PROJECT DESCRIPTION

10: GENERAL

1010 – Project Summary

- Project consists of constructing a new 3-story middle/high school building, abatement/demolition of the existing school building, temporary modular classrooms, and associated site work in Winthrop, Massachusetts.

- Approximate new school building square footage: 187,300 gsf.

- Site: Site work includes new parking areas, drives, walks, site utilities, play structures, athletic fields, and site improvements. Unsuitable soils are present and the site is adjacent to flood zone.

- Phasing: Project shall be phased as follows:
  - Modular classrooms at Cummins Elementary school site.
  - Abatement/demolition.
  - New construction and site completion.

- Sustainable Design: Project is pursuing LEED for Schools certification level - Silver.

1020 – Project Program

- Typical middle and high school classrooms, 2 administrative office suites, Kitchen, 2 cafeterias, Auditorium, Stage, Music/Performing Arts studio, Gymnasium, Locker rooms, Pre-K Lab, Television studio, Art and Music Rooms, Practice rooms, Science Rooms, Resource Labs, Viking Long Ship, OT/PT, Special Education, Nurse, Guidance, Media Center, Team Rooms, Toilet rooms, Storage, Mechanical, Learning Commons, circulation areas, and other program spaces as indicated on Drawings.

1030 – Existing Conditions

- Refer to surveys, and existing building documents.

1040 – Owner’s Work

- Owner will remove all existing furnishings and movable equipment prior to construction.

1050 – Funding

- Local and State funding through MSBA.
20: PROPOSAL, BIDDING AND CONTRACTING

2010 – Delivery Method

- Construction Manager at Risk with Trade-Contractors as required by Massachusetts Public Bid Laws; MGL Ch. 149A. Early bid packages may include site preparation, foundations, and steel.

  o Anticipated Trade Bid categories:
    - MASONRY
    - MISCELLANEOUS AND ORNAMENTAL IRON
    - WATERPROOFING, DAMPPROOFING AND CAULKING
    - ROOFING AND FLASHING
    - GLASS AND GLAZING
    - TILE
    - ACOUSTICAL TILE
    - RESILIENT FLOORS
    - PAINTING
    - ELEVATORS
    - FIRE PROTECTION
    - PLUMBING
    - HVAC
    - ELECTRICAL WORK

2020 – Qualification Requirements

- Bidders for General Construction and Trade-Bids shall be Pre-Qualified according to Massachusetts Public Bid Laws
- Bidders for General Construction and Trade-Bids shall be DCAM certified for their category of work.

2030 – Proposal Requirements: Not Applicable.

2040 – Bid Requirements

- Bidding procedures according to Massachusetts Public Bid Laws

2050 – Contracting Requirements

- Contracting procedures according to Massachusetts Public Bid Laws

30: COST SUMMARY

3010 – Elemental Cost Estimate: Refer to Study Cost Estimate.

3020 – Assumptions and Qualifications: Refer to Study Cost Estimate

3030 – Allowances: Not Applicable
3040 – Alternates:

- Indoor running track in Gymnasium.
- Renovation of the football stadium.
- Acoustic rated windows.

3050 – Unit Prices: Not Yet Determined

A. SUBSTRUCTURE

A10: FOUNDATIONS

See attached structural narrative. Waterproofing is required for the following areas: elevator pit, orchestra pit, and sump pits.

B. SHELL

B10: SUPERSTRUCTURE

See attached structural narrative.

B20: EXTERIOR ENCLOSURE

B2010 – Exterior Walls

- Exterior facing, typical: Combination of decorative CMU, architectural precast concrete, architecturally finished concrete, brick, cement fiber wall panels, and solid phenolic wall panels (Trespa).
  - Multiple colors and patterns in wall cladding will be required.
- Thermal and moisture protections: 3 inch mineral wool board insulation and self-adhered rubberized asphalt membrane air/vapor barrier.
- Waterproofing systems as indicated under A10 FOUNDATIONS herein above.
- Back-up wall: Cold-formed metal framing.
- Exterior graphic aluminum building signage.

B2020 – Exterior Windows and Louvers

- Aluminum windows, fixed and operable
- Insulating glass assembly for south and west facades: Two panes of ¼-inch glass with ½-inch argon-filled space and solar control low-e coating
- Insulating glass assembly for north and east facades: Two panes of ¼-inch glass with ½-inch argon-filled space and low-e coating
- Aluminum storm-proof louvers finished to match windows.
B2030 – Exterior Doors

• Flush aluminum doors with custom vision panels and aluminum frames, typical.
• Stile-and-rail aluminum doors with aluminum frames at vestibule.

B2040 – Curtain Wall and Storefront

• 6-inch deep framing, field glazed with insulating glass assemblies as for exterior windows.
• Aluminum sunscreen louvers mounted on curtain wall and storefront framing.

B30: ROOFING

B3010 – Roof Coverings

• PVC membrane roofing, typical: Fully adhered PVC roofing with average 5-inch-thick sloped polyisocyanurate insulation, ½-inch gypsum protection board with glass mat facing and 6-mil reinforced vapor barrier. PVC membrane roofing shall be white.
• Roof accessories: Kynar coated aluminum roof edges, scuppers, copings, flashings, and internal drains.

B3020 – Roof Openings

• Roof access hatches and ladders.
• Unit skylights.

B3030 – Miscellaneous Roof components

• Roof mounted mechanical screen wall panels, non-acoustic.
• Exterior soffit board.

C. INTERIORS

C10: INTERIOR CONSTRUCTION

C1010 – Partitions

• Type-X gypsum wallboard on 6 inch or 3-5/8-inch steel studs, typical.
• CMU: 8-inch thick, standard and center-scored, normal-weight.
  o Acoustic CMU will be required in Gymnasium.
• Shaftwall.
• Building fire separation walls.
• Ceramic tile wainscot with standard wallboard above, where indicated.

C1020 – Interior Doors

• Metal frames, typical: Formed steel.
• Wood doors, typical: Flush doors with factory-finished maple veneer and custom vision panels.
• Steel doors for mechanical and service areas.
• Door Hardware.
• Sound gasketed doors for Music suite.
• Overhead coiling doors.
• Overhead coiling grilles.
• Overhead sectional doors.
• Vertical motorized folding bi-fold doors.
• Fire shutters.
• Fire rated frames and glazing will be required where indicated.

C1030 – Fittings Specialties

• Acoustic wall panels in Auditorium, Fitness, Band, Practice, Dining, Chorale Rooms, and as indicated.
• Utility and closet shelving.
• Toilet Accessories.
• Sliding glass enclosed tackboards in Corridors.
• Markerboard and tackboards.
• Interior signage including building directory and dedication plaque.
• Solid plastic toilet partitions.
• Student, staff, and athletic, lockers.
• Custom transparent finish maple millwork including display cases, cubbies, benches, wood paneling, wood frames for tackboards, Library/Admin. Security Desks, and other indicated items.
• Building expansion joint systems.
• Fire protection specialties.
• Catwalk in Auditorium.
• OT/PT fittings.
• Loading dock bumpers.
• Decorative column covers.

C20: STAIRS

C2010 – Stair Construction
• Prefabricated steel structure
• Steel pans with concrete fill.
• Ship’s ladders

C2020 – Stair Finishes
• Steel structure and pans shop-primed for field painting.
• Rubber treads, risers and landings.

C30: INTERIOR FINISHES

C3010 – Wall Finishes
• Water-based latex system, typical: Primer with two finish coats.
• High-performance system for corridors, stairways, toilet rooms: Epoxy primer with two polyurethane finish coats.
• Ceramic tile for toilet room and kitchen wainscot: 4” square glazed tile, thin-set.

C3020 – Floor Finishes
• Rubber tile, typical.
• Stained and polished concrete where indicated.
• Ceramic tile for toilet rooms: 2” square unglazed porcelain tile, thin-set.
• Entry mat system at main vestibule and lobby: Metal grating with drained pit outside, grating with alternating vinyl and carpet treads and un-drained pit in vestibule; heavy ridged carpet tile in lobby
• Carpet for Auditorium: Broadloom, CRI Green Label carpet, adhered to concrete.
• Rubber sports surface tiles for Strength Training and P/E Alternative.
• Maple sports floor for main Gymnasium.
• Resinous flooring for kitchen and locker rooms.
- Maple strip floor and black hardboard flooring for stage and orchestra pit.

C3030 – Ceiling Finishes

- 2x2 acoustical ceiling tile, typical.
- Exposed painted steel structure and deck where indicated.
- Drywall soffits.
- Acoustic reflector clouds in Auditorium.
- Intumescent coatings where indicated.

D. SERVICES

D10 CONVEYING SYSTEMS

D1010 – Elevators and Lifts

- Two hydraulic passenger elevators, 3500 pound capacity

D20: PLUMBING

See attached Plumbing System Narrative and the following outline specifications.

D2010 - PLUMBING FIXTURES

Fixtures:
Furnish and install all fixtures, including supports, connections, fittings, and any incidentals to make a complete installation.
Fixtures shall bear the manufacturer's guaranteed label trademark indicating first quality. All acid resisting enameled ware shall bear the manufacturer's symbol signifying acid resisting material.
Vitreous china and acid resisting enameled fixtures, including stops, supplies and traps shall be of one manufacturer by Kohler, American Standard, or Toto. Supports shall be Zurn, Smith, or Josam. All fixtures shall be white. Faucets shall be Toto, Speakman, Symmons, or Chicago.

Fixtures shall be as scheduled on drawings and as follows:
Water Closet: Sloan battery sensor operated water conserving Flush Valve designed for 1.28 gal./flush max and vitreous china wall hung water closet.
Urinal: Sloan, complete HEU system with regenerating battery sensor urinal flush valve for 0.13 gal. flush and vitreous china wall hung urinal.
Lavatory: Wall mounted 22" x 21-1/4" vitreous china lavatory, single hole, punched for concealed armchair carrier. Toto, regenerating battery powered, single hole, sensor faucet, 0.5 GPM rose spray, adjustable thermostatic mixing valve located under lavatory complete with in-line check stops.
Mop Receptor: Stern-Williams Model MTB-2424, 24" x 24" x 10", mop service basin with stainless steel rim guard on exposed sides, 3" caulk connection, stainless steel strainer. Include caulking and sealant to seal between unit and finished wall and
Electric Water Cooler: Halsey Taylor OVL-II SER-Q Barrier Free Hi-Lo Electric Water Cooler, 8.0 GPH capacity, tandem mounting, #4 satin finish stainless steel bowls, flex-guard bubbler, push button actuator, ADA compliant. Furnish and install cane touch skirt.

Stainless Steel Sinks: Just SL-ADA-1921-A-GR single bowl, 19" x 21" x 5-1/2" deep self rimming countertop mounted, 18 GA type 304 stainless steel sink with offset rear outlet; three (3) hole punched faucet ledge & quick clip mounting system, sound deadening underside. Chicago #201A-GN8A-E2805-5CP-317 concealed deck faucet with 8" swing gooseneck spout, 4" wrist blade handles, E-2805 0.5 GPM aerator.

D2020 - DOMESTIC WATER DISTRIBUTION

Piping and Fitting: Potable and Non-Potable cold and hot water system water piping shall be Type 'L' hard tempered copper tubing with wrought copper fittings and silverbrite lead-free solder joints.

Valves: Locate all valves so as to isolate all parts of the system. Shutoff valves 3" and smaller shall be ball valves, solder end or screwed. Valves shall be by Apollo, Nibco, or Watts.

Insulation: Insulation for all water piping and all horizontal roof leaders whether concealed or exposed shall be 1 in. thick, heavy density, preformed snap-on insulation equal to Johns Manville Micro-Lok HP, 850 degrees snap-on system, Owens Corning or Knauf. Insulation for cold water piping shall have a factory applied vapor barrier with ends and butts sealed with overlapping 4 in. sealing strips. Valves, fittings, and the underside of roof drain bodies shall be insulated with pre-formed fiberglass fitting insulation cut from dense fiberglass blanket and covered with pre-molded P.V.C. fitting covers. All insulation shall have self-sealing type, all service jacket (ASJ-SSL) factory applied. At exposed piping areas in locker room or gymnasium cover jacket with continuous P.V.C. jacket.

Wall Hydrant & Hose Bibb: Wall hydrants shall be Zurn Series Z-1310-PB Ecolotrol cast brass 3/4 in. non-freeze wall hydrant with integral backflow preventer, 3/4 in. hose connections, polished nickel bronze face, loose key handle, brass wall sleeve, and fitted with brass locknut. Hose bibb shall be T & S Brass or equal model #B-720 modified, chrome plated, 3/4 in. hose end, integral stop, vacuum breaker, modified with lock shield and loose tee handle.

Domestic Water Sub-meter: Furnish and install ONICON or equal, model F-3500 water flow meter. Furnish 24VDC power supply with plug connection. Coordinate power wiring with Section 260000. Unit shall be capable of providing BACnet output. All BACnet control wiring shall be by Section 230000.

Domestic Water Heating: Furnish and install condensing gas water heater. The water heater will have an efficiency of at least 92 percent. The complete water heating system will comply with all current ASHRAE 90.1 requirements for thermal efficiency and standby heat losses.
D2030 - SANITARY WASTE

**Piping and Fitting:** Soil, Waste and Vent, Kitchen Waste and Vent, and Storm drainage piping to 10' outside shall be hubless cast iron pipe and fittings for 2" and above and shall be Type 'L' copper with cast D.W.V. type fittings for 1-1/2" and smaller.

**Drains:** Drains shall be cast iron, caulked outlets, nickaloy strainers, and in waterproofed areas and roofs shall have galvanized iron clamping rings with 6 lb. lead flashings to bond 9" in all directions. Drains shall be Smith, Zurn, or Josam.

**Cleanouts:** Cleanouts shall be full size up to 4"; threaded bronze plugs located as indicated on the drawings and/or where required in soil, waste and storm pipes.

D2090 - OTHER PLUMBING SYSTEMS

**Workmanship and Installation Methods:** All work shall be installed in a first-class manner consistent with the best current practices. All piping shall be installed true to line and grade, shall be grouped together, be parallel to each other. Utilize gang hangers wherever feasible. Group all valves together where feasible.

**Cleaning and Protection:** Protect all materials and equipment during shipment and installation, and properly handle and store at the job site so as to prevent damage, and upon completion of this work, clean all fixtures and equipment and replace damaged parts.

**Sleeves and Escutcheons:** Furnish and install in masonry walls and floors, galvanized steel sleeves as required.

**Testing:** Test all work in the presence of the Architect and/or Engineer and as required by local codes.

**Chlorination:** Upon completion of the plumbing work, thoroughly chlorinate the entire domestic water system before putting same in service.

**Access Doors:** Furnish access doors for access to all concealed parts of the plumbing system that require accessibility. Coordinate types and locations with the Architect.

**Fuel Gas System:** Furnish and install a complete Natural Gas Supply System including pipe, fittings, valves, connections to all gas fired equipment requiring gas, and all accessories and incidentals as indicated or specified. Installation shall be made in accordance with the State Gas Code requirements. Piping shall be installed with an 8 in. long sediment leg at the base of all risers. All changes in direction shall be made with plugged tees for cleaning piping out. Gas piping shall be black steel pipe and STM A-53 Schedule 40.
Fuel gas valves shall be ball valves with tee handle, screwed end for 2-1/2" and smaller, and lubricated iron body plug cocks for 3" and larger. Valves shall be by Apollo, Nibco, Watts or Rockwell.

**Natural Gas Sub-Meter:** Furnish and install ONICON, or equal, model F-5300 thermal mass flow meter. Furnish 24VDC power supply with plug connection. Coordinate power wiring with Section 260000. Unit shall be capable of providing BACnet output. All BACnet control wiring shall be by Section 230000.

**D30 HEATING, VENTILATING AND AIR CONDITIONING**

See attached HVAC System Narrative and the following outline specifications.

**D3020 - HEAT GENERATING SYSTEMS**

**Boilers:**
High efficiency gas fired condensing hot water boilers. Power burners shall be fully modulating.
Manufacturer: Subject to compliance with the above, provide high efficiency gas fired condensing boiler of one of the following:
- Lochinvar
- Burderus
- Viessman
- Or equal

**Auxiliary Equipment:**

**Pumps:**
Base mounted bronze fitted with high efficiency electric motor. Provide primary and stand-by pump for each system with manual alternator and pilot lights.
Available Manufacturers: Subject to compliance with the contract documents provide pumps of the following manufacturer:
- Bell & Gossett
- Taco
- Armstrong
- Or equal

**Piping and Fittings:**
Hydronic piping shall be Schedule 40 ASTM A-53, black steel pipe with butt welded ends and fittings on 3” and above and threaded ends and fittings on 2-1/2” and smaller. At the contractor option type "L" copper may be used on all 2-1/2” and smaller.

**Valves:**
All valves shall be bronze, brass, or cast iron as system design requires. Locate all valves so as to isolate all parts of the system and as required for normal system operation.
Available Manufacturers: Subject to compliance with the requirements of the contract documents provide valves of the following manufacturer:
Milwaukee
Stockham
Nibco
Or equal

System Identification:
Provide markers on all piping and equipment. Tag all valves in system with corresponding valve lists.

Insulation:
All piping shall be insulated with snap-on fiberglass insulation with all service jacket. Fittings shall be insulated with snap on pre-molded covers with loose fill fiberglass insulation. All HVAC supply and return ductwork shall be insulated with 1.5" thick fiberglass blanket (min. R-5 insulation) with a foil vapor barrier. All outside air intake ductwork shall be insulated with 2" (min. R-8 insulation) rigid fiberglass with foil vapor barrier.

D3030 - COOLING GENERATING SYSTEMS

Air Cooled Liquid Chiller:
General: Unit panels, structural elements and control boxes shall be constructed of 12-gauge galvanized steel and mounted on a welded structural steel base. Chiller shall be covered with heresite or bonderized coating for protection of components in salt-spray environments. Unit panels and control boxes shall be finished with a baked on powder paint, and the structural base with an air dry paint. Units shall be leak and pressure tested at 450 psig high side, 300 psig low side, then evacuated and charged. Packaged units shall ship with a full operating charge of oil and refrigerant. Provide low ambient control down to 20 deg. F.

Trane
McQuay
York
Or equal

Auxiliary Equipment:
Pumps:
Base mounted bronze fitted with high efficiency electric motor. Provide primary and stand-by pump for each system with manual alternator and pilot lights.

Available Manufacturers: Subject to compliance with the contract documents provide pumps of the following manufacturer:

Bell & Gossett
Taco
Armstrong
Or equal

Piping and Fittings: Hydronic piping shall be Schedule 40 ASTM A-53, black steel pipe with butt welded ends and fittings on 3" and above and threaded ends and fittings on 2-1/2" and smaller. At the contractor option type "L" copper may be used on all 2-1/2" and smaller.
Valves:
All valves shall be bronze, brass, or cast iron as system design requires. Locate all valves so as to isolate all parts of the system and as required for normal system operation.
Available Manufacturers: Subject to compliance with the requirements of the contract documents provide valves of the following manufacturer:
- Milwaukee
- Stockham
- Nibco
- Or equal

System Identification:
Provide markers on all piping and equipment. Tag all valves in system with corresponding valve lists.

Insulation:
All piping shall be insulated with snap-on fiberglass insulation with all service jacket.
Fittings shall be insulated with snap on pre-molded covers with loose fill fiberglass insulation.
All HVAC supply and return ductwork shall be insulated with 1.5” thick fiberglass blanket (min. R-5 insulation) with a foil vapor barrier. All outside air intake ductwork shall be insulated with 2” (min. R-8 insulation) rigid fiberglass with foil vapor barrier.

Air Distribution Systems:

Ductwork:
All ductwork shall be galvanized steel with all seams sealed. Entire ductwork system shall be fabricated and installed per SMACNA LOW PRESSURE DUCT CONSTRUCTION STANDARDS. All high velocity ductwork, between air handling unit and VAV box (where applicable), shall be spiral wound round and flat oval.

Diffusers, Registers and Grilles:
All devices shall be steel welded construction with diffusing vanes and baked enamel finish.
Available Manufacturers: Subject to compliance with the requirements of the contract documents provide diffusers, registers, and grills of the following manufacturer:
- Tuttle & Bailey (RC)
- Price
- Nailor Industries
- Metalaire
- Or equal

Displacement Diffusers:
All devices shall be steel welded construction with perforated heavy gauge steel face and baked enamel finish.
Available Manufacturers: Subject to compliance with the requirements of the contract documents provide displacement diffusers of the following manufacturer:

- Price
- Nailor
- Titus
- Or equal

Exhaust Fans:
Exhaust fans shall be galvanized steel construction with centrifugal fan and belt drive motor. Each roof unit shall be provided with 12" high pre-fab curb with motor operated damper in curb.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide exhaust fans of the following manufacturer:

- Greenheck
- Cook
- Twin City
- Or equal

D3050 - TERMINAL & PACKAGE UNITS

Package Units:

Rooftop Air Handling Units (HVAC 100% O.A.):
All units shall be of the draw thru 100% outdoor air design and shall be provided with gas fired S/S heating section, high efficiency DX packaged cooling, hot gas reheat, energy recovery wheel, VFDs, filters (MERV-13), dampers, and centrifugal supply and return air fan with motor. Unit exterior casing shall be constructed of aluminum and internal components shall be covered with heresite or bonderized coating for protection of components in salt-spray environments.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide rooftop air handling units of the following manufacturer:

- Seasons 4
- Annexaire
- SBB
- Or equal

Rooftop Air Handling Units (HVAC Recirculation):
All units shall be of the draw thru type and shall be provided with gas fired S/S heating section, high efficiency DX packaged cooling, hot gas reheat, energy recovery wheel, VFDs, filters (MERV-13), dampers, and centrifugal supply and return air fan with motor. Unit exterior casing shall be constructed of aluminum and internal components shall be covered with heresite or bonderized coating for protection of components in salt-spray environments.

Available Manufacturers: Subject to compliance with the requirements of the contract documents provide rooftop air handling units of the following manufacturer:

- Seasons 4
- Annexaire
- SBB
Or equal

Heating and Ventilating Units:
All units shall be of the draw thru type and shall be provided with gas fired S/S heating section, filters (MERV-13), dampers, and centrifugal supply and return air fan with motor. Unit exterior casing shall be constructed of aluminum and internal components shall be covered with heresite or bonderized coating for protection of components in salt-spray environments.
Available Manufacturers: Subject to compliance with the requirements of the contract documents provide rooftop air handling units of the following manufacturer:
  - Seasons 4
  - Annexaire
  - SBB
  - Or equal

Make-Up Air Units:
All units shall be of the draw thru 100% outdoor air design and shall be provided with gas fired heating section, filters (MERV-13), dampers, and centrifugal supply and return air fan with motor. Unit exterior casing shall be constructed of aluminum and internal components shall be covered with heresite or bonderized coating for protection of components in salt-spray environments.
Available Manufacturers: Subject to compliance with the requirements of the contract documents provide rooftop air handling units of the following manufacturer:
  - Seasons 4
  - Annexaire
  - SBB
  - Or equal

VAV (Variable Air Volume) Terminal Boxes:
VAV Terminal Boxes shall be single duct style with hot water heater coil and duct style with hot water heating coil and sound trap.
Available Manufacturers: Subject to compliance with the requirements of the contract documents provide rooftop air handling units of the following manufacturer:
  - Price
  - Metalaire
  - Nailor
  - Or Equal

Induction Units (Active Chilled Beams):
General - Induction terminal units shall be constant volume primary air flow units designed to induce a secondary airflow within the conditioned space using the primary conditioned air supply. Units shall be designed for ceiling installation with factory supplied hanger supports.
Available Manufacturers: Subject to compliance with requirements of the contract documents provide induction units of one of the following:
  - NuClimate Air Quality Systems,
  - Titus
  - Flakt Woods
Radiant Heating Panels:
The radiant panels will have a minimum heating output of 200 Btu/Hour/Square Foot at 170°F mean water temperature when the room air temperature is 70°F, the roof is of medium insulation value, and natural convection prevails in the room. Panels’ widths shall be as indicated or scheduled on the drawings. Radiant panel shall be manufactured utilizing extruded aluminum strips of approximately 0.115 overall thickness. The strips shall have a minimum 0.495 I.D. copper tube firmly attached to aluminum extrusion under all operating temperature conditions. Ends of tubes shall be swaged to 0.569 I.D. for proper soldering fit of ½ inch Type “L” soft copper tubing.
Available Manufacturers: Subject to compliance with the requirements of the contract documents provide fin-tube radiation of the following manufacturer:
   - Rittling
   - Sterling
   - Sun-El
   - Or equal

Unit Heaters:
Horizontal or cabinet type with exact locations to be determined. All units shall be provided with fan and aquastat control.
Available Manufacturers: Subject to compliance with the requirements of the contract documents provide unit heaters of the following manufacturer:
   - Rittling
   - Sterling
   - Trane
   - Or equal

Fin Tube Radiation:
Commercial slope top fin-tube with steel tube and steel fin. Cover shall be 14 ga. with baked enamel factory finish. All units shall be provided with full backplate, damper, end covers, and splice pieces for a complete installation.
Available Manufacturers: Subject to compliance with the requirements of the contract documents provide fin-tube radiation of the following manufacturer:
   - Sterling
   - Vulcan
   - Rittling

HYDRONIC COILS (RHC):
General: Provide coils of size and in location indicated, and of capacities and having performance data as scheduled. Certify coil capacities, pressure drops, and selection procedures in accordance with ARI 410.
Available Manufacturers: Subject to compliance with requirements, provide coils of one of the following:
   - Heat Transfer, Inc.
   - Carrier Corp.
McQuay Inc.
Trane (The) Co.
York Div.; Borg-Warner Corp.
Or Equal

D3060 - HVAC INSTRUMENTATION & CONTROLS

**Automatic Temperature Controls:**

System shall be an open protocol (BACNet based) direct digital control and building energy management system with Tridium Niagara front end to provide complete automatic temperature control and monitoring of newly installed HVAC system. Available Manufacturers: Subject to compliance with the requirements of the contract documents provide automatic temperature controls of the following manufacturer:
- Johnson Controls (FX)
- Honeywell Controls (WEBs)
- Delta Controls
- Alerton Controls
Or Equal

D3070 - SYSTEMS TESTING & BALANCING

**Testing, Adjusting, Commissioning, and Balancing:**

Requirements include measurement and establishment of the quantities of the mechanical systems as required to meet specifications, and recording and reporting the results. Test, adjust and balance the following mechanical systems:
- Supply air systems.
- Return air systems.
- Exhaust air systems.
- Outside air systems.
- Hydronic heating and cooling systems.
- Verify temperature control system operation.

Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders.

An independent testing, adjusting, and balancing agency certified by the AABC or NEBB as a Test and Balance Engineer in those testing and balancing disciplines required for this project.

D3090 - Other Special HVAC Systems and Equipment

**Workmanship and Installation Methods**

All work shall be installed in a first-class manner consistent with the best current
practices.
All piping shall be installed with slope for proper drainage shall be grouped together, and be parallel to each other. Utilize gang hangers wherever feasible. Group all valves together where feasible.

CLEANING AND PROTECTION

Protect all materials and equipment during shipment and installation, and properly handle and store at the job site so as to prevent damage, and upon completion of this work, clean all fixtures and equipment and replace damaged parts.

SLEEVES AND ESCUTCHEONS

Furnish and install in masonry walls and floors, galvanized steel sleeves as required. Provide escutcheons where sleeves and pipe penetrations are exposed to view.

FIRESAFING

At all sleeved walls and floors provide firesafe caulking, packing, blanket etc., for a completely tight system to prevent the passage of smoke and fire.

OPERATION MANUALS AND MAINTENANCE MANUALS:

Refer to the contracts specifications for a complete outline of all requirements of operations and maintenance data.

RECORD DRAWINGS AND CONTROL DOCUMENTS:

Refer to the contracts specifications project record documents for a complete description of all requirements of recording as built record documents.

D40: FIRE PROTECTION SYSTEMS

See attached Fire Protection System Narrative and the following outline specifications.

D4010 - SPRINKLER

General:
All materials and equipment furnished under this Subcontract shall be new, unused, first quality of a manufacturer of established reputation. Each valve, fitting, section of pipe, piece of equipment, etc., shall have cast or indelibly stamped thereon the manufacturer's name, pressure rating where applicable, type, etc.

- Drains and test connections shall be provided in the systems.

Sprinkler Piping:
Schedule 40 black steel pipe for 1-1/2" and smaller and Schedule 10 for 2" and larger.
Sprinklers:
Upright sprinkler heads in areas with no ceilings shall be Reliable Model "F1FR" Quick Response, upright natural bronze finish heads.

Sidewall heads shall be Reliable Model "F1FR" Quick Response with chrome plated head and escutcheon.

Pendent wet sprinkler heads shall be Reliable Model "F1FR" Quick Response recessed adjustable escutcheon, bright chrome plated.

Concealed heads shall be Reliable Model "G4A" Quick Response concealed type, 1-1/2" adjustment white cover plate. In special areas, as may be noted on the Drawings, provide alternate cover plate finishes.

Double Check Valve Assembly:
Double check valve assembly shall be State approved, U.L./F.M. approved, with iron body bronze mounted construction complete with supervised OS & Y gate valves and test cocks. Double check valve assembly shall be Watts Series 757-OSY, Wilkins 350A-OSY, Conbraco Series 4S-100, or approved equal

Workmanship and Installation Methods:
All work shall be installed in a first-class manner consistent with the best current practices.
All piping shall be installed true to line and grade, shall be grouped together, be parallel to each other. Utilize gang hangers wherever feasible. Group all valves together where feasible.

Cleaning and Protection:
Protect all materials and equipment during shipment and installation, and properly handle and store at the job site so as to prevent damage, and upon completion of this work, clean all fixtures and equipment and replace damaged parts.

D50 ELECTRICAL SYSTEMS
See attached Electrical System Narrative and the following outline specifications.

D5010 – ELECTRICAL SERVICE AND DISTRIBUTION

Electrical Power Equipment:
Motors: Each motor shall have disconnect switch and starter or variable frequency drive provided under this section. Starters which are a part of "factory assembly" control panel will be provided under section supplying equipment but connected under this section.
Provide motor terminal boxes for each motor not furnished with same.

Disconnect Switches:
Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy duty type, quick-make, quick-break type with interlocking
cover mechanism and provisions for padlocking switch handle in "OFF" position.
Three pole toggle switches are not acceptable as substitute for disconnect switches.
Acceptable Manufacturers:

- General Electric
- Westinghouse
- Square D/Groupe Schneider
- Siemens
- Allen Bradley
- Or equal

**Fuses:**
Provide a complete set of fuses for each item of fusible type equipment. Fusible equipment furnished by other contractors will be complete with fuses, unless noted otherwise on electrical drawings.
Acceptable Manufacturers:

- Bussmann, Division of McGraw
- Gould/Shawmut
- GEC-ALSTHOM
- Or equal

**Main Building Switchboard:**

Main building switchboard shall be constructed in accordance with UL 891 and ANSI standards and of the required number of vertical sections bolted together to form one metal enclosed rigid structure. The front shall be accessible. Buses shall be copper.

**Switchboard shall be arranged for operation as follows:**
- Amereage – 2500 amperes
- Voltage - 480Y/277 volts
- Frequency - 60 cycles
- Service - 3 phase, 4 wire, ampere capacity as indicated on drawings
- Neutral - full capacity
- Available short circuit current at line terminals - 65,000 RMS amperes symmetrical
- Integrated equipment rating - 65,000 AIC
- Copper ground bus, full length
- UL service entrance label

**Variable Frequency Drives:**
The variable frequency drives (VFD's) shall be solid state, with a Pulse Width Modulated (PWM) output waveform. The VFD package as specified herein shall be enclosed in a NEMA 1 enclosure, completely assembled and tested by the manufacturer.

All VFD's shall have the same customer interface, including digital display, keypad and customer connections; regardless of horsepower rating. The keypad is to be used for local control, for stepping through the displays and menus.

Prewired 3-position Hand-Off-Auto switch and speed potentiometer. When in "Hand", the VFD will be started, and the speed will be controlled from the speed potentiometer. When in "Off", the VFD will be stopped. When in "Auto", the VFD will start via an external contact closure, and its speed will be controlled via an external speed reference.
The line reactors shall be as manufactured by T.C.I., Milwaukee, Wisconsin and must meet the following requirement:

- Minimum of 3% line impedance.
- 150% continuous current rating for one minute.
- Saturation rating no less than 2.5 times the continuous current rating.
- U.L. recognized.
- Meet IEEE 519 standards.

Acceptable Manufacturers:
Allen Bradley
ABB
Siemens
Square D/Groupe Schneider
Or equal

Panelboards:
Panelboards shall be dead-front, door in door safety type equipped with single or multi-pole circuit breakers suitable for 120/208 volt or 277/480 volt, 3 phase, 4 wire operation.

Buses shall be copper. Panelboards shall have a circuit directory card mounted in a frame with plastic cover on inside of door. Panelboards to have a copper ground bus with terminals for each circuit. Panelboards serving isolated ground receptacles shall have a separate ground bus for terminations of the isolated grounds. The isolated ground bus shall be mounted to the panel tub via non-conducting means with a separate grounding conductor run to the normal panel ground bus.

Panelboards and distribution panels shall be of same manufacturer as switchboard.

Dry-Type Transformers:
Transformer Specification:
Compatibility: This product must facilitate the ability of the electrical system to supply a sinusoidal voltage in order to improve the long-term compatibility of the electrical system with all types of linear and nonlinear connected loads today and in the future. All national and international standards on harmonics and power quality set limits on levels of voltage distortion to maintain compatibility.
Copper-wound, 3-phase, common core, ventilated, dry-type, isolation transformer built to NEMA ST20 and relevant NEMA, UL and IEEE standards; 200 percent rated neutral; 60Hz rated; Transformers 750 kVA and less, 600 volt primary and less, shall be U.L. and CSA Listed and bear the label. All terminals, including those for changing taps, must be readily accessible by removing a front cover plate. Windings shall be continuous with terminations brazed or welded. 10kV BIL.
Insulation System:
Shall be NOMEX-based with an Epoxy Co-polymer impregnant for lowest environmental impact, long term reliability and long life expectancy
Class: 220 degrees C
Impregnant Properties for low emissions during manufacturing, highest reli-
ability and life expectancy
Epoxy co-polymer
VOC: less than 1.65 lbs/gal (low emissions during manufacturing)
Water absorption (24hrs @25C): less than 0.05 percent (superior insulation, longer life)
Chemical Resistance: Must have documented excellent performance rating by supplier
Dielectric Strength: minimum of 3200 volts/mil dry (for superior stress, over-voltage tolerance)
Dissipation Factor: max. 0.02 @25C to reduce aging of insulation, extending useful life

Operating Temperature Rise: 130 degree C in a 40 degree C maximum ambient

Noise levels:
Per NEMA ST-20
Production Test every unit. Data to be available upon request.

UL Listed & Labeled K-Rating: K-7 or higher

Maximum No Load Losses:
Transformers are energized 24 hours a day for their entire life, potentially 40 years or more. These losses are incurred whether the transformer is loaded or not, and cost the user many times the purchase price of the transformer even at current energy rates.

Efficiency at 15 percent loading:
Data shows that transformers are typically very lightly loaded for extended periods of time, therefore to minimize operating cost under real world loading conditions, efficiency at 1/6 loading shall be maximized.

Efficiency at 1/6 load shall meet or exceed: 15kVA: 97.3 percent, 30kVA: 97.6 percent, 45kVA: 97.9 percent, 75kVA: 98.2 percent, 112.5kVA: 98.4 percent, 150kVA: 98.5 percent, 225kVA: 98.6 percent, 300kVA: 98.7 percent, 500kVA: 98.8 percent, 750kVA: 98.9 percent

DOE 10 CFR Part 430 CSL 3 Efficiency requirement, tested per NEMA TP-2:
Shall meet or exceed: 15kVA: 97.6 percent, 30kVA: 98.1 percent, 45kVA: 98.3 percent, 75kVA: 98.6 percent, 112.5kVA: 98.8 percent, 150kVA: 98.9 percent, 225kVA: 98.9 percent, 300kVA: 99.0 percent, 500kVA: 99.1 percent, 750kVA: 99.2 percent

Efficiency under k-7 nonlinear load at 50 percent of nameplate rating:
15kVA: 97.3 percent, 30kVA: 97.7 percent, 45kVA: 97.9 percent, 75kVA: 98.4 percent, 112.5kVA: 98.7 percent, 150kVA: 98.8 percent, 225kVA: 98.8 percent, 300kVA: 98.8 percent, 500kVA: 98.9 percent, 750kVA: 98.9 percent

Voltage Taps: For transformers 30kVA-300kVA, provide two 2-1/2 percent full capacity taps above and below nominal primary voltage. For transformers 15kVA and
smaller as well as 500kVA and larger provide one 5 percent full capacity tap above and below nominal primary voltage.

**Impedance:** Between 3.5 percent and 5.8 percent unless otherwise noted.

**Enclosure type:** Ventilated NEMA 2, drip-proof

**Maximum Footprint for 130 degree C rise model in a NEMA 1 enclosure:**
- 17 in. Wide x 17 in. Deep x 27 in. High for 15kVA.
- 26 in. Wide x 18 in. Deep x 30 in. High for 30kVA, 45kVA
- 33 in. Wide x 22 in. Deep x 40 in High for 75kVA, 112.5kVA
- 38 in. Wide x 28 in. Deep x 52 in. High for 150kVA
- 38 in. Wide x 32 in. Deep x 52 in. High for 225kVA, 300kVA
- 52 in. Wide x 38 in. Deep x 61 in. High for 500kVA
- 63 in. Wide x 46 in. Deep x 67 in. High for 750kVA

**Transformer Features**
- **Electrostatic Shield:** Each winding shall be independently single shielded with a full-width copper electrostatic shield.
- All transformers shall meet Department of Energy CSL3 efficiency.

**Acceptable Manufacturers**
- Powersmiths International Corp. or approved equal, Model ESAVER-C3H for K-7 and over, and Model ESaver-C3L for under K-7.
- Square D, ACME, Jefferson Electric, or equal.

**Electric Service**
- Coordinate and cooperate with National Grid, hereafter referred to as Utility Co., with respect to providing service and metering. See allowances section for backcharges by utility company with respect to permanent service.
- Provide all primary system raceways, elbows, pull wires and all pad grounding. Utility company will provide pad mounted transformer and primary conductors including making up of all terminations and connections.
- **Metering:** All usage will be on one secondary meter. Utility Company will furnish current transformers and potential transformers to be installed in transformer. Empty raceway with pull wire from the C/T compartment to the meter socket shall be provided.

**Raceways and Fittings:**
- **Raceways - General:**
  - No raceway shall be used smaller than 3/4" diameter and shall have no more than four (4) 90o bends in any one run, and where necessary, pull boxes shall be provided. Only rigid metal conduit or intermediate metal conduit is allowed for in-slab work. Cable systems, if allowed to be used by other sections of this specification, shall not be used exposed or in slabs, whether listed by "UL" for such use or not. Rigid metal conduit, may be used for service work, exterior work, slab work, and below grade level slab, wet locations, and in penthouse for drops down to equipment from elevations above eight feet and also where raceway may be subject to mechanical damage.
Electrical Metallic Tubing (EMT), may be used in masonry block walls, stud partitions, above furred ceilings, where exposed but not subject to mechanical damage, and shall be used for fire alarm work.

Surface metal raceways shall be used where raceways cannot be run concealed. Flexible metal conduit shall be used for final connections to recessed lighting fixtures from above ceiling junction boxes and for final flexible connections to motors and other rotating or vibrating equipment. Liquid tight flexible metal conduit shall be used for the above connections which are located in moist locations. All flexible connections shall include an insulated grounding conductor.

Rigid non-metallic conduit may be used at the contractors option for underground electric and telephone services outside the foundation wall and shall be polyvinyl chloride (PVC) schedule 40, 90 deg. C. If option of rigid non-metallic conduit is exercised, underground runs outside the foundation wall shall be concrete encased at electrical contractors expense.

PVC Schedule 40 may also be used for below slab circuits within building confines and site lighting branch circuits. Below slab rigid non-metallic conduits do not require concrete encasement. Rigid non-metallic conduits shall not be used for exterior feeders, in slabs, nor for elbows which penetrate slabs. Raceways and fittings shall be produced by same manufacturer.

Acceptable manufacturers:
- Pittsburgh Standard Conduit Company
- Republic Steel and Tube
- Youngstown Sheet and Tube Company
- Carlon
- Or equal

Uninterruptible Power Supply:
General: Provide a three phase, on-line, solid state uninterruptible power system hereafter referred to as the UPS. The system consists of a solid state inverter, rectifier/battery charger, a static switch, an internal maintenance bypass switch, an internally assembled battery cabinet and synchronizing circuitry as described herein.

UPS Requirements and Performance Characteristics:

Ratings – 30kVA/24kW
Input Requirements: Voltage: 208, 3 phase, 4 wire plus ground ± 15%
Output Characteristics:
Voltage: 208Y/120, 3 phase, 4 wire plus ground. Output voltage adjustable ± 3%.

Outlets, Pull and Junction Boxes:
Outlets:
Each outlet shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations or surface mounted shall be of the cast-metal type having hubs. Concealed boxes shall be cadmium plated or zinc coated sheet metal type. Old work boxes with Madison clamps not allowed in new construction. Thru the wall boxes are not permitted.
Acceptable manufacturers:
- Appleton
Pull and Junction Boxes:  Where indicated on plans, and where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish, and install appropriately designed boxes.  Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws.  Box size shall be as required by Code.

Acceptable Manufacturers:
- Brasch
- Hoffman
- Keystone
- Lee Products Co.
- McKinstry Inc.
- Eldon Inc.
- Or equal

Conductors:

All conductors shall be a minimum size of #12 AWG except for control wiring and fire alarm wiring where #14 AWG may be used.  For all exit sign circuits, normal/emergency and/or emergency only circuits, exterior lighting circuits, and also where distance from panelboard to first outlet exceeds 80’ for 120 volts and 150’ for 277 volts, #10 AWG shall be minimum size wire allowed.  All feeder and branch circuit conductor shall be color coded as follows:

- **208Y/120V**
  - Phase A: Black
  - Phase B: Red
  - Phase C: Blue

- **480Y/277V**
  - Phase A: Brown
  - Phase B: Orange
  - Phase C: Yellow

Grounded Conductor:
- **120/208**
  - White
- **277/480**
  - Grey

Equipment Ground:
- **120/208**
  - Green
- **277/480**
  - Green with Yellow Trace

All conductors not installed in accordance with color scheme shall be replaced.  All conductors larger than #6 AWG must be identified with colored tape.

Connections throughout the entire job shall be made with solderless type devices.
- For #10 AWG and smaller: spring type.
- For #8 AWG and larger: circumferential compression type.

Acceptable manufacturers:
- 3M "Scotchlock"
- IDEAL "Wingnut"
- BURNDY
- MAC
- Or equal

Any splices made up in ground mounted pull boxes shall be resin cast waterproof type or waterproof pressure type, as manufactured by King Technology, St. Louis, MO.

Conductors shall be copper, soft drawn, and annealed of 98% conductivity.  Conductors larger than #10 AWG shall be stranded; #10 AWG and smaller shall be solid.  Conductors shall be insulated for 600 volts and be of following types:
All conductors shall have heat/moisture resistant thermoplastic insulation type THHN/THWN (75 deg. C) except as follows:

In sizes #1 AWG and larger: Crosslinked polyethylene insulation type XHHW (75 deg. C – 90 deg. C) may be used.
Fire alarm system conductors shall be #14 AWG, type THHN, solid.
Color coding of fire alarm conductors shall be in accordance with fire codes.
Fixture whips #16AWG type "SF".

Stranded conductors for all wiring systems except fire alarm will be allowed if installed and terminated as specified under Execution Section.

Mineral-Insulated Metal-Sheathed Fire-Resistive Cables (Type MI) - Cables shall consist of a factory assembly of one or more solid copper conductors insulated with highly-compressed magnesium oxide and enclosed in a seamless, liquid-and-gas-tight continuous copper sheath. Cables shall be rated for 600 volts and less. Cables shall comply with Article 330 of the National Electrical Code. Cables shall be classified by Underwriters Laboratories, Inc. as having a 2-hour fire resistive rating. Cable terminations shall be made with UL listed mineral-insulated cable fittings. Approved Manufacturer - Pyrotenax USA, Inc., or equal.

Type MC cable may be used for concealed branch circuits in hollow spaces where allowed by code if installed and terminated as specified under Execution Section. Armor to be galvanized steel, and shall be UL listed for 2 hour thru-wall fire penetration.

Acceptable manufacturers:

- American Flexible Conduit Company
- American Wire & Cable
- Anaconda
- Cerro
- Cornish
- Cresent
- Essex
- Okonite
- Rome
- Or equal

D5020 - LIGHTING AND BRANCH WIRING

**Sleeves, Inserts, and Openings:** Sleeves: Provide sleeves of proper sizes for all openings required in concrete floors and walls. Sleeves passing through floors shall be set with top of sleeve 1" above finished floor. Core drilling will also be acceptable if in accordance with any structural standards. Any unsleeved openings shall be water proofed.

**Floor Outlets (Flush Type)**

All flush floor outlets shall be Steel City 640 or 840 series cast iron, watertight type. The 640 series shall be used generally, and the 840 series used where shallow depth is required. Whenever floor outlets for different services are indicated in the same location, they
shall be ganged together.

Covers shall be brass series P64. Duplex receptacle covers shall be lift lid type P64DS. Low tension covers shall be series P64-3/4-2 with 3/4” diameter and 2” diameter plugs. Flush floor outlets located in carpeted areas shall be provided with P64-CP carpet plates of the number of gangs required.

**Wiring Devices**
Receptacles: Receptacles shall be flush mounted. All standard 20 ampere devices to be of same manufacturer

**Acceptable Manufacturers:**

Twenty (20) ampere duplex grounding type NEMA 5-20R, Arrow Hart 5739SI, Or equal

Thirty (30) ampere, 250 volt NEMA 10-30R complete with plate, Arrow Hart 9344, Or equal

Switches: 20 ampere, Arrow Hart 1991 series, Or equal

Composition material of wiring devices to be nylon with white finish.

Coverplates: Brushed US 302 stainless steel. Provide gaskets on all wiring device plates where devices are on walls separating conditioned and non-conditioned spaces.

Blank coverplates shall be steel, paintable.

**Dimmer Controls:**
All devices shall be UL listed specifically for the required loads (i.e., incandescent, fluorescent, magnetic low voltage, electronic low voltage). Manufacturer shall provide file card upon request. Universal dimmers are not acceptable.

**Lighting Fixtures:**

**General**
All lamps, ballasts, led sources, drivers, and controls shall meet the latest utility company incentive requirements. Refer to the latest program requirements documentation and coordinate with the utility company to ensure compliance.

**Lamps**
Furnish lamps that comply with requirements specified below and the luminaire schedule on the Drawings. Compact fluorescent lamps shall have kelvin color temperature as scheduled with a color rendering index of 82 minimum. Compact fluorescent lamps shall be the amal-
gam type, Sylvania Dulux T/E/IN or equal by Philips or GE.
Linear fluorescent lamps shall have kelvin color temperature as scheduled with a color rendering index of 85 minimum. T5ho lamps shall be the energy saver type, Sylvania Pentron HO Supersaver Ecologic or equal by Philips or GE. All T5 lamps shall be the energy saver type, Sylvania Pentron Supersaver Ecologic or equal by Philips or GE.

**Ballasts**
Standard compact fluorescent ballasts shall be Sylvania Quicktronic Prostart CF series or equal by Advance, GE, or Universal.
Dimming compact fluorescent ballasts shall be Sylvania Quicktronic Helios CF series (0-10v) or equal by Advance, GE, or Lutron.
Standard T5 and T5HO linear fluorescent ballasts shall be high efficiency type, Sylvania QHE Prostart series or equal by Advance, GE, or Universal.
Dimming linear fluorescent ballasts (0-10v) shall be Sylvania Quicktronic Powersense (T5) series or Sylvania Quicktronic Helios (T5HO) series or equal by Advance, GE, or Lutron.

**LED Assemblies**
LED luminaires shall conform to UL 1598 and to UL 8250 – Safety Standard for Light-Emitting Diode (LED) Light Sources for Use in Lighting Products. Products shall be lead and mercury free.
Photometric characteristics shall be established using IESNA LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurement of Solid-State Lighting Products.
Site lighting shall utilize LED with dimming drivers.

**Interior General:**
Furnish interior luminaries that comply with requirements specified below, indicated on the Drawings, and as required to meet conditions of installation.
Metal parts shall be free from burrs and sharp corners and edges.
Metal components shall be formed and supported to prevent sagging and warping.
Steel parts shall be finished with manufacturer’s standard finish applied over a corrosion-resistant primer. Finish shall be free from runs, streaks, stains, holidays or defects.
Doors and frames shall be smooth operating and free from light leakage under operating conditions. Relamping shall be possible without the use of tools. Doors, frames, lenses and diffusers shall be designed to prevent accidental falling during relamping and when secured in the operating position.
Luminaires shall have minimum reflecting surface reflectance as follows unless specified otherwise on the Drawings:
- White Surfaces: 85 percent
- Specular Surfaces: 83 percent
- Diffusing Specular Surfaces: 75 percent

Lenses, diffusers, covers and globes shall be 100 percent virgin acrylic unless specified otherwise on the Drawings. Lenses shall have 0.125 inches minimum thickness. Lenses for fluorescent troffers shall be injection molded.
Luminaires shall conform to UL 1598 - Luminaires. Provide product with damp location listing or wet location listing as required by installation location.
Interior Installation
Install interior lighting system in accordance with the NEC, manufacturer’s installation instructions, approved shop drawings, and NECA National Electrical Installation Standards.
Have the manufacturer’s installation instructions available at the Project site.
Mounting heights specified or indicated on the Drawings are to the bottom of the luminaire for ceiling-mounted fixtures and to the center of the luminaire for wall-mounted fixtures.

Exterior - General
Furnish exterior luminaires that comply with requirements specified in this Section and in the luminaire schedule on the Drawings.
Luminaire photometric characteristics shall be based on IESNA approved methods for photometric measurements performed by a recognized photometric laboratory.

Exterior Poles and Accessories
Furnish poles and accessories that comply with requirements specified in this Section and the luminaire schedule on the Drawings.
Pole, base, and anchorage shall carry the luminaires, supports, and appurtenances at the indicated height above grade without deflection or whipping.
Mountings, fastenings and other appurtenances shall be fabricated from corrosion-resistant materials that are compatible with poles and luminaires and will not cause galvanic action at contact points. Mountings shall correctly position luminaires to provide scheduled light distribution.
Metal poles shall have anchor type bases and galvanized steel anchor bolts and leveling nuts.
Metal poles shall have a metal base cover that covers the entire base plate and anchorage.

Exterior Installation
Install products in accordance with manufacturer's instructions, NECA/IESNA 501, and approved shop drawings.
Locations of luminaires and poles shown on the Drawings are diagrammatic. Coordinate luminaire locations with building finishes, building structure, paving and striping, utility piping, security fences, and existing trees.

Panelboard Lighting Control System:
Panelboard Lighting Control System
The lighting control system shall consist of microprocessor-based control electronics with remotely operated circuit breakers. The circuit breakers shall provide overcurrent protection, and have an AIR rating or series connected rating that meets or exceeds the fault current of the system to which the panelboard is being applied.
The lighting control system shall meet or exceed the following capabilities:
- Sixteen (16) 2-wire maintained dry-contact inputs for connection to external low voltage (24 Vdc or below) switch contacts.
- Zone creation of multiple branch circuits and control of zones.
- Individual zone override.
- True status feedback by monitoring branch circuit breaker status based on
actual system voltage at load side terminal. Downloadable firmware over network that will permit field installation of newest features in existing systems.

Provide BACNet gateway to “BMS” system.

**Dual Technology Ceiling Occupancy Sensors:**
Dual technology occupancy sensors shall be capable of detecting occupants within the coverage area designated via detection of a doppler shift in the transmitted ultrasonic sound wave and a change in the infrared heat present. Major motion and minor motion shall cause the controlled load to switch to the “ON” mode.

The dual technology passive infrared sensor shall use a multi-level 100 segment Fresnel lens and four pyroelectric detectors to insure adequate PIR coverage of the intended area.

Dual technology sensors shall have on override to “ON” bypass logic key in the event of sensor failure.

Sensors are to be ceiling mounted using a back mounting plate and standard electrical outlet boxes.

Dual technology sensors shall cover up to 2000 sq. ft. for walking motion, with a field of view of 360 degrees.

Dual technology sensors shall be compatible with electronic ballasts, compact fluorescent, and inductive loads.

**Photo Sensor:**
Photo sensors shall meet the following:
- Shall be Class 2, low voltage.
- Ambient light sensor designed to interface directly with the analog input of the Lighting Control System.
- Sensor shall supply an analog signal to the ALCS proportional to the light measured.
- Sensor output shall provide for zero or offset based signal.
- Sensor shall be capable of a fully adjustable response in the range between 0 and 10,000 foot candles with a +/- 1% accuracy at 70 deg F.
- Input: 10VDC.
- Minimum Output: 0 VDC.
- Maximum Output: 10 VDC.
- Sensor housing shall be flame retardant and meet UL 94 HB standards.
- Operating Temp: -10 deg C to 60 deg C.
- The sensitivity adjustments shall be at sensor body, and outside of the sensor’s viewing angle.
- The sensor housing shall be flame retardant and meet UL 94HB standards.

D5030 - COMMUNICATIONS & SECURITY
Integrated electronic Security System:

Intrusion:
Furnish a complete addressable Security and Detection and Alerting system to be connected, tested and left in first-class operating condition.

The security alarm system shall monitor the integrity of all alarm initiating circuits.

System Operation:

The system shall be completely addressable. System shall be continually supervised by a microprocessor.

The system shall be armed, disarmed, reset, monitored and altered by the use of the remote multiplexed type alpha numeric keypads. The system shall be capable of arming or disarming by zone/partition.

Actuation of any device shall cause the following to occur.

- Activate telephone dialer, seize the protected premises telephone line and automatically report the alarm to a remote location.
- Indicate the alarm condition at the remote keypad.
- Record device alarm on the access control computer and activate the sound system for alarm tones over the entire PA System.
- Call up the closed circuit camera in the area and record at 30 frames per second.

Closed Circuit Television (CCTV):
Provide a complete UL Listed CCTV system as shown on drawings and herein specified. All system components shall be from a single manufacturer.

IP Cameras: Camera installations shall be securely attached to mounting surface.

The Closed Circuit TV System shall consist of computer servers with image software, computer monitors and IP based closed circuit TV cameras. The head end server will be located in the head end MDF room and will be rack mounted. The system will be accessed from any PC within the facility or externally via an IP address. Each camera can be viewed independently. The network video recorders NVR’s will record all cameras and store information for 21 days at 15 images per second (virtual real time).

The location of the cameras is generally in corridors and exterior building perimeter. The exterior cameras will pan-tilt-zone type.

Cameras shall be solid state and have automatic iris control and shall be for interior or exterior use under normal and low light conditions of illumination and shall be provided with a weatherproof or tamper-proof housing as specified.

Weatherproof-tamper proof housing for fixed cameras shall be constructed of aluminum and finished with a weatherproof, heat reflecting paint. Housing shall be internally insulated. Hinged cover shall be secured in place with tamper proof bolts.
Interface system with card access, intrusion and intercom systems. Activation of system alarms shall call up the appropriate camera. Activation of a door intercom station shall also call up the appropriate camera.

Card Access:
Furnish and install a complete access control system as specified herein and shown on the drawings. The system shall include a head end computer with 17” monitor, keyboard, mouse and printer. Furnish and install proprietary Continuum or equal controllers with 4 hour battery backup.

Controller: Unit shall be able to accept 16 doors complete with card reader request to exit and door position switch. Controllers shall provide 400 event buffer.

Card Readers: Furnish and install proximity readers as shown on drawings. Devices shall have a 6” – 10” read range. Devices shall be flush mounted.

Cards: Provide 250 proximity cards. Cards shall be the size of a standard credit card in both thickness and dimension.

Interface the access control system with the closed circuit TV system for alarm call up and allow for CCTV images to be viewed from the access control computer. Interface system with the intrusion alarm system to annunciate alarms (by device) on the access control computer. All intrusion alarms shall be recorded on the access computer and printed on system printer.

Communications:
Telephone/Data Systems
Telephone system instruments and interconnecting wiring will be provided by the ITS Contractor. Data system outlets and interconnecting wiring will be provided by the ITS Contractor.

For each telephone outlet or data outlet indicated on the drawings, provide a 4” square flush outlet box. In insulated partitions, provide a 1” raceway stubup terminating with bushing to above nearest accessible hung ceiling.

Fiber Innerduct
Description: From the MDF to IDF, segments of optical fiber innerduct shall be installed.

Quantities Required: Innerduct runs do not have to be continuous throughout, breaks are expected at the pull boxes. Contractor is responsible for determination of actual lengths of innerduct required. Enough innerduct shall be provided and installed to extend from the fiber service loop in the MDF to the fiber service loop in each IDF. If the route passes through a pull box, the segments of innerduct shall extend twelve inches into the pull box. If the route passes through an enroute HC, each segment of innerduct shall extend at least twelve inches beyond the end of the service conduit.

Fiber Distribution:
Description: From the MDF to each IDF a continuous segment of fiber cable shall be
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WINTHROP, MA

provided.
Product: 12 strands multi-mode laser optimized 50/125 UM and 6 strands single-mode 8.3/125 UM.

Quantities Required: The contractor is responsible for determination of actual segment lengths. Actual quantities will be determined by the routing established by the electrical engineer.

Work Station Cable:
Description: From each MDF or IDF, 4-pair enhanced Category 6 cables shall be routed to each work station (data outlets). Category 6A shall be provided as indicated on drawings.

Intermediate Distribution Facilities:
Description:
Products and Quantities:
   Equipment Rack: Panduit CMR19x84, 19 X 84", floor-mounted.
   Fiber Interconnect: Panduit FRME2, 12 Port Rack Mount Fiber Patch Panel.
   Modular Patch Panels: Panduit DP48688TG, 48-port Category 6 Patch Panel. One (1) Port for each workstation served from the MC with a minimum of 12 spare ports are required. If the number of workstation cables, plus required spare count (12) is greater than 48, then a second 48 port patch panel is required.

Testing And Documentation:
Testing: Contractor shall test each fiber strand and each pair of each twisted-pair copper cable. The Owner reserves the right to have a representative present during all or a portion of the testing process. If the Owner elects to be present during testing, test results will only be acceptable when conducted in the presence of the Owner.

Documentation: Contractor shall provide documentation to include test results and as-built drawings.
   Fiber Test Results: The results of the fiber testing shall be entered into the attached form "10 Fiber Attenuation Test Results". Hand written results are acceptable provided the text is neat and legible. Copies of test results are not acceptable. Only original signed copies will be acceptable.
   Work Station Cable: The results of the work station cable tests shall be provided in the form of print-outs from the test equipment.

Integrated Sound, Public Address, & Wireless Master Clock System:
General:
Provide all equipment, accessories, and materials in accordance with these specifications and related documents to provide a complete and operating Integrated, Sound, Intercom and Master Clock System. Each classroom shall be equipped with voice lift audio system.

System Description:
This Section includes requirements for programmable Integrated and Video System
components including, but not limited to, the following:

Integrated Communications System Computer and Software.
Telephone System Integration Requirements. (Owner has communications manager, Avaya)
Controls and Terminal Equipment.
Power Supplies.
Wireless Master and Secondary Clock Systems

**IP Speakers:**
General Description: Accessible as specific SIP end point and accessible as a multicast group member. Valcom multicast group paging features robust grouping and priority controls. This makes it easy to distribute low priority announcements yet allow high priority paging to override ongoing announcements.

**Group Paging Priority Feature:** An absolute priority can be assigned to allow for emergency override in any circumstance. Group paging priorities work locally or across the network in the same fashion allowing facility wide emergency paging.

**Supervision Features:** If a fault is detected in speakers, it can be reported to an external device or syslog facility.

**D5050 - ELECTRICAL SYSTEM CONTROLS AND INSTRUMENTS:**

Provide a complete power system consisting of branch circuits, motor disconnect switches, pushbutton stations, motor starters, and other devices to connect up and leave in operating condition each piece of electrically operated equipment provided either under this section or other Divisions.

All control wiring not indicated in the electrical specifications or not shown on electrical drawings will be provided by Temperature Control Subcontractor.

**D5060 - ELECTRICAL TESTING**

**Distribution Equipment Testing:**
All dry-type transformers, individual motor starters, switchboard and main distribution panels, motor controls, motor control centers, feeder conductors, and emergency systems shall be tested in accordance with the following. In general, all tests shall be done in accordance with the 1995 Acceptance Testing Specifications of the International Electrical Testing Association.

**Grounding Grids or Electrodes:** Measurement of resistance from ground grids or electrodes to earth to determine adequacy of grounding system in building and compliance with specifications and/or electrical code.

**Settings of Adjustable Devices:** Using the result of the fault current and coordination study specified hereinafter, the Testing Contractor shall set all adjustable devices.
D5090 - OTHER ELECTRICAL SYSTEMS

Grounding System: All equipment and systems shall be grounded. Refer especially to NEC Section 250 Requiring Connections to Building Steel, Foundation, Water Service, and Interior Piping. Provide transformer pad grounding to be in accordance with utility company standards.

Standby Electrical System:
Provide one 200KW, 250 KVA at .8 PF standby power rated natural gas generator set mounted in perfect alignment on an all welded, fabricated steel sub-base which shall allow for attachment of all necessary engine and generator accessories.

Acceptable Manufacturers:

Caterpillar
Onan
Kohler
Generac
Baldor
Or equal

Generator: 200 KW, 250 KVA, 277/480 volt, 3 phase, 4 wire, 60 Hz, 1800 RPM revolving field type main generator with brushless exciter.
Voltage regulation ±1%.

Generator Control Panel: To completely control operation of engine generator set. Panel to have automatic start control, AC volt meter, AC ammeter, pointer type frequency meter, volt meter, ammeter and selector switch.

Automatic Transfer Switch: Provide automatic transfer switches for operation on 277/480 volts, 3 phase, 4 wire operation. Unit to be housed in a NEMA 1 enclosure.
Entire switch shall be listed under UL 1008.

Acceptable Manufacturers:
Russ Electric RMTD (4 Pole)
ASCO (with overlapping neutral contacts)
Onan
Kohler
Or equal

Remote Annunciator Panel: A flush mounted panel shall include a visual signal that battery charger is functioning properly and both audible and visual signals. Annunciator shall meet NFPA 110 Standards.

Generator shall be housed in a weatherproof sound attenuated aluminum enclosure.

Access Panels:
Provide access panels for access to concealed junction boxes and to other concealed parts of system that require accessibility for operation and maintenance. In general, electrical work shall be laid out so access panels are not required.
Access panels shall be prime painted and equipped with screwdriver operated cam
locks.

Acceptable manufacturers:
Inland Steel Products Company - Milcor
Miami Carey
Walsh-Hannon-Gladwin, Inc. - Way Locator
Or equal

Specific types:
Acoustical Tile Ceiling  "Milcor Type AT"
Plastered Surfaces "Milcor Type K"
Masonry Construction  "Milcor Type M"
Drywall Construction  "Milcor Type DW"

Fire Alarm and Detection System:

Work Included:
Furnish and install a 24 VDC closed circuit non-coded, continuous ringing, supervised, addressable fire alarm system in accordance with the following specifications, to be wired, connected and left in first class operating condition. All equipment shall be listed by Underwriters Laboratories or approved by Factory Mutual.

General Requirements: The system shall include but not be limited to all control panels, power supplies, initiating devices, audible (Voice Evac) and visual alarm devices, and all accessories required to provide a complete operating fire alarm system in accordance with code and local fire department.
Acceptable Manufacturers:
Notifier
EST
Siemens
Or equal

Surge Protective Devices: Furnish and install surge protective devices with ratings of 120,000 amperes on the secondary side of the main service overcurrent device and panelboards feeding computer equipment.

Ladder Tray: Provide 12" wide aluminum ladder tray with 9" rung spacing with 6" side rail. Ladder tray shall be as manufactured by B-Line. "Ladder Type". Provide all hangers required.

Lightning Protection System:

General: Provide all labor, material, equipment, and services required for the complete lightning protection system in accordance with NFPA 780, UL96A and applicable contract drawings for the Building. System shall receive UL Master Label.

Standards of Quality:
All materials shall be the product of a manufacturer regularly engaged in the production of lightning protection equipment.
All material shall be manufactured by Heary Bros. Lightning Protection Co, Thompson Lightning Protection, Harger, or East Coast Lightning Equipment.

Master Label:
Submit factory certified tests.
Submit guarantee for installation and range of lightning protection.

**Electronic Scoreboard and Shot Clocks:**
Furnish and install, as hereinafter specified, Fair-Play Electronic Scoreboard, as Manufactured by Fairtron Corporation and distributed by Hampden Engineering Corporation, East Longmeadow, Massachusetts.

The scoreboard shall include all equipment as hereinafter specified and shall be Model BB-6620, with metric clock. Provide remote shot clocks.

The Electrical Subcontractor shall be responsible for structural support including all anchor bolts, hangers, etc. support shall be provided as recommended by scoreboard manufacturer.

**D5095 - GENERAL CONSTRUCTION ITEMS**

**Portable or Detachable Parts:** Retain possession of and be responsible for spare parts, portable and detachable parts, and other removable portions of installation including fuses, keys, locks, blocking clips, inserts, lamps, instructions, drawings, and other devices or materials that are relative to and necessary for proper operation and maintenance of the system until final acceptance, at which time such parts shall be installed or turned over to the Owner, as the case may be.

**Safety Precautions:** Provide proper guards, signage, and other necessary construction required for prevention of accidents and to insure safety of life and property. Remove any temporary safety precautions at completion.

**Mounting Heights:** All electrical equipment shall be mounted at the following heights unless noted or detailed otherwise on drawings. Notes on architectural drawings shall supersede those noted below or detailed on the electrical drawings. If mounting height of an electrical component is questionable, obtain clarification from Architect before installation.

- Duplex convenience outlets, microphone outlets, and telephone outlets - 18 inches.
- Light switches, pushbutton stations, HOA switches, and all other toggle or control switches for the operation of heating, ventilating, and air conditioning, plumbing, and general service - 48 inches.
- Clock outlets - 84 inches.
- Fire alarm pullstations - 48 inches.
- Fire alarm audio visual signals - 80 inches or 6 inches below ceiling, whichever is lower.
- Panelboards for lighting, power, telephone, and other auxiliary systems - 78" to top.

Mounting heights given are from finished floor to centerline. In the case of a raised floor, surface of raised floor is the finished floor.

**Workmanship and Installation Methods:**
Fastenings: Fasten electric work to building structure in accordance with the best industry practice.

General Raceway Installation: Install the various types of raceways in permitted locations as previously specified. All raceways shall be run concealed. Consult Architect for instruction for raceways which must be exposed in public spaces.

Branch Circuits: Provide all branch circuit wiring and outlets for a complete and operating system. The system shall consist of insulated conductors connected to the panelboards and run in raceways or as cable systems if permitted under products section, as required to the final outlet and shall include outlet boxes, supports, fittings, receptacles, plates, fuses, etc.

Fireproofing and Waterproofing: Fireproof and waterproof all openings in slabs and walls to maintain the original rating of same.

Cutting and Patching: All cutting of surfaces, including core drilling of walls and slabs, shall be done by Electrical Subcontractor. Openings through new wall surfaces will be provided by General Contractor if Electrical Subcontractor gives suitable notice as erection of surface proceeds. If suitable notice is not given, Electrical Subcontractor shall then be responsible for cost of corrective work required.

Elevator Coordination:
Elevator Electrical Work: Several items pertaining to elevator electrical system shall be provided by Electrical Subcontractor as follows:
Power source to elevator machine room including fused disconnect switch and wiring between disconnect switch and controller for each elevator fused disconnect switch (120 volt) for elevator signal system and cab light for each cab light, switch, and GFCI receptacle in each pit and machine room.
Control modules from fire alarm system for elevator recall to prevent cab opening on a fire floor.
Junction box in machine room for cab telephone and paging system.

Mechanical System Coordination: The Mechanical System Subcontractor will be providing various items of mechanical services equipment and control apparatus. In general, Electrical Subcontractor shall connect up power wiring to this equipment. Equipment provided by Mechanical System Subcontractors will include built-in disconnecting means and overcurrent protection unless shown otherwise on drawings. This does not include terminal boxes.

E. EQUIPMENT AND FURNISHINGS

E10: EQUIPMENT

E1010 – Commercial Equipment

- Commercial food service equipment for Kitchen.
E1090 – Other Equipment

- Residential appliances including: refrigerators, microwave ovens, dishwashers, lab dishwashers, and electric ranges.
- Athletic equipment including: scoreboard and shot clocks, and wall pads.
- Stage curtains and rigging.
- Black Box theater equipment.
- Manual and electric operated projection screens.
- Lab fume hoods and emergency eyewash/shower cabinets.
- Telescoping bleachers.

E20: FURNISHINGS

E2010 – Fixed Furnishings

- Fixed Audience seating in Auditorium.
- Recessed exterior foot grilles and interior floor mats and frames at building entrances.
- Manually and electrically operated window shades, including blackout shades in Auditorium.

E2030 – Manufactured Casework.

- Plastic laminate storage cabinets with maple doors and drawers in classrooms and where indicated.
- Laminate and solid surface counters in classrooms and where indicated.
- Lab casework and fixtures.
- Instrument storage.

F. SPECIAL CONSTRUCTION AND DEMOLITION

F10: SPECIAL CONSTRUCTION

Not applicable.

F20: DEMOLITION

F2010 – Building Demolition

- Demolish existing building and foundations.
- Salvage existing bleachers for use at Middle school, Viking long ship boat, and
sound system for reinstallation at the new Middle High school.

- Protect existing site improvements and other features to remain.

F2020 – Hazardous Components Abatement:

- Complete hazardous material abatement from existing building.

G. BUILDING SITEWORK

G10: SITE PREPARATION

SOIL EROSION AND SEDIMENT CONTROL

Scope:
1. Provide all equipment and materials, and do all work necessary to construct a complete erosion and sediment control program for minimizing erosion and siltation during the construction phase of the project.

Products:
1. Hay bales for construction of erosion control devices shall be new, firm, wire- or nylon-bound livestock feedgrade.
2. Grass seed for temporary seed cover shall be previous year’s crop. Not more than 0.5% by weight shall be weed seed and not more than 1.75% by weight crop seed. Seed shall be delivered to the site in sealed containers, labeled with name of seed grower and seed formula, in form stated below. Seed shall be dry and free of mold.
3. Geotextile Fabric: Shall consist of long-chain synthetic polymers, composed of at least 85% by weight polyolefins, polyesters, or polymides.
4. The area of construction entrance should be clear of all vegetation, roots, and other objectionable material. The filter fabric should be placed on the subgrade prior to the stone placement.

SITE UTILITY PREPARATION

Scope:
1. Provide all labor, materials, equipment, services and transportation required to complete all site preparation work as shown on Drawings, as specified herein, or both.
2. Include the following work:
   - Abandonment of existing storm drainage, sanitary sewer, electrical, cable and telephone service and water utilities and their appurtenances.
   - Removing of existing storm drainage, sanitary sewer, electrical, cable and telephone service and water utilities and their appurtenances.
   - Adjusting frame, grate and rim elevations of existing storm drainage, sanitary sewer, and water utilities to remain.

G20: SITE IMPROVEMENTS

See attached outline specifications.

G30: SITE CIVIL/MECHANICAL UTILITIES

WATER SYSTEM

Scope:
1. Assume connection point to building service lines as being approximately 10 feet outside buildings and structures to which service is required.

2. Field Measurement:
   - Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.
   - Locate water pipe at least 10 feet away, horizontally, from sewer pipes. Where bottom of the water pipe will be at least 12 inches above top of sewer pipe, locate water pipe at least 6 feet away, horizontally, from the sewer pipe.
   - Where water lines cross under gravity-flow sewer lines, fully encase the sewer pipe in concrete for a distance of at least 10 feet each side of the crossing, or provide pressure pipe with no joint located within 3 feet of the crossing.

3. Changes in direction, both vertical and horizontal, of water pipelines shall be braced with concrete thrust blocks and restraint joints (Mega Lugs or approved equal).

Products:
1. Piping:
   - Ductile iron pipe shall be super bell-tight joint, class 52, double cement lined (1/8"), bituminous coated, 18-20 foot lengths.

2. Valve boxes:
   - Valves 3 inches and larger: use service box of cast iron with "water" cast into the cover, extension type of the required length, with screw adjustment.
   - Valves 2-1/2 inches and smaller: Use precast concrete or metal box with the word "water" cast into the cover.
   - Install boxes in accessible locations beyond limits of street surfacing, walks and driveways.

3. Gate Valves:
   - Gate valves should be Mueller A-2360 Resilient Gate Valves or approved equal by Town of Winthrop Water Department

4. Tapping Sleeve:
   - Tapping sleeves shall be Mueller Mechanical Joint type H-615 or approved equal by Town of Winthrop Water Department

5. Post Indicator Valve:
   - Post indicator valves shall be vertical adjustable indicator posts model number A20806 as manufactured by Mueller Co. or approved equal by Town of Winthrop Fire Department.

STORM DRAINAGE

Scope:
1. Assume connection point to building service lines as being approximately 10 feet outside buildings and structures to which service is required.

2. Testing:
   - Provide personnel and equipment necessary, and perform tests required to demonstrate that the work of this section has been completed in accordance with specified requirements and with governmental authority having jurisdiction.

3. Connect into existing storm drainage system.

4. Clean and video inspect existing storm drainage system.

Products:
1. Pipe Materials:
   - Provide pipe and associated materials of the size indicated on the Drawings.

2. Catch Basins:
   - Basin frame and grate: Cast iron.
   - Reinforced precast concrete pipe sections, tongue and groove joints.
   - Catch Basins shaft shall be conical, precast structures with a 6 foot sump.
   - Oil hoods shall be installed on all catchbasins
3. Manholes:
   - Frame and cover: Cast iron.
   - Manholes shaft shall be conical, precast structures.
   - Manhole steps shall be Polypropylene plastic reinforced with 3/8 inch diameter steel rods at 12 inches o.c.

4. Bedding:
   - Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe.
   - Provide a minimum of 12 inches of gravel bedding over the top and under the pipe.

5. Water Quality Units:
   - Precast structure
   - Capable of achieving an 80% reduction in total suspended solids.
   - Capable of removing all floatable and buoyant materials.
   - Capable of retaining petroleum hydrocarbons.

SANITARY SEWAGE

Scope:
1. Assume connection point to building service lines as being approximately 10 feet outside buildings and structures to which service is required.
2. Testing And Inspection: Provide personnel and equipment necessary, and perform tests required to demonstrate that the work of this Section has been completed in accordance with the specified requirements.
3. Connect into existing sanitary system

Products:
1. Pipe Materials:
   - Provide pipe and associated materials of the size indicated on the Drawings
2. Bedding:
   - Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe.
   - Provide a minimum of 12 inches of gravel bedding over the top and under the pipe.
   - Backfill: Backfill and compact in accordance with provisions of Earthwork.
3. Manholes:
   - Frame and cover: Cast iron.
   - Manholes shaft shall be conical, precast structures. (2 external coats of bit paint)
   - Manhole steps shall be Polypropylene plastic reinforced with 3/8 inch diameter steel rods at 12 inches o.c.
4. Grease Trap:
   - 1,000 gal watertight precast concrete tank
   - Frame and cover: Cast iron to grade

G40: SITE ELECTRICAL UTILITIES

G90: OTHER SITE CONSTRUCTION

Z. GENERAL REQUIREMENTS

Z1010 – Administration
Z1020 – Procedural General Requirements and Quality Requirements
Z1030 – Temporary Facilities and Temporary Controls
Z1040 – Project Closeout

Z1050 – Permits, Insurance and Bonds

Z1060 – Fees

Z2010 – Bidding Requirements Design Contingency

End of Document