in 90° increments. Boxes not suitable for rotation shall be capable of top entry.
   2. The area in which the main terminal box is connected with the motor frame shall be fully gasketed in order to prevent entrance of foreign matter into the motor and to provide support for the stator leads where they pass through the motor frame.
   3. A properly sized grounding terminal shall be mounted in the main terminal box.

M. Accessories
   1. Non-Reverse Ratchet
      a. Motors shall be furnished with a non-reverse ratchet.
   2. Space Heaters
      a. Motors shall be furnished with space heaters to provide sufficient wattage to maintain the internal temperature of the motor at a level approximately 10°C above the ambient temperature while the motor is not in operation.
      b. Space heaters shall be of the silicone rubber strip type attached directly to the stator end turns. The leads shall be brought out to an auxiliary terminal box.
      c. The space heaters shall be rated for operation on a single phase, 60 hertz, 120 volt system.

PART 3 - EXECUTION

3.01 TESTING

A. Prior to shipment, one (1) motor of each horsepower and voltage rating shall be given a complete initial certified test in accordance with IEEE 112 method B and shall include the following items:
   1. Current Balance
   2. High Potential Test
   3. Winding Resistance
   4. Locked Rotor Current
   5. No Load Running Current
   6. Full Load Heat Run

7. Full Load Percent Slip
8. Efficiency at 100%, 75% and 50% Load
9. Power Factor at 100%, 75% and 50% Load

B. Noise test shall be performed in accordance with NEMA MG1 / ANSI S12.51-2002.

C. Certified test reports shall be submitted to upon completion of all required tests.
1. After the motor has operated for a minimum of 12 hours under load, all motors shall be given a short commercial test in accordance with NEMA MG1-12.55.

D. VIBRATION TEST
1. After a minimum of 12 hours or motor operation under load, a vibration test shall be conducted.
2. Perform a vibration test on the installed motors.
3. Contractor to provide the equipment necessary to perform the test.
4. Instruments for vibration test must be approved by the Engineer.
5. Record displacement, velocity, and spike energy for each point as defined below.
6. Perform vibration test for each point in the pump test as outlined in Section 11209.

DESCRIPTION	MEAS. LOC.	DISPLACE. (MILS)	VELOCITY	SPIKE ENERGY
Top of Motor Bonnet - Horizontal		Y	Y	N
Upper Motor Bearing - Horizontal	90 & 180 degrees	Y	Y	Y
Lower Motor Bearing - Horizontal	90 & 180 degrees	Y	Y	Y
Discharge Head Coupling - Horizontal	90 degrees	Y	Y	N
Discharge Head Packing Gland - Horizontal		Y	Y	N
Discharge Head Base - Horizontal	90 & 180 degrees	Y	Y	N

Y - Required as part of vibration testing.
N - Not required as part of vibration testing.
90° - 90 degrees from discharge head discharge.
90 & 180° - 90 and 180 degrees from discharge head discharge.

7. Displacement readings greater than 2.0 mils or spike energy readings greater than 0.3 shall be cause for the Contractor to take measures to reduce the vibrations. This shall be done at no additional cost to the Owner.

3.02 INSTALLATION

A. Prior to installation, verify motor horsepower, voltage and RPM.

B. Furnish and install new motor. Adjust/modify pump column shaft after motor installation.

C. Install motor in accordance with manufacturer’s recommendations.

D. Perform vibration test as outlined in this specification section.

3.03 ADJUSTING

A. Adjust under provisions of Section 017500.

3.04 DEMONSTRATION

A. Demonstrate operation and maintenance of motor to Owner's personnel.

3.05 PROTECTION

A. Protect finished work.

B. Protect motor and accessories from damage and contamination until project is accepted by the Owner.

END OF SECTION 432268.01

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Calcium hypochlorite tablet chlorinator.

B. Calcium hypochlorite pump and accessories.

C. Spill containment pallet.

1.02 RELATED SECTIONS

A. Section 220529 - Hangers and Support for Piping.

B. Section 221113 - Facility Piping.

1.03 COORDINATION

A. Coordinate work under provisions of Section 013100.

B. Coordinate the inspection of the system by the manufacturer with the complete installation of the system.

C. Coordinate with all other adjacent electrical and mechanical work.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Indicate information on solution tank, chemical feed pump, mixer, controls, including capacities, hypochlorite treatment unit, recirculation pump, secondary containment basin, capacities, performance, and accessories.

C. Shop Drawings: Indicate plan layout of equipment, pertinent dimensions, mounting details, construction details, required clearances, power requirements and wiring diagrams.

D. Manufacturer’s Installation Instructions: Indicate special procedures and conditions required for proper installation.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017823.

B. Operation Data: Indicate proper operating instructions and procedures.

C. Maintenance Data: Indicate types and methods of lubrication, cleaning, schedules, spare parts list and local parts supplier.

1.06 SPARE PARTS

A. The following spare parts shall be provided for each chlorinator unit:
   1. One (1) calcium hypochlorite pump.
   2. One (1) set of diaphragms, poppets, and seals for each chemical metering pump and standard manufacturer’s preventative maintenance kit for each pump supplied.
   3. One (1) complete length of discharge tubing.
   4. One (1) quart of pump lubricant, S.A.E. 40.

5. Four (4) 50 lb. pails of calcium hypochlorite briquettes, NSF Standard 60, 7 gram briquette size with anti-scale inhibitor. Provide hand scoop constructed of corrosion resistant material for transferring tablets to hopper.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products to the site under provisions of Section 016500.

B. Do not remove manufacturer's packaging until product is ready to be installed.

C. Do not store product directly on the ground.

D. Store product on a firm, level surface.

1.08 WARRANTY

A. Provide manufacturer's standard warranty.

B. Warranty to include coverage for materials.

PART 2 - PRODUCTS

2.01 CALCIUM HYPOCHLORITE TABLET CHLORINATOR

A. Manufacturers:
   1. Constant Chlor Plus, Model MC4-50 LITE as manufactured by Arch Chemicals, Inc. of Atlanta, GA. The chlorinator shall be factory pre-wired and piped and require only connecting to a reliable water supply, connecting to the dosing pump suction and plugging into an 115V outlet.

B. Description:
   1. Equipment:
      a. Calcium hypochlorite tablet chlorinator shall consist of a feed hopper; feed hopper cover, chemical support grid, a spray water system, solution storage tank and fully integrated control panel with PLC, to provide independent system operation and alarms.
   2. Chemical:
      a. Chlorinator shall be designed to operate with Constant Chlor Plus TM briquettes. Briquettes shall be 66 percent calcium hypochlorite by weight with a size and form to prevent bridging and clogging of the hopper screen.
      b. Briquettes shall contain a scale inhibitor, 0.5 percent by weight, to prevent excessive scaling of the wetted components.
      c. Chemicals shall comply with: EPA No. 1258-1179, NSF Standard 60, and AWWA B300.

C. Operation:
   1. Pressure Range: 40 to 150 psig
   2. Dry chemical Capacity: 62 lbs
   3. Solution Tank Volume: 25 gallons
   4. Available Working Solution: 13 gallons
   5. Water Inlet Size: 1/2 inch FNPT
   6. Solution Outlet Size: 1/2 inch MNPT
   7. Solution Strength: <1.0 percent
   8. Operating Temperature: 40 degrees to 105 degrees F
   9. Electrical: 115V, 60Hz, 15A, 1Phase

D. Controls and Alarms:
   1. 4 Normally Open Contacts for Remote Interface. 1 Dry Contact for Remote Start of Dosing Pump.
   2. 24VDC Control Power.
   3. PLC with 14 inputs/10 outputs
      a. 6 Inputs and 2 Outputs Available for Systems Integration 8 Buttons / Indicators:
         1) OFF/ON Indicator: Push-Button to turn the unit ON or OFF
         2) LID OPEN: Prevents the unit from operating if lid is open
         3) TANK LOW: Solution inside tank is low, alarm condition
         4) CIRCULATION PUMP: Circulation pump is interlocked with TANK LOW AND will not operate if TANK LOW alarm is activated. Lamp flashes is circulation pump pressure drops below 5 psi. Push- Button to turn ON or OFF
         5) DOSING PUMP: Chemical dosing pump is interlocked to the system. Will not pump if LOW CHLORINE SOLUTION alarm is activated. Remote or manual start capability. Push-Button to turn ON or OFF
         6) FILLING: Indicates that the solenoid is energized and the unit is making solution
         7) TANK FULL: The high float is engaged and the tank is full of concentrated solution
         8) E-STOP: Push-Button emergency stop for the unit. Turns off every function.

E. Materials:
   1. Hopper / Basket Assembly
      a. Hopper / Basket Assembly shall be constructed of molded polyethylene and provide a minimum slope of 60 degrees to properly feed the briquettes to the hopper screen.
      b. Hopper will be complete with a tightly sealed lid to retard condensation and casual water from binding the stored briquettes.
      c. Hopper screen
         1) Hopper screen shall be made from polyethylene and shall be molded into the hopper / basket assembly.
         2) Hopper/ Screen shall be field replaceable and not require any tools for removal or installation.
      d. Spray assembly
         1) Spray assembly shall be completely constructed of non-ferrous materials and shall be fitted with non clogging spray nozzles. Spray nozzles shall be designed to operate at 30-50 psi and shall provide spray patterns which completely covers the hopper grid area. Spray assembly shall be modified to produce a <1.0 percent solution.
      e. Solution tank
         1) Solution tank shall be constructed of molded polyethylene.
         2) Solution tank will be fitted with factory installed connections for recirculation pump inlet and discharge, water inlet, chemical feed pump suction and return, off-gassing/spare and drain with shut-off valve.
      f. Solution mixer
         1) A magnetically driven pump will be provided for recirculation mixing. The pump shall be sized to provide a minimum mixing capability to keep suspended solids in suspension in the calcium hypochlorite solution.
         2) An eductor will be used to provide additional mix solution in the tank.
      g. Inlet water assembly
         1) Inlet water assembly shall consist of an isolation valve, inlet Y-strainer with mesh screen, volumetric water meter (if required), pressure regulator, inlet water pressure gauge, pressure regulator, feeder inlet pressure gauge and a solenoid valve.
         2) Inlet assembly shall be 1/2” diameter piping (material as shown on drawings)
      h. Level controls and alarms

1) A total of three level sensors shall be provided. These sensors include:
   (a) A normally closed electronic low level control float.
   (b) A normally closed electronic high level control float.
   (c) A mechanical overflow float.
2) The hopper shall include an option to provide a low level dry briquette alarm.
3) The hopper lid shall include an “open lid” magnetic proximity switch and alarm.
4) The solution tank shall include a low level alarm and a low level system shut off switch.

2.02 CALCIUM HYPOCHLORITE PUMP

A. Manufacturers:
   1. Jesco, Memdox DX.
   2. Approved equal.

B. Description:
   1. Motor driven, heavy duty, oscillatory displacement, diaphragm pump
   2. Contractor shall furnish and install calcium hypochlorite pumps in the locations indicated on the Plans. Provide one (1) spare pump to the Owner.

C. Performance/Design Criteria:
   1. Pump shall be capable of pumping up to 1.0 percent calcium hypochlorite solution at pressure to 150 psi.
   2. Single head pumps shall operate against a backpressure from 0 to 150 psi.
   3. Rated capacity to be adjustable with a maximum rate of 19 gallons per hour at 150 psi backpressure.

D. Materials:
   1. Materials of construction shall be compatible with up to 1.0 percent calcium hypochlorite solution.
   2. Clear PVC housings, 3/4” PVDF connections, PTFE seals, and PVDF integrated pressure relief valve.

E. Accessories:
   1. Pump shall be equipped with 10-foot length of cord with NEMA 460 volt, 20 amp, three phase twist-lock plug for matching receptacle.
   2. Provide standard manufacturers pump discharge anti-siphon valve.
   3. Filter housing, as manufactured by Pentair Water or approved equal, for filtering calcium hypochlorite solution on the discharge line. Filter shall be constructed of durable polypropylene or a clear FDA-compliant Styrene-Acrylonitrile (SAN). Filter shall be equipped with 3/4-inch NPT inlet and outlet ports and will also have two corresponding ball valves in order to remove filter for servicing.
   4. Flexible Suction and Discharge Line: provide clear, lightweight ozone resistant PVC tubing, 1/2 and 3/4 inch ID, reinforced with spiraled polyester yarn to reduce elongation under pressure. Certified NSF-61 and rated for working pressure of 250 psig at 70 degrees F and burst pressure of 1000 psig at 70 degrees F.

2.03 ACCESSORIES

A. Spill Containment Pallet:
   1. Manufacturers: New Pig, Model No. PAK606, or approved equal
   2. Performance/design criteria: Minimum 66 gallon sump capacity and 3000 lb. load capacity. Complies with regulatory citations: 40CFR 112.7, 40CFR 122.26, 40CFR 264.175
   3. Materials: Linear low density polyethylene pallet without drain

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate and conditions are ready to accept work of this section as required by the manufacturer.

B. Beginning of installation means installer accepts existing substrate and conditions.

3.02 INSTALLATION

A. Mount and install treatment system and accessories in accordance with manufacturer’s installation instructions and approved shop drawings.

B. Pumps and piping runs shall be braced, properly supported, neat and orderly in appearance and parallel to walls and floors where possible.

3.03 MANUFACTURER’S FIELD SERVICE

A. Provide manufacturer’s field services under provisions of Section 017500.

B. Manufacturer shall provide a trained service technician for one day per unit to verify proper installation, to start the system and to demonstrate operation of the unit to the Owner’s designated representatives.

C. Schedule demonstration with the Owner.

3.04 STARTUP

A. Provide manufacturer's representative for calibration and 4 hour startup of chemical feed systems. Submit written report from manufacturer’s representative covering inspection and startup of installed system.

B. Prime suction and discharge line.

C. Demonstrate system operation to Owner.

3.05 PROTECTION

A. Protect finished work under provisions of Section 016500.

B. Protect system and equipment from damage until project is accepted by the Owner.

END OF SECTION 444416

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Active mixing system for storage tank and accessories.

1.02 REFERENCES

A. NSF/ANSI Standard 61.

1.03 SUBMITTALS

A. Submit under provision of Section 013300.

B. Product data: provide data on mixing system and all associated accessories.

C. Shop drawing of unit and all accessory installations.

D. Computational Fluid Dynamics (CFD) modeling including:
   1. The average flow induced throughout the tank.
   2. The corresponding average turnover for the tank (in hours)
   3. The corresponding average power consumption of the mixer.

E. Manufacturer's certificate: certify that manufacturer's product meets or exceeds specified requirements.

1.04 WARRANTY

A. Manufacturer's warranty: Materials shall be free of defects in material and workmanship for a period of five (5) years from the date of installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. SolarBee, Inc. of Dickinson, ND

B. Or specifically approved equal.

2.02 GENERAL PERFORMANCE AND FEATURES

A. Mixer shall be of submersible type and shall continuously mix water storage tank such that all temperatures converge within 2°F within 48 hours after mixing system installation. All temperatures shall remain within 2°F thereafter during continuous operation.

B. Mixer shall be able to be installed through a maximum 24"Ø hatch, and not require any major welding operations or structural changes to the existing storage tank.

C. Mixer shall be of Type 316 stainless steel construction.

D. Motor shall be water lubricated, direct-drive operated, low voltage, and designed for continuous submersible operation.

E. Submersible mixer shall be able to sit within tank without any additional bracing or supports, and shall not damage any interior coatings during operation.

F. Submersible mixer shall be NSF/ANSI 61 approved.

2.03 POWER REQUIREMENTS AND CONTROLS

A. Motor control box shall be a NEMA 4X enclosure.

B. Motor controller box shall have a manual speed controller, built in current overload and thermal shut-off protection, and green and red LED indicating lights showing motor status.

C. Additional SCADA control board with digital output signals indicating motor running, and motor fault. Digital input/output signal allowing remote submersible mixer on/off control.

D. Provide all required conduit, wiring, junction boxes, etc. as required by the manufacturer for a full complete mixing system.

PART 3 - EXECUTION

3.01 DELIVERY AND STORAGE

A. Delivery of materials to the site shall be made in unopened cartons with the name of the manufacturer clearly visible on the carton.

B. Materials shall be stored in a safe, dry place.

3.02 INSTALLATION

A. Install submersible mixer, controllers, and all associated accessories as indicated in the specifications and according to manufacturer's instructions.

3.03 START-UP, TESTING, AND DEMONSTRATION

A. Start-up submersible mixer after disinfection and testing to ensure proper electrical connections.

B. Contractor shall record water temperature for a period of ten (10) consecutive days after installation and start-up of submersible mixer. Five (5) days shall be when the mixer is turned off while the last five (5) days shall be when the mixer is turned on. Temperature readings shall be in increments of ten (10) feet. Submit report to Engineer within 30 days of start-up.

C. Demonstrate operation of mixer to Owner and maintenance personal of the Water District.

END OF SECTION 464127

APPENDIX A
SOIL BORING REPORT

CARLIN • SIMPSON & ASSOCIATES, LLC

Consulting Geotechnical and Environmental Engineers

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28 June 2022

H2M Architects + Engineers
538 Broad Hollow Rd, 4th Floor East
Melville, NY 11747

Attn: Mr. John Collins, P.E.
Vice President – Dep. Manager – Water Resources

Re: Report on Subsurface Soil and Foundation Investigation
Proposed New Ground Storage Tank
64 East Winds Drive
Wading River, NY (CSA Job #22-82)

Dear Mr. Collins:

In accordance with our revised proposal dated 10 January 2023 and your subsequent authorization, we have completed a Subsurface Soil and Foundation Investigation for the referenced site. The purpose of this study was to determine the nature and engineering properties of the subsurface soil and groundwater conditions for the new construction, to recommend a practical foundation scheme, and to determine the allowable bearing capacity of the site soils.

We understand the planned construction will consist of a new ground storage tank. Site improvements will also consist of a new booster building, generator pad, and small storage building. To guide us in our study, you have provided us with plans that indicate the location of the planned construction.

Our scope of work for this project included the following:

1. Reviewed the proposed layout, the existing site conditions, the expected soil conditions, and planned this study.

2. Retained Environmental Technical Drilling Inc. to advance six (6) soil borings at the subject site.

3. Laid out the boring locations in the field, provided full time inspection of the explorations, obtained soil samples, and prepared detailed logs and a Boring Location Plan.

4. Performed soil identification tests on selected soil samples in our laboratory.

5. Analyzed the field and laboratory test data and prepared this report containing the results of this study.

1.0 SITE DESCRIPTION

The project site is located at 64 East Winds Drive in Wading River, New York. The site is currently an active construction yard for the Town of Riverhead. A small maintenance building and a salt storage building is located in the center of the site. The remainder of the site to the north consists of gravel driveways and to the south consists of a wooded area. Site grades are relatively flat.

2.0 PROPOSED CONSTRUCTION

We understand the planned construction will consist of a new 2.5-million-gallon ground storage tank. The proposed storage tank is planned in the southeast corner of the site. The proposed site grades were unknown at the time of writing this report.

Site improvements will also consist of a new booster building located to the west of the proposed ground storage tank, a new generator pad located to the north of the planned booster building, and a storage garage located in the north end of the site (near boring location B-6). The finished floor elevations of the proposed buildings and generator pad were unknown as of the date of this report. However, we anticipate that minor cuts and fills will be required to achieve the planned finished floor elevations. We anticipate that site improvements will also include new underground utilities.

The following evaluation is based on the information that has been provided to our office as of the date of this report. Once the construction plans have been further developed, a copy of the plans should be forwarded to our office so that we can review them along with the recommendations in this report. At that time, any changes or additional recommendations can be provided, if required.

3.0 SUBSURFACE CONDITIONS

To determine the subsurface soil and groundwater conditions at the site, six (6) borings were performed by Environmental Technical Drilling, Inc. at the locations shown on the enclosed Boring Location Plan. The borings were performed using hollow stem augers and split spoon sampling. Detailed boring logs have been prepared and are included in this report. The borings were completed in April 2023 under the full-time inspection of Carlin-Simpson & Associates. Our field engineer visually identified all of the soil samples obtained during the boring operations and selected samples were tested in our laboratory.

3.1 Soils

The soil descriptions shown on the boring logs are based on the Burmister Classification System. In this system, the soil is divided into three components: Sand (S), Silt ($), and Gravel (G). The major component is indicated in all capital letters, the lesser in lower case letters. The following modifiers indicate the quantity of each lesser component:

Modifier	Quantity
trace (t)	0 -10%
little (l)	10% - 20%
some (s)	20% - 35%
and (a)	35% - 50%

In addition, the Unified Soil Classification System (USCS) has been provided for each major soil stratum. The subsurface soil conditions encountered in the borings can be summarized as follows:

Stratum 1 Topsoil — At the surface in 5 of the 6 borings is topsoil that ranges from approximately 2 to 5 inches in thickness.

Stratum 2 Existing Fill — At the surface in boring B-6 and below the surface layer in the remaining borings is existing fill that generally consists of loose to medium dense brown coarse to fine SAND, little (to and) Silt, trace (to little) coarse to fine Gravel. Debris was encountered within this stratum in borings B-1, B-5, and B-6 consisting of organics, asphalt, and ash. This stratum extends to depths ranging from 2’0” to 5’0” below the existing ground surface at the boring locations.

Stratum 3 Sand [USCS: SP] — Beneath the existing fill is loose to dense brown coarse to fine SAND, trace Silt, trace (to little) coarse to fine Gravel. Each boring was terminated in this stratum at depths ranging from 25’0” to 70’0” below the existing ground surface.

3.2 Groundwater

During this investigation groundwater was not encountered in any of the borings to a depth of 70’0” below the existing ground surface. Based on the boring observations and anticipated construction, we do not expect that groundwater will be encountered during construction. However, perched or trapped water may be encountered within the existing fill, especially during wet periods. Proper groundwater control measures will be required in the event that water is encountered in site excavations.

Variations in the location of the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, and other factors not immediately apparent at the time of this exploration.

3.3 Summary of Subsurface Observations

A summary of the boring observations is provided in Table 1 below.

Table 1 – Boring Observation Summary

Boring No.	Depth to Groundwater	Depth to Bottom of Existing Fill
B-1	NE to 50'0"	2'6"
B-2	NE to 50'0"	2'6"
B-3	NE to 50'0"	2'0"
B-4	NE to 50'0"	2'0"
B-5	NE to 70'0"	2'0"
B-6	NE to 25'0"	5'0"

NE – Not Encountered

4.0 SUMMARY OF DESIGN RECOMMENDATIONS

Below is a summary of the major design and construction considerations for this project. Additional recommendations are provided in the following sections of this report.

- *Subsurface Conditions (Section 3.0)*
  - Existing fill was encountered throughout the site to depths ranging from 2'0" to 5'0" below the existing ground surface.
  - Groundwater was not encountered in any of the borings to a depth of 70'0" below the existing ground surface.
  - A summary of the subsurface observations is provided in Table 1 above.

- *Subgrade Preparation (Section 5.1)*
  - Surface materials (i.e., topsoil) must be stripped from the proposed construction areas.
  - Existing fill is not suitable for support of the proposed ground storage tank or garage storage building foundations and floor slabs.
  - Where existing fill is encountered in the proposed ground storage tank area or garage storage building area it shall be completely removed down to the virgin sand and replaced to the subgrade elevation with engineer-approved compacted fill.
  - All subgrades shall be densified with several passes of a vibrator roller prior to the placement of new structure fill or prior to the excavation of foundations.
  - New backfill shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D1557).

- *Foundation Design Recommendations (Section 5.2)*
  - Existing fill is not suitable for support of the proposed booster building or generator pad foundations. The footings for the referenced structures must be lowered to bear directly on virgin soil below the existing fill.

- All new foundations may be designed as shallow spread footing bearing on virgin soil, or engineer-approved compacted fill.
- Net design bearing pressure is 4,000 psf.
- Minimum depth for frost protection is 36 inches.
- Seismic Site Class D or Stiff Soil Profile.

- *Floor Slab Recommendations (Section 5.4)*
  - The existing fill can be densified in-place for support of the proposed floor slab for the booster building and generator pad.
  - The existing fill cannot be densified in-place for support of the proposed floor slab for the ground storage tank or garage storage building.
  - The floor slab may be designed as slab on grade.
  - Modulus of subgrade reaction is 200 pci.

5.0 EVALUATION

We understand the planned construction will consist of a new 2.5-million-gallon ground storage tank. The proposed storage tank is planned in the southeast corner of the site. The proposed site grades were unknown at the time of writing this report.

Site improvements will also consist of a new booster building located to the west of the proposed ground storage tank, a new generator pad located to the north of the planned booster building, and a storage garage located in the north end of the site (near boring location B-6). The finished floor elevations of the proposed buildings and generator pad were unknown as of the date of this report. However, we anticipate that minor cuts and fills will be required to achieve the planned finished floor elevations. A summary of the boring observations performed for the planned construction is provided in Table 1 above.

Existing fill (Stratum 2) is present throughout the site extending to depths ranging from 2’0” to 5’0” below the existing ground surface. The depth and extent of the existing fill is expected to be variable and may be deeper or shallower in unexplored areas of the site. The consistency and density of the soil fill are not predictable. Certain areas may contain clean dense soils while other areas may contain loose material, void spaces, and/or debris. The existing soil fill creates the possibility of intolerable differential settlements under loading.

Ground Storage Tank and Garage Storage Building

The existing fill present in the ground storage tank and garage storage building areas is not an acceptable bearing material for the new tank or garage storage building foundations or floor slab. We expect that a majority of the existing fill will be removed during the excavation to the ground storage tank subgrade elevation. However, existing fill in the area of the proposed garage storage building extends to a depth of 5’0” below the existing ground surface. Where existing fill is present below these structures subgrade it shall be completely removed and replaced with new compacted fill.

Provided that the ground storage tank and garage storage building areas are prepared as outlined in this report, it is our opinion that the new engineer-approved compacted fill and/or virgin soil can adequately support the planned foundations and floor slab. Recommendations for preparation of the tank and garage storage building subgrades are provided in Section 5.1. Foundations and floor slab recommendations are provided in Section 5.2 and 5.3 below, respectively.

Booster Building and Generator Pad

The existing fill is not an acceptable bearing material for the booster building or generator pad foundations. We recommend that a series of test pits be performed prior to construction to confirm the depth and extent of existing fill in the referenced areas.

The booster building and generator pad foundations shall be lowered to bear directly on the virgin sand (Stratum 3, USCS: SP) below the existing fill layer. Where loose existing fill extends beyond a depth where lowering the proposed footings is practical, it should be removed to virgin soil and replaced with new compacted fill to the planned subgrade elevation. Provided that the booster building and generator pad foundations are prepared as outlined in this report, it is our opinion that the new engineer-approved compacted fill and/or virgin soil can adequately support the planned foundations. Recommendations for preparation of the booster building and generator pad subgrades are provided in Section 5.1. Foundation recommendations can be found in Section 5.2 of this report.

In our opinion the existing fill located in the booster building and generator pad areas can be densified in place for support of the respective slabs. Floor slab recommendations are provided in Section 5.3 below.

5.1 Subgrade Preparation

All vegetation and surface materials such as asphalt and topsoil shall be removed from the planned construction areas, extending at least ten (10) feet beyond the new construction limits, where practical.

In the event that existing utilities are encountered within the planned construction areas, they should be either abandoned or rerouted around the new structures. Once the utility has been rerouted or abandoned, the section of pipe and any associated structure within the construction areas should be completely removed. The removal of the pipe and structure must also include any loose fill around the pipe or structure. After the pipe, associated structure, and associated loose backfill have been removed, the resulting excavation shall be backfilled with new controlled fill as described below in “Installation of New Structural Fill”.

Removal of Existing Fill – Ground Storage Tank and Garage Storage Building Only

As discussed above, the existing fill is not suitable for support of the ground storage tank or the garage storage building foundations or floor slab. Existing fill was encountered within the storage tank area to depths ranging from 2’0” to 2’6” below the existing ground surface. We

expect that a majority of the existing fill will be removed during the excavation to the storage tank subgrade elevation.

Existing fill was encountered in boring B-6 performed for the proposed storage garage building to a depth of 5’0” below the existing ground surface. Where existing fill is present below the planned subgrade elevation of both the ground storage tank or garage storage building, it must be completely removed and replaced as described below.

The excavation shall extend through the existing fill, down to the virgin sand. At the bottom of the excavation, the removal of the unsuitable material shall extend horizontally beyond the structure limits a minimum distance of 1’0” plus a distance equal to the depth of the excavation below the planned foundation bearing elevation. For example, if the removal of the existing fill extends vertically 2’0” below the planned structure area, the excavation must extend horizontally a minimum of 3’0” (1’0” plus 2’0”) beyond the new structure limits at that location.

The removal of the existing fill from the ground storage tank area and garage storage building shall be performed under the full time inspection of Carlin-Simpson & Associates or a qualified geotechnical engineering firm. The on-site representative from Carlin-Simpson & Associates or a qualified geotechnical engineering firm shall direct the contractor during this operation to ensure that all of the unsuitable material has been removed from the proposed structure areas.

During the removal of the unsuitable material, the contractor should segregate the potentially re-usable existing soil/fill material from the non-reusable fill (i.e. debris and topsoil). The on-site representative from Carlin-Simpson & Associates or a qualified geotechnical engineering firm shall evaluate the suitability of the excavated materials for use as compacted fill during the excavation and prior to its re-use. Potentially usable fill should be stockpiled and covered with tarps or plastic sheeting for protection from excess moisture. Any fill material that is or becomes wet must be dried prior to its re-use.

Densification of Subgrade Soils (Proofrolling) – All Structures

After the surface materials and existing fill (where required) are removed as outlined above and prior to the placement of new structural fill, the exposed subgrade soil must be graded level shall be proofrolled with at least five (5) passes of a large vibratory drum roller (i.e. Dynapac CA 250 or equivalent). The proofrolling is necessary to densify the underlying soils. Proofrolling must be performed prior to the excavation for new foundations and/or the installation of new compacted fill in the structure areas.

A representative from Carlin-Simpson & Associates or a qualified geotechnical engineering firm shall observe the proofrolling operation. If any excessive movement is noted during the proofrolling, the soft soil shall be removed and replaced with new compacted fill. The Carlin-Simpson & Associates or a qualified geotechnical engineering firm representative shall be responsible for determining what material, if any, is to be removed and will direct the contractor during this operation. The subgrade proofrolling may be eliminated, if in the opinion of the

geotechnical engineer, the proofrolling will cause pumping or otherwise disturb the stability of the subgrade.

Installation of New Structural Fill – All Structures

Where new fill is required to achieve final grades, it shall consist of either suitable on-site soil or imported sand and gravel. The new fill shall be placed in layers not exceeding one (1) foot in thickness and each layer shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D1557). Each layer must be compacted, tested, and approved by the Carlin-Simpson & Associates or a qualified geotechnical engineering firm field representative prior to placing subsequent layers. The suitability of the excavated soil for reuse as compacted structural fill is discussed in Section 6.3 below.

If imported structural fill is required during construction, the imported structural fill shall meet the following specified gradation:

US Standard Sieve Size	Percent Finer by Weight
3 inch	100
No. 4	30-80
No. 40	10-50
No. 200	0-20

5.2 New Foundations

Once the planned structure areas have been prepared as described in Section 5.1 above, the new foundations may be constructed on the virgin site soils and/or new compacted fill. Foundation design parameters for all structures can be found below in Table 2.

Booster Building and Generator Pad

The booster building and generator pad foundations may be designed as shallow foundations lowered to bear on virgin soils. Borings were not performed for the booster building or generator pad. However, existing fill in the vicinity of the planned building and pad areas extend to depths ranging from 2’0” to 2’6” below the existing ground surface. We recommend that a series of test pits be performed prior to construction to confirm the depth of existing fill.

Alternatively, where lowering the footings to bear on virgin soil is not practical, the existing fill can be completely removed from beneath the “zone of influence” of the new building and pad foundations and replaced with new engineer-approved compacted fill to the planned subgrade elevation. At the bottom of the excavation, the removal of the existing fill shall extend horizontally beyond the foundation footprint a minimum distance equal to the depth of the excavation below the planned foundation bearing elevation on each side of the foundation. For example, if the removal of the existing fill extends vertically two (2) feet below the planned footing bearing elevation, the excavation must extend horizontally a minimum of three (3) feet (1 foot plus 2 feet) beyond the new footing limits at that location. Once the existing fill is completely removed, as described, it can then be backfilled to the planned subgrade elevation as

described in Section 5.1 “Installation of New Structural Fill”. The foundation design parameters in Table 3 below shall be used for design.

Ring Wall Foundation – Ground Storage Tank

We understand that the ground storage tank foundation will likely be designed utilizing a ring-wall foundation. The new tank foundations may be designed as a shallow spread foundation bearing on virgin soil or engineer-approved compacted fill using the net design bearing pressures in Table 3 below.

The ringwall foundation design must also consider the potential overturning of the tank caused by wind loads. The movement of the tank under wind loading must be computed and the foundation must be designed to withstand that load. For a ringwall foundation, the resistance to overturning is provided by the weight of the footing and the soil above the footing. The backfill placed above the new footings must consist of a dense graded aggregate (DGA). This backfill shall be installed in loose layers not exceeding one (1) foot in thickness and each layer shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D-1557). The DGA shall meet the following gradation:

US Standard Sieve Size	Percent Finer By Weight
1 ½ inch	100
¾ inch	55-90
No. 40	25-50
No. 50	5-20
No. 200	3-10

The proper placement of new fill within the tank area and adjacent to the ringwall foundation is critical to the performance of the tank and for minimizing settlement. Carlin-Simpson & Associates or qualified geotechnical engineering firm must be retained to monitor and test the placement of fill within the tank area and adjacent to the ringwall foundations.

The soil within the tank area, adjacent to the ringwall, will exert a horizontal pressure against the ringwall. This pressure is based on the soil density and coefficient of earth pressure at rest (k_o), which is applicable to non-yielding walls. Values for these parameters can be found in Table 2 below.

Table 2 – Ringwall Foundation Earth Pressures Design Parameters

Soil Type	**On-Site Soils**
Moist Unit Weight (γ)	130 pcf
Friction Angle (ϕ, deg)	30
Cohesion (c, psf)	0
Coefficient of Earth Pressure at Rest (k_o)	0.5
Coefficient of Passive Earth Pressure (k_p)	3.0
Equivalent Fluid Pressure*	162.5 psf/ft
Foundation Sliding Coefficient	0.45

(*) – A factor of safety of 2.5 is applied.

Foundation Design Parameters – All Structures

All new structure foundations may be designed as shallow spread footings using net design bearing pressures as listed in Table 3 below. All of the exterior footings shall bear at the minimum depth listed below for protection from frost. Interior column footings may bear on the virgin soil or new structural fill just below the floor slab provided the structure is heated during winter. The footings shall have minimum dimensions as listed below.

Table 3 – Foundation Design Parameters

Description	Value
Foundation Bearing Material	Virgin Soil/ New Compacted Fill
Net Design Bearing Pressure	4,000 psf
Minimum Frost Depth	36 inches
Minimum Column Dimension	30 inches
Minimum Wall Dimension	18 inches

The excavations for the new foundations shall be performed under the full-time inspection of Carlin-Simpson & Associates or a qualified geotechnical engineering firm. The on-site representative shall confirm that the foundation bearing material is capable of supporting the design bearing pressure.

Prior to the placement of formwork, reinforcement steel, and concrete, the bearing subgrade soil shall be cleaned of all loose soil and where soil is encountered at the subgrade elevation, it shall be compacted with several passes of a small vibratory drum trench compactor (i.e. Wacker Model RT560), a heavy vibratory plate tamper (i.e. Wacker BPU 3545A or equivalent), or "jumping jack" style tamper (i.e. Wacker Model BS 600). This must be performed under the observation of Carlin-Simpson & Associates or a qualified geotechnical engineering firm. If instability is observed during the compaction of the bearing subgrade, the soft soil shall be removed and replaced with new compacted fill.

5.3 Floor Slab on Grade

New fill for the floor slab shall consist of either suitable on-site soil or imported sand and gravel. In the event that imported sand and gravel is required it should meet the gradation provided in "Installation of New Structural Fill" in Section 5.1. The new fill shall be placed in layers not exceeding one (1) foot in loose thickness and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557). Fill layers shall be compacted, tested, and approved before placing subsequent layers.

Slab Subgrade Preparation – Booster Building and Generator Pad Only

In our opinion, the existing fill can be adequately compacted in place to support the new floor slab for the booster building and generator pad. During the preparation of subgrade for the structure area, if instability is noted by Carlin-Simpson & Associates or qualified geotechnical

engineer, the existing fill may be partially removed and replaced with new compacted fill for support of the new floor slab.

Slab on Grade Design Recommendations – All Structures

The structure floor slab may be designed as a slab on grade bearing on densified virgin soil, new engineer-approved structural fill or engineered approved densified existing fill. Floor slab design parameters are provided in Table 4 below. A layer of 3/4-inch crushed stone is recommended beneath the concrete slab for additional support and drainage.

Table 4 – Floor Slab Design Parameters

Description	Value
Slab Subgrade Material	Virgin Soil/ New Structural Fill/ **Densified Existing Fill
Modulus of Subgrade Reaction (k)	200 pci
Crushed Stone Cushion Thickness	6 inches

(**) – Booster Building and Generator Pad Only

5.4 Settlement

Settlement of individual footings, designed in accordance with recommendations presented in this report, is expected to be within tolerable limits for the proposed structures. For footings placed on natural soils or new compacted fill approved by Carlin-Simpson & Associates or a qualified geotechnical engineering firm and constructed in accordance with the requirements outlined in this report, maximum total settlement is expected to be on the order of 1-inch or less. Maximum differential settlement between adjacent columns or load bearing walls is expected to be ½-inch or less.

The above settlement values are based on our engineering experience with similar soil conditions and the anticipated structural loading. These estimated settlements are intended to guide the structural engineer with their design. It is critical that Carlin-Simpson & Associates or a qualified geotechnical engineer be retained to observe the foundation bearing surfaces and to confirm the recommended bearing pressures during construction.

5.5 Site Seismic Design Considerations

From site-specific test boring data, the Site Class was determined from Building Code of New York State Section 1613.2.2. The site-specific data used to determine the Site Class typically includes soil test borings to determine Standard Penetration resistances (N-values). Based on estimated average N-values in the upper 100 feet of soil profile, the site can be classified as Site Class D – Stiff Soil Profile.

New structures should be designed to resist stress produced by lateral forces computed in accordance with Section 1613 of the Building Code of New York State. The values in Table 5 shall be used for this project.

Table 5 – Seismic Design Values

Description	Value
Mapped Spectral Response Acceleration for Short Periods, [Fig 1613.2.1 (1)]	S_S=0.179g
Mapped Spectral Response Acceleration at 1-Second Period, [Fig 1613.2.1 (2)]	S_1=0.050g
Site Coefficient [Table 1613.2.3 (1)]	F_a= 1.60
Site Coefficient [Table 1613.2.3 (2)]	F_v= 2.40
Max Considered Earthquake Spectral Response for Short Periods [Eq 16-36]	S_{MS}=0.286g
Max Considered Earthquake Spectral Response at 1-Second Period [Eq 16-37]	S_{M1}=0.119g
Design Spectral Response Acceleration for Short Periods [Eq 16-38]	S_{DS}=0.190g
Design Spectral Response Acceleration for 1-Second Period [Eq 16-39]	S_{D1}=0.080g

We expect that the proposed buildings and ground storage tank will be an essential facility with a Risk Category of IV. Based on this assumption, the Seismic Design Category (SDC) is C. The Risk Category and SDC should be verified by the project structural engineer. In the event that the structure has a different Risk Category, the SDC should be updated in accordance with Section 1613 of the New York State Building Code.

6.0 SITE EVALUATION

Our recommendations for the proposed site development including new utilities, temporary excavation and bracing, and suitability of the existing site soils for reuse are provided below. A summary of the boring observations is provided in Table 1 above.

6.1 Utilities

New utilities may bear in the densified existing fill, virgin site soils, and new compacted fill. The bottom of all trenches should be excavated clean and shaped so a hard bottom is provided for the pipe support. If any soft or unsuitable soil conditions are encountered during construction, the unsuitable materials must be removed and replaced with new compacted fill.

For areas where existing fill is encountered within the utility excavations, the subgrade at bottom of the utility excavation shall be compacted in place with a vibratory drum trench compactor or “jumping jack” style tamper. Carlin-Simpson & Associates or a qualified geotechnical engineering firm must evaluate these areas for the presence of soft or unsuitable material within the existing fill matrix. If instability is observed, portions of this fill may have to be removed and replaced with new compacted fill. Carlin-Simpson & Associates or a qualified geotechnical engineering firm will determine this during construction.

In the event that the trench bottom becomes soft due to the inflow of surface or trapped water, the soft soil shall be removed and the excavation filled with a minimum of six (6) inches of 3/4-inch clean crushed stone to provide a firm base for support of the pipe. Sump pits and pumps should be adequate to keep the excavations dry.

After the utility is installed, the trench must be backfilled with compacted fill. The fill shall consist of suitable on-site soil or imported sand and gravel. In the event that imported fill in

required, it shall meet the gradation provide in Section 5.3 “Installation of New Structural Fill” above. Controlled compacted fill shall be placed in one (1) foot loose layers and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D-1557). The backfill must be free of topsoil and debris.

6.2 Temporary Construction Excavations and Excavation Protection

Temporary construction excavations shall be conducted in accordance with the most recent OSHA guidelines or applicable federal, state or local codes. A qualified person should evaluate the excavations at the time of construction to determine the appropriate soil type and the allowable slope configuration. Based on the boring data, we believe the site soil would have the following classifications as defined by the OSHA guidelines.

Soil Type	Possible Classification	Maximum Slope or Bench
Existing Fill	“C”	1½H:1V
Virgin Soil	“B” or “C”	1H:1V or 1½H:1V

Temporary support (i.e., trench boxes, sheeting and shoring, etc.) should be used for any excavation that cannot be sloped or benched in accordance with the applicable regulations, where necessary to protect adjacent utilities and structures, or where saturated soils or water seepage is encountered within the excavation.

A New York State licensed professional engineer must design all temporary and permanent support systems. The contractor will select the shoring type and submit design calculations for the proposed shoring method to Carlin-Simpson & Associates for review. The soil adjacent to the temporary support system will exert a horizontal pressure against the system. This pressure is based on the soil unit weight, coefficient of active earth pressure, and depth of the excavation. Support of Excavation design parameters are listed in Table 6 below.

Table 6 – Temporary Sheeting and Shoring Design Parameters

Description	Value
Moist Unit Weight (pcf)	130
Friction Angle (ϕ, deg)	30
Cohesion (c, psf)	0
Active Earth Pressure Coefficient (k_a)	0.33
Equivalent Fluid Pressure (pcf)	42.9
Passive Earth Pressure Coefficient (k_p)	3.0

6.3 Suitability of the In-Situ Soils for Use as Compacted Fill

The suitability of each soil stratum for use as compacted fill is discussed below.

Stratum 1 Topsoil

Topsoil is not suitable for use as compacted fill. During the stripping operation, it may be stockpiled on site for later use in the landscaped areas or removed from the site.

Stratum 2 Existing Fill

The existing fill generally consists of loose to medium dense brown coarse to fine SAND, little (to and) Silt, trace (to little) coarse to fine Gravel.

Debris was encountered in borings B-1, B-5, and B-6 within this stratum consisting of organics, asphalt, and ash. In order for the existing fill to be used as compacted fill, the debris within the existing fill stratum must be removed prior to reuse. A screener may be required to remove the debris. In some cases, a screener may not be able to remove all debris. If all debris cannot be removed from the existing fill, the material will not be suitable for reuse as compacted fill.

The existing fill contains a moderate to high percentage of silt and will be moisture sensitive. When this material becomes wet, it will be difficult to reuse.

The existing fill is generally suitable for reuse as compacted fill provided that it remains relatively dry for optimum compaction and that any debris, or organic material has been removed prior to its reuse.

Stratum 3 Sand [USCS: SP]

The virgin site soils consist of brown coarse to fine SAND, trace Silt, trace (to little) coarse to fine Gravel. The virgin site soils are suitable for reuse as compacted fill.

The boring data indicates that the on-site soils contain a varying of silt (3% to 45%). The moderate to high silt content soils may be moisture sensitive, particularly some of the existing fill. If the soil becomes too wet, it will be difficult to achieve adequate compaction.

Proper moisture conditioning of the soil will be required. New compacted fill should be within 2% (+/-) of its optimum moisture content at the time of placement. In the event that the on-site material is too wet at the time of placement and cannot be adequately compacted, the soil should be aerated and allowed to dry or the material removed and a drier cleaner fill material used. In the event that the on-site material is too dry at the time of placement and cannot be adequately compacted, water may be needed to increase the soil moisture content for proper compaction.

The in-situ soils which exist throughout the site may become soft and weave if exposed to excessive moisture and construction traffic. The instability will occur quickly when exposed to these elements and it will be difficult to stabilize the subgrade. We recommend that adequate site

drainage be implemented early in the construction schedule and if the subgrade becomes wet, the contractor should limit construction activity until the soil has dried.

The minimum compaction requirements for the various areas of the site are summarized in Table 7 below.

Table 7 – Minimum Compaction Requirements

Area	Maximum Modified Dry Density (ASTM D-1557)
Below Foundations	95%
Above Ring Wall Foundations	95%
Below Floor Slab	92%
Pavement Areas	92%
Exterior Slabs and Sidewalks	92%
Utility Trenches	92%
Landscape Areas (non-sloped)	90%

Debris Fill and Potential Environmental Concerns

Debris was encountered within the existing fill stratum during this subsurface investigation. Debris must be removed from the existing fill in order to be reused as structural fill onsite. In some cases, a screener cannot remove all debris from the existing fill sufficiently enough to be reused. In that case, the material would need to be reused in non-structural areas onsite or be hauled off site. The possibility of not being able to reuse all of the existing fill material should be taken into consideration by the project team. This should also be included in the project specifications.

In the event that the debris material needs to be hauled off site, environmental testing will likely be required to export the debris fill material. An environmental evaluation of the site was beyond the scope of this study. Proper disposal of all soil and water must be performed in accordance with applicable federal and state regulations. An environmental engineering firm should be retained by the owner to address these potential issues. The possibility of having to haul off possible contaminated materials should be taken into consideration by the project team.

7.0 GENERAL

The findings, conclusions and recommendations presented in this report represent our professional opinions concerning subsurface conditions at the site. The opinions presented are relative to the dates of our sitework and should not be relied on to represent conditions at later dates or at locations not explored. The opinions included herein are based on information provided to us, the data obtained at specific locations during the study and our past experience. If additional information becomes available that might impact our geotechnical opinions, it will be necessary for Carlin-Simpson & Associates to review the information, reassess the potential concerns, and re-evaluate our conclusions and recommendations.

Regardless of the thoroughness of a geotechnical exploration, there is the possibility that conditions between borings and test pits will differ from those encountered at specific boring or test pit locations, that conditions are not as anticipated by the designers and/or the contractors, or that either natural events or the construction process have altered the subsurface conditions. These variations are an inherent risk associated with subsurface conditions in this region and the approximate methods used to obtain the data. These variations may not be apparent until construction.

The professional opinions presented in this geotechnical report are not final. Field observations and foundation installation monitoring by the geotechnical engineer, as well as soil density testing and other quality assurance functions associated with site earthwork and foundation construction, are an extension of this report. Therefore, Carlin-Simpson & Associates should be retained by the Owner to observe all earthwork and foundation construction, to document that the conditions anticipated in this study actually exist, and to finalize or amend our conclusions and recommendations Carlin-Simpson & Associates is not responsible or liable for the conclusions and recommendations presented in this report if Carlin-Simpson & Associates does not perform the observation and testing services.

Therefore, in order to preserve continuity in this project, the Owner shall retain the services of Carlin-Simpson & Associates to provide full time geotechnical related monitoring and testing during construction. At a minimum, this shall include the observation and testing of the following: 1) the removal of existing fill and unsuitable soil, where required; 2) the proofrolling of the subgrade soil prior to the placement of new compacted fill; 3) the placement and compaction of controlled fill; 4) the excavations for the new foundations; and 5) the preparation of the subgrade for the floor slab and pavement areas.

This report has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty is expressed or implied. The evaluations and recommendations presented in this report are based on the available project information, as well as on the results of the exploration. Carlin-Simpson & Associates should be given the opportunity to review the final drawings and site plans for this project to determine if changes to the recommendations outlined in this report are needed. Should the nature of the project change, these recommendations should be re-evaluated.

This report is provided for the exclusive use of H2M Architects + Engineers and the project specific design team and may not be used or relied upon in connection with other projects or by other third parties. Carlin-Simpson & Associates disclaims liability for any such third-party use or reliance without express written permission. Use of this report or the findings, conclusions or recommendations by others will be at the sole risk of the user. Carlin-Simpson & Associates is not responsible or liable for the interpretation by others of the data in this report, nor their conclusions, recommendations or opinions.

If the conditions encountered during construction vary significantly from those stated in this report, this office should be notified immediately so that additional recommendations can be made.

Thank you for allowing us to assist you with this project. Should you have any questions or comments, please contact this office.

Very truly yours,

CARLIN-SIMPSON & ASSOCIATES, LLC

CATHERINE K. ANDERSEN, P.E.
Project Engineer

ROBERT B. SIMPSON, P.E.
Principal

File No. 22-82

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-1

Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**								**SHEET NO.:**	1 of 3
Client:	**H2M Architects + Engineers**								**JOB NUMBER:**	22-82
Drilling Contractor:	**Environmental Technical Drilling, Inc.**								**ELEVATION:**	-
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	-
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	3/Apr/23
No Groundwater Encountered				**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	3/Apr/23
				WGHT		**140#**			**DRILLER:**	SP
				FALL		**30"**			**INSPECTOR:**	JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			5		**Topsoil** 0'2"	
1		**S-1**	5		**FILL (Dark gray, brown coarse to fine**	Rec = 13"
			5		**SAND, little (+) Silt, little coarse to fine**	moist
2			5		**Gravel, with asphalt)**	
			3		2'6"	
3		**S-2**	4			Rec = 22"
			4		Lt br cf S, t $, t cf G	moist
4			5			
			4			
5		**S-3**	5		same, l cf G	Rec = 9"
			9			moist
6			8			
			6			
7		**S-4**	8		same, t (-) $, t (+) mf G	Rec = 15"
			6			moist
8			8			
			6			
9		**S-5**	8		same, t cf G	Rec = 16"
			7			moist
10			8		**Light brown coarse to fine SAND,**	
					trace Silt, trace coarse to fine Gravel	
11					**[USCS: SP]**	
12						
13						
			4			
14		**S-6**	3		same	Rec = 19"
			4			moist
15			5			
16						
17						
18						
			6			
19		**S-7**	7		same	Rec = 16"
			10			moist
20			10			
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-1
Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**	**SHEET NO.:** 2 of 3
Client:	**H2M Architects + Engineers**	**JOB NUMBER:** 22-82

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
			5			
24		S-8	7		Lt br cf S, t $, l (-) cf G	Rec = 20"
			7			moist
25			9			
26						
27						
28						
			6			
29		S-9	8		same	Rec = 17"
			11			moist
30			12			
31						
32						
33					**Light brown coarse to fine SAND, trace Silt, little (-) coarse to fine Gravel [USCS: SP]**	
			6			
34		S-10	8		same	Rec = 20"
			13			moist
35			13			
36						
37						
38						
			7			
39		S-11	12		same	Rec = 14"
			14			moist
40			14			
41						
42						
43						
			9			
44		S-12	12		same	Rec = 24"
			13			moist
45			16			
46						
47						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-1
Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**	**SHEET NO.:** 3 of 3
Client:	**H2M Architects + Engineers**	**JOB NUMBER:** 22-82

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
48					**Light brown coarse to fine SAND,**	
			13		**trace Silt**	
49		**S-13**	13		**[USCS: SP]**	Rec = 16"
			13		Lt br cf S, t $	moist
50			19		50'0"	
					End of Boring @ 50'0"	
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						
64						
65						
66						
67						
68						
69						
70						
71						
72						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-2
Project: Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY		**SHEET NO.:** 1 of 3
Client: H2M Architects + Engineers		**JOB NUMBER:** 22-82
Drilling Contractor: Environmental Technical Drilling, Inc.		**ELEVATION:** -

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	**DATUM:** -
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			**START DATE:** 3/Apr/23
No Groundwater Encountered				DIA.	3 1/4"	1 3/8"			**FINISH DATE:** 3/Apr/23
				WGHT		140#			**DRILLER:** SP
				FALL		30"			**INSPECTOR:** JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Topsoil** 0'5"	
1		**S-1**	2		FILL (Gr, br cf S, a $, l cf G)	Rec = 10"
			3		**FILL (Gray, brown coarse to fine SAND,**	moist
2			5		**and Silt, little coarse to fine Gravel)**	
			3		2'6"	
3		**S-2**	5		Lt br cf S, t $	Rec = 10"
			6			moist
4			6			
			6			
5		**S-3**	12		same	Rec = 14"
			12			moist
6			12			
			8			
7		**S-4**	9		same, l (-) cf G	Rec = 17"
			9			moist
8			10			
			7			
9		**S-5**	8		same	Rec = 14"
			6			moist
10			8		**Light brown coarse to fine SAND,**	
					trace Silt	
11					**[USCS: SP]**	
12						
13						
			4			
14		**S-6**	5		same	Rec = 20"
			5			moist
15			5			
16						
17						
18						
			3			
19		**S-7**	5		same	Rec = 16"
			4			moist
20			6			
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-2
Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**	**SHEET NO.:** 2 of 3
Client:	**H2M Architects + Engineers**	**JOB NUMBER:** 22-82

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
			7			
24		**S-8**	10		Lt br cf S, t $, t cf G	Rec = 15"
			9			moist
25			13			
26						
27						
28						
			6			
29		**S-9**	9		same	Rec = 19"
			10			moist
30			13			
31						
32						
33					**Light brown coarse to fine SAND, trace Silt, trace coarse to fine Gravel [USCS: SP]**	
			6			
34		**S-10**	10		same, l cf G	Rec = 20"
			10			moist
35			14			
36						
37						
38						
			6			
39		**S-11**	11		same	Rec = 17"
			13			moist
40			16			
41						
42						
43						
			8			
44		**S-12**	8		same	Rec = 21"
			10			moist
45			12			
46						
47						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-2
Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**	**SHEET NO.:** 3 of 3
Client:	**H2M Architects + Engineers**	**JOB NUMBER:** 22-82

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
48					**Light brown coarse to fine SAND,**	
			11		**trace Silt, trace coarse to fine Gravel**	
49		**S-13**	13		**[USCS: SP]**	Rec = 20"
			14		Lt br cf S, t $, t cf G	moist
50			18		50'0"	
					End of Boring @ 50'0"	
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						
64						
65						
66						
67						
68						
69						
70						
71						
72						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-3
Project: Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY		**SHEET NO.:** 1 of 3
Client: H2M Architects + Engineers		**JOB NUMBER:** 22-82
Drilling Contractor: Environmental Technical Drilling, Inc.		**ELEVATION:** -

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	**DATUM:** -
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			**START DATE:** 4/Apr/23
No Groundwater Encountered				DIA.	3 1/4"	1 3/8"			**FINISH DATE:** 4/Apr/23
				WGHT		140#			**DRILLER:** SP
				FALL		30"			**INSPECTOR:** JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3		**Topsoil** 0'2"	
1		**S-1**	4		**FILL (Brown coarse to fine SAND,**	Rec = 12"
			4		**some Silt, little coarse to fine Gravel)**	moist
2			5		FILL (Br cf S, s $, l cf G) 2'0"	
			5			
3		**S-2**	5		Lt br cf S, t $, s (-) cf G	Rec = 13"
			8			moist
4			7			
			11			
5		**S-3**	9		same, l (-) cf G	Rec = 18"
			10			moist
6			9			
			9			
7		**S-4**	8		same	Rec = 20"
			7			moist
8			7			
			5			
9		**S-5**	5		same, t (+) cf G	Rec = 15"
			4			moist
10			7		**Light brown coarse to fine SAND,**	
					trace Silt, some (-) coarse to fine Gravel	
11					**[USCS: SP]**	
12						
13						
			3			
14		**S-6**	4		same	Rec = 20"
			5			moist
15			6			
16						
17						
18						
			3			
19		**S-7**	6		same	Rec = 20"
			9			moist
20			9			
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-3
Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**	**SHEET NO.:** 2 of 3
Client:	**H2M Architects + Engineers**	**JOB NUMBER:** 22-82

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
			5	■		
24		S-8	6	■	Lt br cf S, t $, t (+) cf G	Rec = 20"
			6	■		moist
25			7	■		
26						
27						
28						
			4	■		
29		S-9	5	■	same	Rec = 19"
			8	■		moist
30			10	■		
31						
32						
33					**Light brown coarse to fine SAND, trace Silt, trace (+) coarse to fine Gravel [USCS: SP]**	
			6	■		
34		S-10	9	■	same	Rec = 20"
			10	■		moist
35			12	■		
36						
37						
38						
			8	■		
39		S-11	8	■	same	Rec = 19"
			15	■		moist
40			17	■		
41						
42						
43						
			6	■		
44		S-12	9	■	same	Rec = 17"
			10	■		moist
45			12	■		
46						
47						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-3
Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**	**SHEET NO.:** 3 of 3
Client:	**H2M Architects + Engineers**	**JOB NUMBER:** 22-82

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
48					**Light brown coarse to fine SAND,**	
			8		**trace Silt, trace (+) coarse to fine Gravel**	
49		**S-13**	10		**[USCS: SP]**	Rec = 15"
			11		Lt br cf S, t $, t (+) cf G	moist
50			14		50'0"	
					End of Boring @ 50'0"	
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						
64						
65						
66						
67						
68						
69						
70						
71						
72						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-4

Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**								**SHEET NO.:**	1 of 3
Client:	**H2M Architects + Engineers**								**JOB NUMBER:**	22-82
Drilling Contractor:	**Environmental Technical Drilling, Inc.**								**ELEVATION:**	-
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	-
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	5/Apr/23
No Groundwater Encountered				**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	5/Apr/23
				WGHT		**140#**			**DRILLER:**	SP
				FALL		**30"**			**INSPECTOR:**	JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3		**Topsoil** 0'2"	
1		**S-1**	2		**FILL (Brown coarse to fine SAND,**	Rec = 15"
			3		**some Silt, little (-) coarse to fine Gravel)**	moist
2			4		FILL (Br cf S, s $, l (-) cf G) 2'0"	
			4			
3		**S-2**	3		Lt br cf S, t $, t (+) mf G	Rec = 12"
			3			moist
4			4			
			4			
5		**S-3**	6		same	Rec = 15"
			7			moist
6			6			
			9			
7		**S-4**	7		same	Rec = 17"
			6			moist
8			8			
			4			
9		**S-5**	5		same	Rec = 16"
			5			moist
10			4			
					Light brown coarse to fine SAND,	
11					**trace Silt, little (-) coarse to fine Gravel**	
					[USCS: SP]	
12						
13						
			3			
14		**S-6**	3		same	Rec = 15"
			5			moist
15			5			
16						
17						
18						
			4			
19		**S-7**	5		same	Rec = 14"
			7			moist
20			8			
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-4
Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**	**SHEET NO.:** 2 of 3
Client:	**H2M Architects + Engineers**	**JOB NUMBER:** 22-82

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23		**S-8**	5 6 7	■	Lt br cf S, t $, t (+) cf G	Rec = 21" moist
24			7	■		
25						
26						
27						
28						
29		**S-9**	4 6 7	■	same	Rec = 22" moist
30			9	■		
31						
32						
33					**Light brown coarse to fine SAND, trace Silt, trace (+) coarse to fine Gravel [USCS: SP]**	
34		**S-10**	4 8 9	■	same	Rec = 18" moist
35			10	■		
36						
37						
38						
39		**S-11**	5 9 10	■	same	Rec = 15" moist
40			12	■		
41						
42						
43						
44		**S-12**	6 10 15	■	same	Rec = 24" moist
45			14	■		
46						
47						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-4
Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**	**SHEET NO.:** 3 of 3
Client:	**H2M Architects + Engineers**	**JOB NUMBER:** 22-82

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
48					**Light brown coarse to fine SAND,**	
			14		**trace Silt, trace coarse to fine Gravel**	
49		**S-13**	14		**[USCS: SP]**	Rec = 20"
			15		Lt br cf S, t $, t cf G	moist
50			16		50'0"	
					End of Boring @ 50'0"	
51						
52						
53						
54						
55						
56						
57						
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60						
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71						
72						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-5
Project: Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY		**SHEET NO.:** 1 of 3
Client: H2M Architects + Engineers		**JOB NUMBER:** 22-82
Drilling Contractor: Environmental Technical Drilling, Inc.		**ELEVATION:** -

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	**DATUM:** -
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			**START DATE:** 4/Apr/23
No Groundwater Encountered				DIA.	3 1/4"	1 3/8"			**FINISH DATE:** 4/Apr/23
				WGHT		140#			**DRILLER:** SP
				FALL		30"			**INSPECTOR:** JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			1		**Topsoil** 0'4"	
1		**S-1**	2		**FILL (Brown coarse to fine SAND,**	Rec = 20"
			1		**some Silt, trace coarse to fine Gravel,**	moist
2			2		**with organics** 2'0"	
			4			
3		**S-2**	5		Lt br cf S, t $, t cf G	Rec = 14"
			7			moist
4			8			
			7			
5		**S-3**	10		same, l cf G	Rec = 12"
			9			moist
6			12			
			11			
7		**S-4**	10		same	Rec = 14"
			9			moist
8			9			
			7			
9		**S-5**	4		same	Rec = 10"
			8			moist
10			8			
11					**Light brown coarse to fine SAND,**	
					trace Silt, trace coarse to fine Gravel	
12					**[USCS: SP]**	
13						
			2			
14		**S-6**	3		same	Rec = 22"
			4			moist
15			4			
16						
17						
18						
			4			
19		**S-7**	6		same	Rec = 12"
			6			moist
20			7			
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-5
Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**	**SHEET NO.:** 2 of 3
Client:	**H2M Architects + Engineers**	**JOB NUMBER:** 22-82

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
			5			
24		S-8	7		Lt br cf S, t $, l (-) cf G	Rec = 23"
			8			moist
25			8			
26						
27						
28						
			5			
29		S-9	8		same	Rec = 18"
			10			moist
30			9			
31						
32						
33					**Light brown coarse to fine SAND, trace Silt, little (-) coarse to fine Gravel [USCS: SP]**	
			6			
34		S-10	9		same	Rec = 24"
			9			moist
35			10			
36						
37						
38						
			7			
39		S-11	9		same	Rec = 20"
			10			moist
40			12			
41						
42						
43						
			9			
44		S-12	11		same	Rec = 24"
			11			moist
45			15			
46						
47						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-5
Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**	**SHEET NO.:** 3 of 3
Client:	**H2M Architects + Engineers**	**JOB NUMBER:** 22-82

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
48						
			10			
49		S-13	12		Lt br cf S, t $, t cf G	Rec = 20"
			10			moist
50			15			
51						
52						
53						
54						
55						
56						
57					**Light brown coarse to fine SAND, trace Silt, trace coarse to fine Gravel [USCS: SP]**	
58						
			9			
59		S-14	12		same	Rec = 20"
			15			moist
60			15			
61						
62						
63						
			8			
64		S-15	12		same	Rec = 18"
			15			moist
65			20			
66						
67						
68						
			12			
69		S-16	16		same	Rec = 20"
			15			moist
70			20		70'0"	
					End of Boring @ 70'0"	
71						
72						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-6
Project: Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY		**SHEET NO.:** 1 of 2
Client: H2M Architects + Engineers		**JOB NUMBER:** 22-82
Drilling Contractor: Environmental Technical Drilling, Inc.		**ELEVATION:** -

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	**DATUM:** -
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			**START DATE:** 5/Apr/23
No Groundwater Encountered				DIA.	3 1/4"	1 3/8"			**FINISH DATE:** 5/Apr/23
				WGHT		140#			**DRILLER:** SP
				FALL		30"			**INSPECTOR:** JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			8			
1		S-1	13		FILL (Dk gr cf S, l (+) $, l (+) cf G, w/ash, asphalt)	Rec = 12"
			12			moist
2			11			
			9			
3		S-2	5		FILL (same, gr, br s (+) $, w/organics, ash)	Rec = 16"
			5		**FILL (Dark gray coarse to fine SAND, little (+) Silt, little (+) coarse to fine Gravel, with organics, ash, asphalt)**	moist
4			4			
			4			
5		S-3	5		5'0"	Rec = 10"
			4		Lt br cf S, t $, t cf G	moist
6			5			
			5			
7		S-4	5		same	Rec = 12"
			7			moist
8			6			
			8			
9		S-5	6		same	Rec = 13"
			8			moist
10			8			
11						
					Light brown coarse to fine SAND, trace Silt, trace coarse to fine Gravel [USCS: SP]	
12						
13						
			4			
14		S-6	6		same	Rec = 10"
			4			moist
15			7			
16						
17						
18						
			4			
19		S-7	5		same	Rec = 24"
			6			moist
20			8			
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-6
Project:	**Proposed Ground Storage Tank, 64 East Winds Dr, Wading River, NY**	**SHEET NO.:** 2 of 2
Client:	**H2M Architects + Engineers**	**JOB NUMBER:** 22-82

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23					**Light brown coarse to fine SAND,**	
			7		**trace Silt, little (-) coarse to fine Gravel**	
24		**S-8**	9		**[USCS: SP]**	Rec = 15"
			9		Lt br cf S, t $, l (-) cf G	moist
25			11		25'0"	
					End of Boring @ 25'0"	
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
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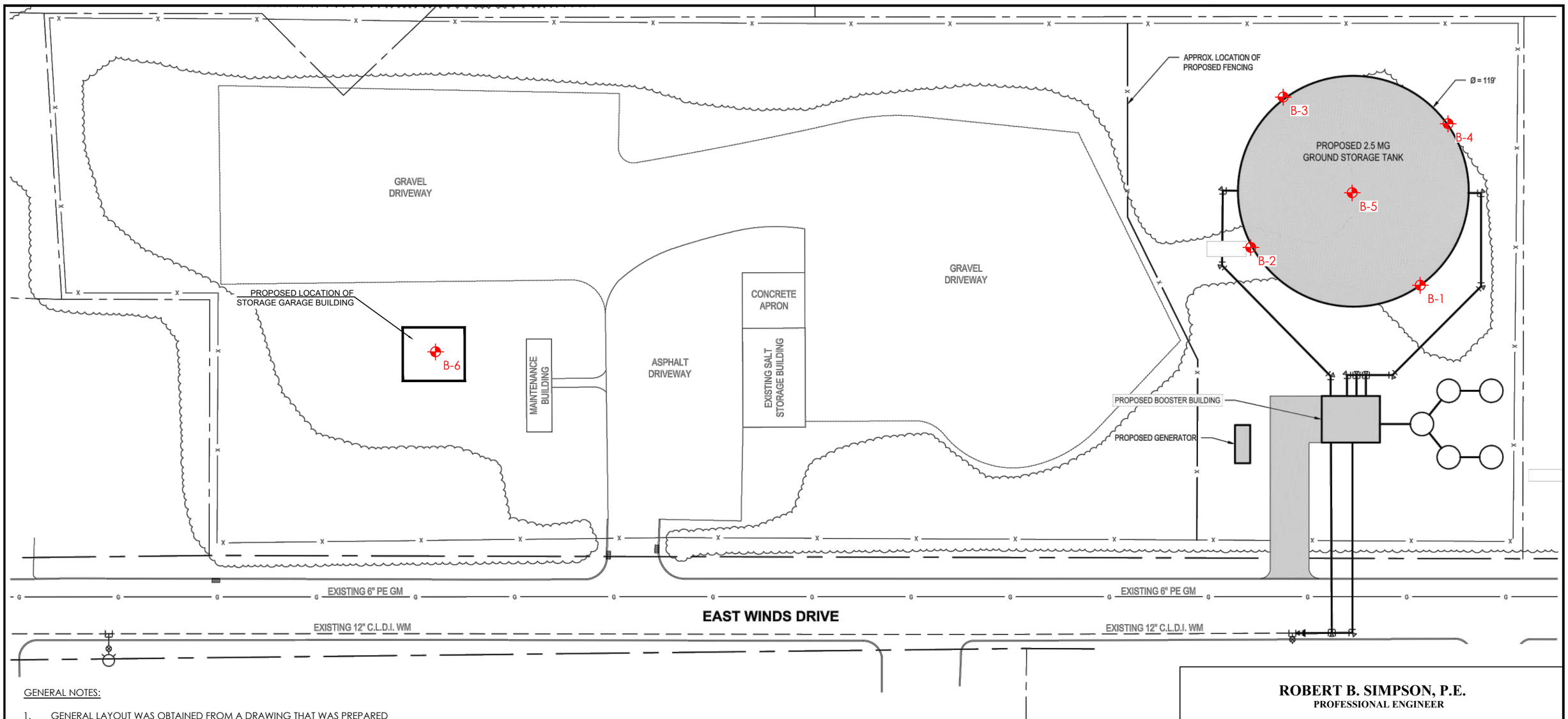


GENERAL NOTES:

1. GENERAL LAYOUT WAS OBTAINED FROM A DRAWING THAT WAS PREPARED BY H2M ARCHITECTS + ENGINEERS, ENTITLED "PRELIMINARY SITE PLAN", DATED FEBRUARY 2022.
2. BORING LOCATIONS WERE LAID OUT IN THE FIELD BY CARLIN-SIMPSON & ASSOCIATES (CSA).
3. THE BORINGS WERE PERFORMED BY ENVIRONMENTAL TECHNICAL DRILLING, INC. ON 3 & 5 APRIL 2023, UNDER THE FULL TIME INSPECTION OF CSA.
4. LOCATIONS ARE APPROXIMATE.

LEGEND:

- BORING LOCATION

ROBERT B. SIMPSON, P.E.
PROFESSIONAL ENGINEER

BORING LOCATION PLAN

PROPOSED GROUND STORAGE TANK
64 EAST WINDS DRIVE
WADING RIVER, NEW YORK

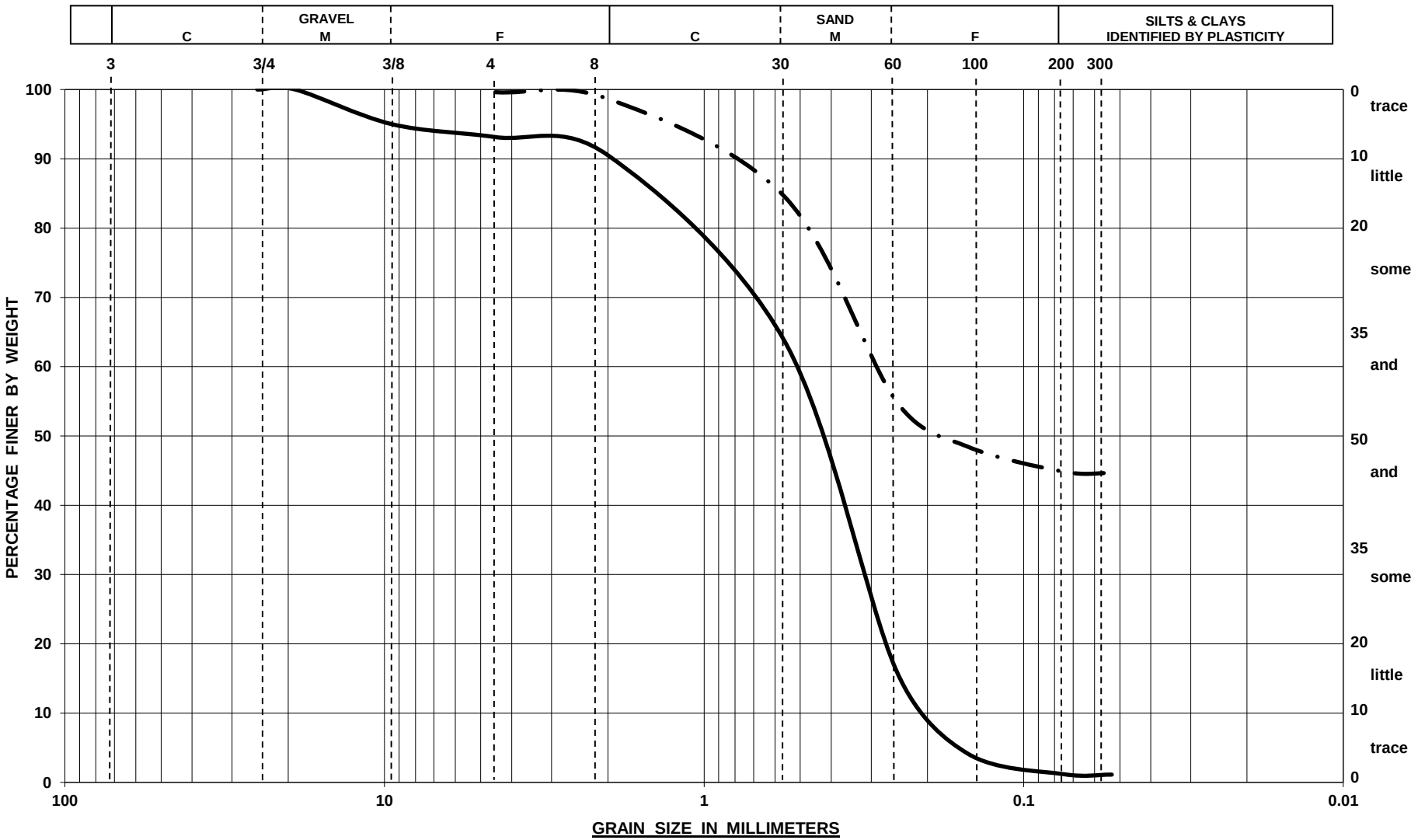
DRAWN: CKA	SCALE: 1" = 50'
CHECKED: RBS	DATE: 06.19.20203
PROJECT NO.: 22-82	DWG NO.: FIG -1
APPROVED:	

CARLIN-SIMPSON AND ASSOCIATES, LLC
61 Main Street
Sayreville, NJ 08872

Consulting Geotechnical and Environmental Engineers

CARLIN-SIMPSON & ASSOCIATES, LLC
SAYREVILLE, NJ 08872

SIEVE ANALYSIS

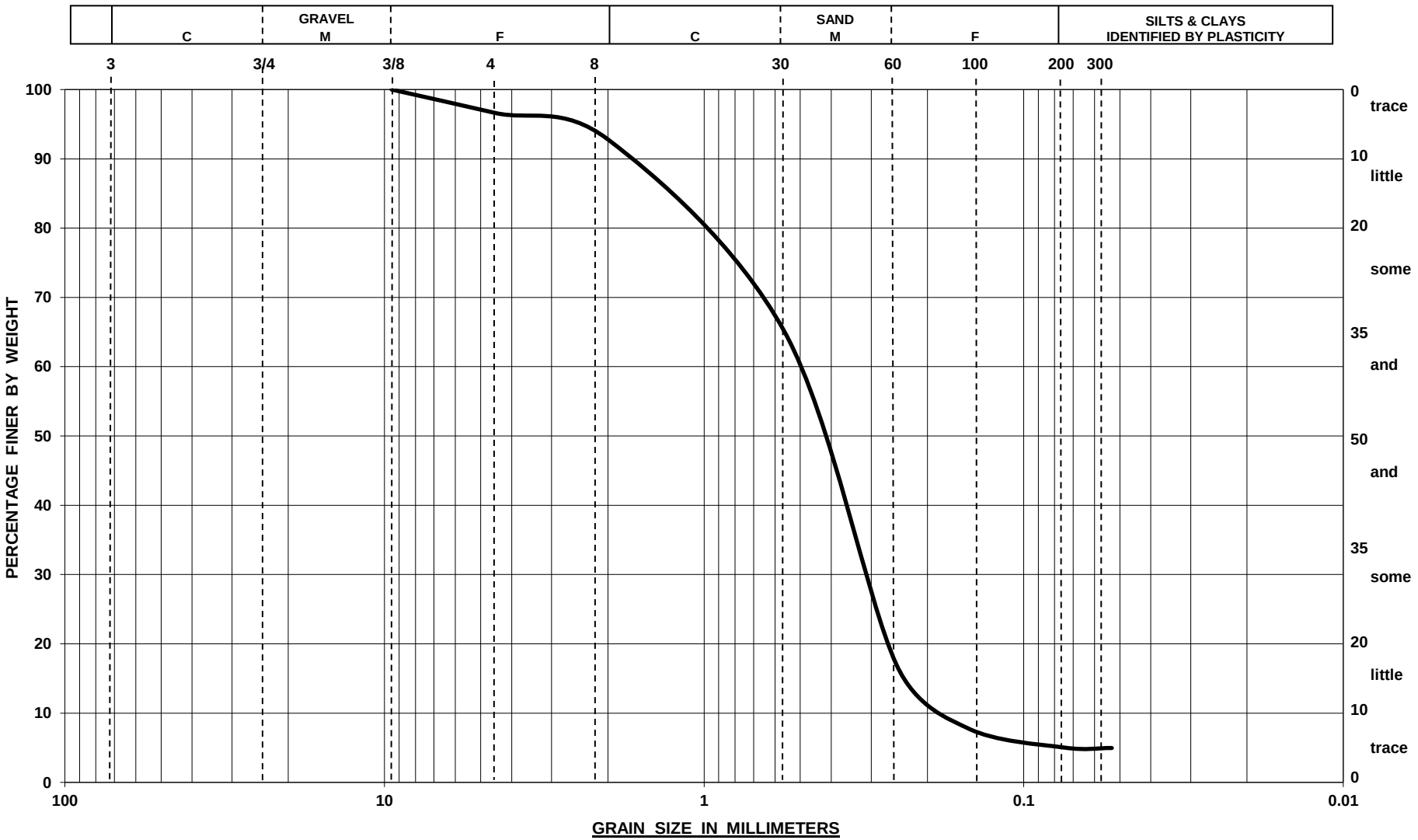


SYMBOL	BORING	SAMPLE	DEPTH	DESCRIPTION	NAT MC
———	B-1	S-4	6'-8'	Light Brown coarse to fine SAND, trace (-) Silt, trace (+) medium to fine Gravel [SP]	3.4%
— · —	B-2	S-1	0'-2'	FILL (Gray brown coarse to fine Sand, and Silt, trace (-) fine Gravel)	25.6%

PROJECT Proposed Ground Storage Tank, 64 Winds Drive, Wading River, NY **BY** BGH **DATE** 17-Apr-23 **JOB NO** 22-82

CARLIN-SIMPSON & ASSOCIATES, LLC
SAYREVILLE, NJ 08872

SIEVE ANALYSIS



SYMBOL	BORING	SAMPLE	DEPTH	DESCRIPTION	NAT MC
———	B-4	S-2	2'-4'	Light brown coarse to fine SAND, trace Silt, trace (+) medium to fine Gravel [SP]	4.7%

PROJECT Proposed Ground Storage Tank, 64 Winds Drive, Wading River, NY **BY** BGH **DATE** 17-Apr-23 **JOB NO** 22-82